Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:55:04

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.54m² Plot Reference: Site Reference : Hermitage Lane Plot 11

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 11.55 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 33.9 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: North East	8.65m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	

Community heating, heat from boilers - mains gas

Photovoltaic array

		Llser	Details:						
Access Name	Zahid Ashraf	0361		a Mirros	b a v .		CTDO	001000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	•	Stroma Softwa					001082 on: 1.0.5.9	
Contware Name.	Ottoma i Orii 2012		y Address:		31011.		V 01010	7.0.0.0	
Address :		·	-						
1. Overall dwelling dime	ensions:								
Ground floor		Aı	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (15)		(1a) x		2.5	(2a) =	126.36	(Sa)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)·	+(1h)	50.54	(4)	\	n (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	126.36	(5)
2. Ventilation rate:	main see	condary	other		total			m³ per hou	r
Number of abinomous	heating he	ating		,			40 =	-	_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents					0		10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs. flues and fans = (6a))+(6b)+(7a)+(7b))+(7c) =	Г	0		÷ (5) =	0	(8)
•	een carried out or is intended			ontinue fr			. (-)		(``
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fr	omo or 0.25	for magaan	v oonetr	ruotion	[(9)	-1]x0.1 =	0	(10)
	resent, use the value correspo			•	uction			0	(11)
deducting areas of openir	ngs); if equal user 0.35						1		_
•	floor, enter 0.2 (unseale	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0 s and doors draught stri	nnad						0	(13)
Window infiltration	s and doors draught stri	ppeu	0.25 - [0.2	x (14) ÷ 1	001 =			0	$=$ $\frac{(14)}{(15)}$
Infiltration rate			(8) + (10)		_	+ (15) =		0	(15)
	q50, expressed in cubic	c metres per		, , ,	, , ,	, ,	area	3	(17)
If based on air permeabil		•	•	•				0.15	(18)
•	es if a pressurisation test has l				is being u	sed	1		
Number of sides sheltere	ed							3	(19)
Shelter factor			(20) = 1 -		[9)] =			0.78	(20)
Infiltration rate incorporat			(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f			1.	_				1	
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			<u> </u>		ı	ī	1	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	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		

Colouista atta	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		ı	1	ı	1		
If mechanical If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h	n) = (23a)			0.5	(23
If balanced with) = (23a)			0.5	(23
a) If balance		•	•	_					2h\m + (23h) ~ [1 _ (23c)	79.05	(2:
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]	(2
b) If balance	L				<u> </u>	l .	l	<u> </u>	L		ļ ·		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	iouse ex	tract ver	itilation o	or positiv	re input v	ventilatio	n from o	utside		ļ.		1	
,	n < 0.5 ×			•	•				.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•								
	n = 1, the	r ` ´	· `		·		 					1	(0
24d)m= 0	. 0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			`	` `	´``	´`		`		0.04	1 004	1	(0
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	eat loss _l	oaramete	er:									
LEMENT	Gros		Openin m		Net Ar		U-val W/m2		AXU	()	k-value kJ/m²-		X k J/K
oors	area	(1112)	Ш	-	A ,r				(W/l	<u>^)</u>	KJ/IIII	r K	
Vindows					8.651	X v1	1.4 /[1/(1.4)+	0.041 -	11.47	\dashv			(2
Valls Type1	19.	,]	0.05	_		_		:		╡ ,		-	\(\rac{1}{2}\)
Valls Type1			8.65	=	11.05	=	0.15	=	1.66			-	—\(\frac{1}{2}\)
	19.		2		17.7	=	0.14	=	2.5				
OTOL STAD OF A													
		•	effective wi	ndow H-v	39.4		ı formula 1	/[(1/ -va	ıe)±0 041 s	as aiven in	naragranl	h 32	
for windows and	d roof wind	ows, use e			alue calcul		ı formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	h 3.2	
for windows and * include the area	l roof wind as on both	ows, use e sides of ir	nternal wali		alue calcul	ated using	formula 1		ue)+0.04] a	as given in	paragraph	h 3.2	(3
for windows and include the area abric heat los	l roof winde as on both ss, W/K :	ows, use e sides of ir = S (A x	nternal wali		alue calcul	ated using) + (32) =	ue)+0.04] a				(3
for windows and tinclude the area abric heat los leat capacity	f roof windo as on both ss, W/K : Cm = S(ows, use e sides of ir = S (A x (A x k)	iternal wali U)	ls and par	alue calcul titions	lated using) + (32) = ((28).		2) + (32a).		18.43	(3
for windows and tinclude the area abric heat los leat capacity thermal mass for design assess	d roof winder as on both ss, W/K = Cm = S(s parame	ows, use e sides of ir = S (A x (A x k) eter (TMF	oternal wali U) P = Cm ÷ tails of the	s and pan	alue calcul titions	ated using	(26)(30)) + (32) = ((28) Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46	(3
for windows and * include the area fabric heat los feat capacity Thermal mass for design assess an be used inste	d roof windons on both SS, W/K = Cm = S(S parame sments when ad of a december of the second of	ows, use e sides of ir = S (A x (A x k) eter (TMF erer the de tailed calc	nternal wall U) P = Cm ÷ tails of the ulation.	s and pan	alue calcul titions n kJ/m²K ion are not	lated using	(26)(30)) + (32) = ((28) Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100	(3
for windows and * include the area cabric heat los deat capacity Thermal mass for design assess an be used inste	I roof winder as on both as, W/K: Cm = S(as parame asments whead of a deces: S (L	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal	eternal wall U) P = Cm ÷ tails of the ulation. culated t	s and pan - TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)) + (32) = ((28) Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46	(3
for windows and include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg details of therma	I roof windo as on both ss, W/K: Cm = S(s parame sments wh had of a de- es: S (L al bridging	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal	eternal wall U) P = Cm ÷ tails of the ulation. culated t	s and pan - TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)) + (32) = ((28). Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100	(3
for windows and * include the area fabric heat los deat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma Total fabric he	I roof winder as on both as, W/K: Cm = S(as parame asments whead of a deces: S (L al bridging at loss	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn	enternal wall O = Cm : tails of the ulation. culated to own (36) =	- TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)	(28). Indicative	(30) + (32 utive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	18.43 402.46 100 5.54	(3
for windows and include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg details of therma fotal fabric he	I roof winder as on both as, W/K: Cm = S(as parame asments whead of a deces: S (L al bridging at loss	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn	enternal wall O = Cm : tails of the ulation. culated to own (36) =	- TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)	(28). Indicative	(30) + (32) tive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	18.43 402.46 100 5.54	(3
for windows and include the area fabric heat loss leat capacity fhermal mass for design assess and be used instead details of thermal bridg details of thermal fotal fabric head fabric head Jan	roof windows on both ss, W/K: Cm = S(s parame sments whe had of a decest is S (L had bridging hat loss at loss ca	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not kn	ternal wall D = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir construct using Ap	n kJ/m²K ion are not opendix I	lated using	(26)(30)	(28) Indicative indicative (33) + (38)m	(30) + (32) tive Value e values of (36) = 1 = 0.33 × (2) + (32a). : Low : <i>TMP in T</i> 25)m x (5	(32e) =	18.43 402.46 100 5.54	(3 (3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess an be used instead details of thermal bridg details of thermal fotal fabric head fabric head and sales are sales and sales are sal	roof winder as on both ss, W/K: Cm = S(s parametes where and of a decest is S (Least bridging teat loss at loss cat lo	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn alculated Mar	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir construct using Ap - 0.05 x (3	alue calcul hitions n kJ/m²K ion are not pendix h 1)	lated using t known pr	recisely the	(33) + (38)m Sep 9.22	(30) + (32) tive Values of evalues of (36) = (36) = (0.33 × (0.35))	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82	(32e) = Fable 1f	18.43 402.46 100 5.54	(3 (3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
	roof winder as on both ss, W/K: Cm = S(s parametes where and of a decest is S (Least bridging teat loss at loss cat lo	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn alculated Mar	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir construct using Ap - 0.05 x (3	alue calcul hitions n kJ/m²K ion are not pendix h 1)	lated using t known pr	recisely the	(33) + (38)m Sep 9.22	(30) + (32) tive Values of evalues of (36) = (36	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82	(32e) = Fable 1f	18.43 402.46 100 5.54	(3) (3) (3) (3) (3) (3)
for windows and include the area fabric heat los feat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma fotal fabric he fentilation hea Jan 10.55 Heat transfer (39)m= 34.52	roof windows on both ss, W/K: Cm = S(s parame sments when ad of a decest in S (Leal bridging eat loss at loss ca Feb 10.43 coefficier 34.4	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not know alculated Mar 10.31 nt, W/K	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) = H monthly Apr 9.7	- TFA) ir construct using Ap - 0.05 x (3	alue calcul titions n kJ/m²K ion are not opendix l 1) Jun 8.97	t known pr	Aug 8.85	(33) + (38)m Sep (39)m (31) + (38)m (39)m (33) + (38)m	(30) + (32) tive Value e values of (36) = = 0.33 × (Oct 9.58 = (37) + (32)	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82 38)m 33.8	(32e) = Sable 1f Dec 10.06	18.43 402.46 100 5.54	(3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
for windows and * include the area fabric heat los feat capacity Thermal mass for design assess an be used inste Thermal bridg I details of thermal Total fabric hea Ventilation hea Jan 38)m= 10.55	roof windows on both ss, W/K: Cm = S(s parame sments when ad of a decest in S (Leal bridging eat loss at loss ca Feb 10.43 coefficier 34.4	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not know alculated Mar 10.31 nt, W/K	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) = H monthly Apr 9.7	- TFA) ir construct using Ap - 0.05 x (3	alue calcul titions n kJ/m²K ion are not opendix l 1) Jun 8.97	t known pr	Aug 8.85	(33) + (38)m Sep (39)m (31) + (38)m	(30) + (32) tive Values of (36) = = 0.33 × (Oct 9.58 = (37) + (32)	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82 38)m 33.8 Sum(39).	(32e) = Sable 1f Dec 10.06	18.43 402.46 100 5.54 23.97	(3)

Number of days in month (Table 1a)

	Jan.		T	i .	N/a	1	1	Λ	0	0-4	Nan	Dan		
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
		ipancy, l										71		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TI	-A -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
Annua	l averag	e hot wa	ater usaç									.65		(43)
		_	hot water person per			_	-	to achieve	a water us	se target o	f		l	
not more							•	T .	0	0.1	NI.	5	1	
Hot wate	Jan er usage ii	Feb	Mar day for ea	Apr ach month	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	86.52	83.37	80.23	77.08	73.93	70.79	70.79	73.93	77.08	80.23	83.37	86.52		
(44)111=	00.02	00.07	00.23	77.00	73.93	70.79	10.19	73.33		Total = Su	l	l .	943.85	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor				0.10.00	 ` ′
(45)m=	128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95	104.82	114.42	124.26		
			Į.				!	!		Total = Su	m(45) ₁₁₂ =	=	1237.53	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)				•	
(46)m=	19.25	16.83	17.37	15.14	14.53	12.54	11.62	13.33	13.49	15.72	17.16	18.64		(46)
	storage		includir	na anv sa	olar or M	/WHRS	storana	within s	ame ves	امء		0		(47)
•		` ,	ind no ta	•			_		arric ves	301		0		(47)
	-	-			_			. ,	ers) ente	er '0' in (47)			
	storage			`					,	`	,			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
•			storage	-				(48) x (49)) =		1	10		(50)
•			eclared of factor fr	-								00		(51)
		•	ee secti		0 2 (1000)	11/11(10/00	ху /				0.	02		(31)
	•	from Ta									1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
		(54) in (5	,								1.	03		(55)
Water	storage	loss cal	culated 1	for each	month			((56)m = (55) × (41)	m 				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	m Table	3							0		(58)
	-		culated		,	•	. ,	, ,						
•									cylinde				I	,·
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$										
(62)m= 183.58 162.14 171.07 154.45 152.15 137.08 132.74 144.16 143.44 160.1 167.92 179.53	(62)									
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	(63)									
Output from water heater										
(64)m= 183.58 162.14 171.07 154.45 152.15 137.08 132.74 144.16 143.44 160.1 167.92 179.53										
Output from water heater (annual) ₁₁₂ 1888.37	(64)									
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]										
(65)m= 86.88 77.25 82.72 76.36 76.43 70.59 69.98 73.78 72.7 79.08 80.84 85.54	(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= 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31	(66)									
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5										
(67)m= 13.65 12.12 9.86 7.47 5.58 4.71 5.09 6.62 8.88 11.28 13.16 14.03	(67)									
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	,									
(68)m= 148.65 150.19 146.3 138.03 127.58 117.77 111.21 109.66 113.55 121.83 132.27 142.09	(68)									
	(00)									
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53	(69)									
	(00)									
Pumps and fans gains (Table 5a)	(70)									
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(70)									
Losses e.g. evaporation (negative values) (Table 5)	(74)									
(71)m= -68.25 -68	(71)									
Water heating gains (Table 5)										
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97	(72)									
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$										
(73)m= 327.67 325.87 315.95 300.15 284.49 269.11 258.94 264.03 272 287.98 306.31 319.68	(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)										
	,									
Northeast 0.9x 0.77 x 8.65 x 11.28 x 0.63 x 0.7 = 29.83	(75)									
Northeast 0.9x 0.77 x 8.65 x 22.97 x 0.63 x 0.7 = 60.72	(75)									
Northeast 0.9x 0.77 x 8.65 x 41.38 x 0.63 x 0.7 = 109.4	(75)									
Northeast 0.9x 0.77 x 8.65 x 67.96 x 0.63 x 0.7 = 179.67	(75)									
Northeast 0.9x 0.77 x 8.65 x 91.35 x 0.63 x 0.7 = 241.51	(75)									
Northeast 0.9x 0.77 x 8.65 x 97.38 x 0.63 x 0.7 = 257.47	(75)									
Northeast 0.9x 0.77 x 8.65 x 91.1 x 0.63 x 0.7 = 240.86										
0.00 A 91.1 A 0.00 A 91.1	(75)									

Northea	ıst _{0.9x}	0.77	X	8.6	55	x	5	0.42	x		0.63	x	0.7		133.31	(75)
Northea	ast _{0.9x}	0.77	x	8.6	55	x	2	8.07	x		0.63	x	0.7	=	74.21	(75)
Northea	st _{0.9x}	0.77	x	8.6	55	x	1	4.2	х		0.63	x	0.7	=	37.53	(75)
Northea	st _{0.9x}	0.77	x	8.6	55	x	9	9.21	х		0.63	x	0.7	=	24.36	(75)
	_					_										_
Solar g	ains in	watts, ca	alculated	for eacl	n month				(83)m	= Sı	um(74)m .	(82)m				
(83)m=	29.83	60.72	109.4	179.67	241.51	25	7.47	240.86	192.	02	133.31	74.21	37.53	24.36		(83)
Total g	ains – iı	nternal a	nd solar	(84)m =	(73)m -	+ (8	3)m ,	watts					•		•	
(84)m=	357.5	386.59	425.35	479.81	525.99	52	6.58	499.8	456.	05	405.31	362.19	343.84	344.04		(84)
7. Me	an inter	nal temp	erature ((heating	season)										
			eating p	`			area f	rom Tab	ole 9,	Th	1 (°C)				21	(85)
		_	ains for li			-					` ,					_
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Αι	ıa T	Sep	Oct	Nov	Dec		
(86)m=	0.93	0.9	0.85	0.72	0.56	\vdash	.39	0.29	0.3	- 	0.54	0.78	0.89	0.93		(86)
) / I					T4 /f-						. 0-1			ļ		
ı			ature in I				i			-		20.74	20.24	10.04	1	(87)
(87)m=	19.97	20.14	20.42	20.74	20.92		0.98	21	20.9	9	20.95	20.71	20.31	19.94		(01)
Temp	erature	during h	eating p	eriods ir	rest of	dwe	elling	from Ta	ble 9	, Th	n2 (°C)				1	
(88)m=	20.36	20.36	20.36	20.37	20.37	20	0.38	20.38	20.3	39	20.38	20.37	20.37	20.36		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling,	h2,r	m (se	e Table	9a)							
(89)m=	0.92	0.89	0.83	0.7	0.53	0	.36	0.25	0.2	9	0.49	0.75	0.88	0.93		(89)
Mean	interna	l temper	ature in t	he rest	of dwelli	na .	T2 (fc	ollow ste	ns 3	to 7	' in Tahl	e 9c)	•	•	•	
(90)m=	18.96	19.2	19.6	20.05	20.28	Ť	0.37	20.38	20.3		20.33	20.02	19.46	18.93		(90)
` ′ [!				f	LA = Livir	l g area ÷ (4	4) =	0.43	(91)
			. "				`	A T4			A) TO					┛` ′
ı			ature (fo				$\frac{3}{0.63}$					20.20	10.00	40.07		(92)
(92)m=	19.4	19.61	19.96	20.35	20.56			20.65	20.6		20.6	20.32	19.83	19.37		(92)
	19.4	19.61	ne mean 19.96	20.35	20.56	_	0.63	20.65	20.6		20.6	•	19.83	19.37	l	(93)
(93)m=				20.35	20.56		J.63	20.65	20.6	95	20.6	20.32	19.63	19.37		(90)
		ting requ		onorotuu	o obtoin	d	ot oto	n 11 of	Toble	o Oh	oo tha	tTime (76)m on	d ro ool	vulata	
			ernal ten or gains ι			ieu	ai sie	p ii oi	rabie	90), so ma	t 11,111=(76)III an	u re-caic	Julate	
	Jan	Feb	Mar	Apr	May	П	Jun	Jul	Αι	ıa T	Sep	Oct	Nov	Dec		
ا Utilisa			ains, hm	•						<u> </u>					ı	
(94)m=	0.91	0.88	0.82	0.7	0.53	0	.37	0.27	0.3	3	0.51	0.75	0.87	0.91		(94)
Usefu	I gains,	hmGm ,	W = (94)	l)m x (84	4)m		!		<u> </u>						ı	
(95)m=	324.14	339.99	348.5	334.44	281.29	19	5.84	132.71	138.	36	206.09	270.88	298.67	314.73		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able	8								l	
(96)m=	4.3	4.9	6.5	8.9	11.7	1.	4.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	3)m-	- (96)m]	•	•	•	
(97)m=	521.21	505.93	461.28	385.53	297.18	19	8.81	133.32	139.	37	215.59	326.16	430.2	516.28		(97)
Space	heatin	g require	ement for	r each n	nonth, k\	Nh/	mont/	h = 0.02	24 x [(97)	m – (95)m] x (4	1)m	!	•	
(98)m=	146.62	111.51	83.91	36.79	11.82		0	0	0	Ť	0	41.13	94.7	149.96		
'			!				•		-	Fotal	per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	676.43	(98)
Space	e heatin	a require	ement in	kWh/m²	/vear										13.38	 (99)
Сриос		5 . oquii 0			, ,										L	

9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)
The community scheme may obtain heat from several sources. The procedure allow	us for CHP and up to four other heat sources: the		(302)
includes boilers, heat pumps, geothermal and waste heat from power stations. See			_
Fraction of heat from Community boilers	_	1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating	Г	kWh/yea	<u>r</u>
Annual space heating requirement	(00) (004) (005) (000)	676.43	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	710.25	(307a)
Efficiency of secondary/supplementary heating system in % (from T	· · · · · · · · · · · · · · · · · · ·	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement	Γ	1888.37	7
If DHW from community scheme:	(0.4) (2002) (2005) (2000)	1000 70	
Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1982.79	(310a)
Electricity used for heat distribution	0.01 x [(307a)(307e) + (310a)(310e)] =	26.93	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	side	175.36	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	175.36	(331)
Energy for lighting (calculated in Appendix L)	Ī	241.09	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Γ	-510.48	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor E kWh/year kg CO2/kWh k	missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	o fuels repeat (363) to (366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310	b)] x 100 ÷ (367b) x	618.83	(367)
Electrical energy for heat distribution [(313	3) x 0.52 =	13.98	(372)
)(366) + (368)(372) =	632.8	(373)
CO2 associated with space heating (secondary) (309		0	(374)
(000			

CO2 associated with water from imme	rsion heater or instanta	aneous heater (3	312) x	0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (37	75) =			632.8	(376)
CO2 associated with electricity for pun	nps and fans within dw	elling (331)) x		0.52	=	91.01	(378)
CO2 associated with electricity for ligh	ting	(332))) x		0.52	=	125.12	(379)
Energy saving/generation technologies	s (333) to (334) as app	licable					_
Item 1				0.52 x 0.0)1 =	-264.94	(380)
Total CO2, kg/year	sum of (376)(382) =					584	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					11.55	(384)
El rating (section 14)						91.81	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 11

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 166.8 (P1)

Transmission heat loss coefficient: 24

Summer heat loss coefficient: 190.77 (P2)

Overhangs:

Overhangs:

Orientation: Ratio: Z_overhangs:

North East (NE) 0 1

Solar shading:

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

Solar gains:

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

Internal gains:

June July **August** 360.45 Internal gains 366.65 353.83 610.35 696.41 659.28 (P5) Total summer gains Summer gain/loss ratio 3.65 3.46 3.2 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 20.95 22.66 22.3 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom Softwa					0001082 on: 1.0.5.9	
	F	roperty	Address	: Plot 11					
Address: 1. Overall dwelling dime	oncione:								
1. Overall awelling aime	511310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.5	(2a) =	126.36	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	50.54	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	126.36	(5)
2. Ventilation rate:									
	main seconda heating heating	у	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	_ = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				2	x ′	10 =	20	(7a)
Number of passive vents	3			Ē	0	x	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_					
				_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			continue fr	20		÷ (5) =	0.16	(8)
Number of storeys in t		u 10 (11),	ound wide	oonanao n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
ir both types of wall are p deducting areas of openi	resent, use the value corresponding tongs); if equal user 0.35	tne grea	ter wall are	ea (arter					
•	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	P x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15) (16)
	q50, expressed in cubic metre	s per h	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + ($	8), otherw	vise (18) = ((16)				0.31	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	90		(20) = 1 -	[0.075 x (²	19)] =			0.78	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	3) x (20) =				0.24	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
	•	-	-	-	-	•	-	•	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m						
0.3	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28			
Calculate effec		•	rate for t	he appli	cable ca	se	!	ļ.	!	!	!	1		_
If mechanica				al.) (aa				. (22)	\			(0	(23a)
If exhaust air h		0 11	, ,	, ,	,		,, ,	`) = (23a)			(0	(23b)
If balanced with		-	•	_									0	(23c)
a) If balance	·					- ` ` 	- ^ `	ŕ	- 		1 ` ´	÷ 100]		(5.4.)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If balance							- 	í `	 	'		1		,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole h if (22b)n		tract ven (23b), t			•				.5 × (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural if (22b)n		on or wh en (24d)							0.5]					
(24d)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54			(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		-	-			
(25)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54			(25)
3. Heat losse	s and he	at loss r	naramete	or:										
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE.	ΑXU		k-value	۵	АХ	(k
LLLIVILINI	area		m		A ,r		W/m2		(W/	K)	kJ/m²-l		kJ/l	
Doors					2	х	1.4	=	2.8					(26)
Windows					8.651	x1	/[1/(1.4)+	0.04] =	11.47					(27)
Walls Type1	19.	7	8.65		11.05	x	0.15	= i	1.66	=		ΠГ		(29)
Walls Type2	19.	7	2		17.7	x	0.14	=	2.5	F i		Ħ ř		(29)
Total area of e	elements	, m²			39.4									– (31)
* for windows and ** include the area						ated using	g formula 1	/[(1/U-valu	ue)+0.04] á	as given in	n paragraph	3.2		
Fabric heat los	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				18	.43	(33)
Heat capacity	Cm = S	(Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	402	2.46	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) in	kJ/m²K			Indica	itive Value	: Low		1(00	(35)
For design assess can be used inste				constructi	on are not	t known pr	recisely the	e indicative	e values of	TMP in T	able 1f			_
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						5.	54	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)									_
Total fabric he								(33) +	(36) =			23	.97	(37)
Ventilation hea	at loss ca	alculated	l monthly	/		I			= 0.33 × ((25)m x (5)	1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 22.78	22.71	22.64	22.29	22.23	21.92	21.92	21.87	22.04	22.23	22.36	22.49			(38)
Heat transfer of	coefficie	nt, W/K				•		(39)m	= (37) + (38)m		1		
(39)m= 46.76	46.68	46.61	46.26	46.2	45.9	45.9	45.84	46.01	46.2	46.33	46.47			_
Heat loss para	meter /L		m2k						Average = = (39)m ÷	` '	112 /12=	46	.26	(39)
(40)m= 0.93	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	1		
(10)111-	1 0.02	1 0.02	0.02	0.01	0.01	0.01	1 0.01		Average =		1	0	92	(40)
									orago –	Jann(40)	12 / 12-	<u> </u>		``

Number of days in month (Table 1a)

Nullibe	ei oi day	5 111 11101	illi (Tab	ie ia)	ı	ı	ī	ī	ı	ı	I	1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
		ıpancy, l										71		(42)
	FA > 13.9 FA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)		•	
		-	ater usaç	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		78	3.65		(43)
		_	hot water person per			-	-	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	l Oct	INOV	Dec		
(44)m=	86.52	83.37	80.23	77.08	73.93	70.79	70.79	73.93	77.08	80.23	83.37	86.52		
					1						m(44) ₁₁₂ =		943.85	(44)
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,ı	n x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	•	
(45)m=	128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95	104.82	114.42	124.26		7(45)
If instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1237.53	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	_	ınd no ta		-			` '						
	vise if no storage		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	_		eclared l	oss facto	or is kno	wn (kWl	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
			eclared o										· I	(=4)
			factor free section		ie z (KVV	n/iitre/ua	ay)					0		(51)
	-	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	•	(54) in (5	•									0		(55)
		loss cal	culated f					((56)m = (55) × (41)				I	
(56)m=	0	0	0	0	0 (56) ==	0	0	0	0 7\m (FC)	0	0	0 m Append	iv I I	(56)
•							· /- ·		, , , ,	·	· · · · ·		ıx n	(<u>)</u>
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•	`	nual) fro			\	(=a)					0		(58)
	-		culated to rom Tab			•	. ,	, ,		r thermo	etat)			
(59)m=	0	0	0	0	0	0	0		0	0	0	0		(59)
			for each	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>					I	
(61)m=	0	0	o each	0	0	000) - 30	05 × (41)	0	0	0	0	0		(61)
()			<u> </u>	L	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L	1	(= -/

Total heat rec	uired for	water he	eating ca	alculated	d fo	r each mont	n (62))m =	0.85 × (45)m -	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 109.06	95.38	98.43	85.81	82.34	7	1.05 65.84	75	.55	76.45	89.1	97.26	105.62		(62)
Solar DHW input	calculated	using App	endix G o	Appendi:	хН	(negative quant	ty) (en	ter '0	if no solar	contrib	ution to wate	er heating)	•	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	3 ap	oplies, see A	ppen	dix C	3)					
(63)m= 0	0	0	0	0		0 0		0	0	0	0	0		(63)
Output from w	ater hea	iter												
(64)m= 109.06	95.38	98.43	85.81	82.34	7	1.05 65.84	75	.55	76.45	89.1	97.26	105.62		
								Outp	out from wa	iter heat	er (annual) ₁	12	1051.9	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′	$[0.85 \times (45)]$ r	n + (6	61)m	n] + 0.8 x	[(46)n	n + (57)m	+ (59)m]	
(65)m= 27.26	23.85	24.61	21.45	20.58	1	7.76 16.46	18	.89	19.11	22.28	24.32	26.4		(65)
include (57)	m in cal	culation of	of (65)m	only if o	Cylii	nder is in the	dwel	ling	or hot wa	ater is	from com	munity h	i leating	
5. Internal g			. ,									•		
Metabolic gair	·			<i>/-</i>										
Jan	Feb	Mar	Apr	May	Т	Jun Jul	T A	ug	Sep	Oct	Nov	Dec		
(66)m= 85.31	85.31	85.31	85.31	85.31	Ę	5.31 85.31	+	.31	85.31	85.31	85.31	85.31		(66)
Lighting gains	. (calcula	ted in Ar	<u> </u>	l equat	tion	 I 9 or I 9a)								
(67)m= 13.65	12.12	9.86	7.47	5.58	_	4.71 5.09	_	62	8.88	11.28	13.16	14.03		(67)
Appliances ga	1	l	l	l							1		l	,
(68)m= 148.65	- `	146.3	138.03	127.58		17.77 111.21		9.66	113.55	121.83	132.27	142.09	1	(68)
` '	<u> </u>	ļ	<u> </u>	<u> </u>		!			LI		102.21	142.00		(00)
Cooking gains (69)m= 31.53	31.53	31.53	31.53	1.53	_	1.53 31.53	i 	.53	31.53	31.53	31.53	31.53		(69)
` '			<u> </u>	31.03		01.00	31	.55	31.55	31.33	31.55	31.33		(00)
Pumps and fa		r `			_	0 1 0	1	0	_		1 0		1	(70)
(70)m= 0	0	0	0	0	Ļ	0 0		0	0	0	0	0		(70)
Losses e.g. e		- ` 		- ^ `	_		1				T		1	(74)
(71)m= -68.25	-68.25	-68.25	-68.25	-68.25	-	68.25 -68.25	-68	3.25	-68.25	-68.25	-68.25	-68.25		(71)
Water heating	` ` `	- 	ı	ı	_						_		ı	
(72)m= 36.65	35.49	33.07	29.8	27.67	2	22.12		.39	26.55	29.94	33.77	35.49		(72)
Total interna	l gains =	:			_	(66)m + (67)	m + (6	8)m +	+ (69)m + (70)m +	(71)m + (72)	m	•	
(73)m= 247.54		237.83	223.88	209.42	1	95.74 187.01	190	0.26	197.57	211.64	227.8	240.2		(73)
6. Solar gain														
Solar gains are		•			and	·	ations	to co	nvert to the	e applica		ion.		
Orientation:	Access F Table 6d		Area m²			Flux Table 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	0.77	x	8.6	35	X	11.28	7 x		0.63	_ x [0.7		29.83	(75)
Northeast _{0.9x}	0.77	X	8.6		x	22.97	d x		0.63	x	0.7	= =	60.72	(75)
Northeast _{0.9x}	0.77		8.6		x	41.38	i x		0.63	_	0.7	= =	109.4] (75)
Northeast 0.9x	0.77	×			x	67.96	ا ا		0.63		0.7	= =	179.67](75)
Northeast 0.9x	0.77	×			x	91.35	^ x	\vdash	0.63	^ [_ x [0.7	=	241.51](75)
Northeast 0.9x	0.77	_			x	97.38	^ x	\vdash	0.63	^ [_ x [0.7	_	257.47](75)
Northeast 0.9x		×	8.6		X	91.1	-		0.63	_	0.7	_	240.86](75)
Northeast 0.9x	• • • • • • • • • • • • • • • • • • • •	_					╡	\vdash		╡		=		╡
THORETOGOL U.9X	0.77	X	8.6	oo	X	72.63	X	1	0.63	X	0.7	=	192.02	(75)

Northea	est _{0.9x}	0.77	х	8.6	65	x	50.42	2	x		0.63	X	0.7	=	133.31	(75)
Northea	ıst _{0.9x}	0.77	X	8.6	6 5	x	28.07	7] x		0.63	X	0.7	=	74.21	(75)
Northea	ıst _{0.9x}	0.77	X	8.6	65	x	14.2		x [0.63	X	0.7	=	37.53	(75)
Northea	st _{0.9x}	0.77	х	8.6	55	x	9.21] x [0.63	х	0.7	=	24.36	(75)
	_															
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m =	= Sur	m(74)m .	(82)m			_	
(83)m=	29.83	60.72	109.4	179.67	241.51	257	7.47 24	0.86	192.0	2	133.31	74.21	37.53	24.36		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m ·	+ (8	3)m , wa	atts	•	•			-		_	
(84)m=	277.37	307.12	347.23	403.55	450.93	453	3.21 42	27.87	382.2	:8	330.88	285.84	265.33	264.56		(84)
7. Me	an inter	nal temp	erature	(heating	season)										
Temp	erature	during h	eating p	eriods ir	the livii	ng a	rea fror	n Tal	ole 9,	Th1	(°C)				21	(85)
•		•	ains for I			-					` ,					
	Jan	Feb	Mar	Apr	May	È		Jul	Au	αT	Sep	Oct	Nov	Dec	7	
(86)m=	0.97	0.96	0.93	0.86	0.73			.45	0.51	_	0.74	0.9	0.96	0.97	1	(86)
) / l					T4 //-			0.4		<u></u>	0-2		-		J	
I	19.04	19.25	ature in 1		20.62	_	- i -	3 to <i>1</i> 0.96	r	$\overline{}$		20.15	19.5	18.99	7	(87)
(87)m=	19.04	19.25	19.65	20.18	20.02	20	1.01 21	0.96	20.93	,	20.72	20.15	19.5	16.99	_	(01)
Temp	erature	during h	eating p	eriods ir	rest of	dwe	lling fro	m Ta	able 9,	Th	2 (°C)			,	_	
(88)m=	20.15	20.15	20.15	20.15	20.16	20	.16 20	0.16	20.16	3	20.16	20.16	20.15	20.15		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling,	h2,n	n (see T	able	9a)							
(89)m=	0.97	0.95	0.92	0.84	0.7	0.	52 0	.37	0.43		0.68	0.89	0.95	0.97]	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na 1	 Γ2 (follo	w ste	ens 3 t	n 7	in Tabl	e 9c)	•	•	_	
(90)m=	18.33	18.54	18.93	19.45	19.86	Ť	<u> </u>	0.14	20.13	-	19.96	19.43	18.8	18.29	7	(90)
` ′			<u> </u>			<u> </u>	!				f	LA = Liv	l ing area ÷ (<u>(4)</u> =	0.43	(91)
			. "				\ (I A		/4		· · · · · · · · · · · · · · · · · · ·					」 ` ′
I			ature (fo			Ť	<u> </u>		- `	-		40.74	1 40 4	10.50	٦	(92)
(92)m=	18.64	18.85	19.24	19.77	20.19			0.49 	20.48		20.28	19.74	19.1	18.59	J	(92)
(93)m=	18.64	18.85	he mean 19.24	19.77	20.19	ī		0.49	20.48	-	e appro	19.74	19.1	18.59	7	(93)
				19.77	20.19		1.42 2	0.49	20.40	<u> </u>	20.26	19.74	19.1	16.59		(93)
		·	uirement	nnoratuu	ro obtoir	od (at etan 1	11 of	Table	Ωh	co tha	t Ti m-	:(76)m an	nd ro col	culato	
			or gains u			ieu a	ai siep	1101	Table	90,	, 50 iiia	L 11,111=	(10)111 a1	iu ie-cai	Culate	
	Jan	Feb	Mar	Apr	May	J	un .	Jul	Au	a T	Sep	Oct	Nov	Dec	7	
Utilisa	tion fac	tor for g	ains, hm		,	!					•			!	_	
(94)m=	0.96	0.94	0.91	0.83	0.7	0.	53 (0.4	0.46		0.69	0.87	0.94	0.96]	(94)
Usefu	l gains,	hmGm .	, W = (9 ⁴	l)m x (8	4)m					_					_	
(95)m=	265.53	289.27	314.75	333.74	314.24	242	2.18 1 ⁻	71.1	175.4	4	229.26	250.04	249.69	254.56	7	(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able	8		•	•			•	•	_	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6 1	6.6	16.4		14.1	10.6	7.1	4.2]	(96)
Heat I	oss rate	for mea	an intern	al tempe	erature,	Lm ,	, W =[(3	9)m	x [(93)	m–	(96)m]			_	
(97)m=	670.43	651	593.82	502.69	392.1	267	7.13 17	8.64	186.8	6	284.58	422.23	556.07	668.8		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	/Vh/r	month =	0.02	24 x [(97)r	n – (95)m] x (41)m		= -	
(98)m=	301.25	243.09	207.63	121.65	57.92		0	0	0		0	128.11	220.59	308.2		
									Т	otal	per year	(kWh/ye	ar) = Sum(9	98)15,912 =	1588.45	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year										31.43	(99)
•		•			-											_

8c. Sp	pace co	oling red	quiremer	nt										
Calcu	lated fo	r June, c	July and	August.	See Tal	ole 10b							i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	oerature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	431.44	339.65	348.4	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.86	0.9	0.87	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	Vatts) =	(100)m x	(101)m		_	_						
(102)m=	0	0	0	0	0	369.88	306.37	304.5	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	594.22	563.42	511.11	0	0	0	0		(103)
		g require zero if (lwelling,	continue	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m] x	x (41)m	
(104)m=	0	0	0	0	0	161.53	191.25	153.71	0	0	0	0		
<u>'</u>									Total	= Sum(104)	=	506.49	(104)
Cooled	fraction	n							f C =	cooled	area ÷ (4	1) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)									1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	l = Sum(104)	= [0	(106)
•		requirer	ment for	month =	(104)m	× (105)	× (106)r	n					ı	
(107)m=	0	0	0	0	0	40.38	47.81	38.43	0	0	0	0		
									Total	= Sum(107)	=	126.62	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear				(107)	÷ (4) =		Ī	2.51	(108)
8f. Fab	ric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				•
Fabrio	Energ	y Efficie	псу						(99)	+ (108) =	=		33.93	(109)

SAP Input

Property Details: Plot 11

Address:

Located in: England Region: Thames valley

UPRN:

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

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height: 50.545 m^2 2.5 m

Living area: 21.831 m² (fraction 0.432)

Front of dwelling faces: South West

Opening types:

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

SW Manufacturer Solid

NE Manufacturer Windows double-glazed Yes

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

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

NE External Wall North East 0 0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
External Wall	19.699	8.65	11.05	0.15	0	False	N/A
Corridor Wall	19.699	2	17.7	0.15	0.4	False	N/A

Internal Elements

Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1407

Length	Psi-value		
4.795	0.289	E2	Other lintels (including other steel lintels)
13.2	0.047	E4	Jamb
21.687	0.066	E7	Party floor between dwellings (in blocks of flats)
10.9	0.055	F18	Party wall between dwellings

SAP Input

6.992 0.08 E24 Eaves (insulation at ceiling level - inverted)

7.229 0.131 E21 Exposed floor (inverted)

20.976 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: Number of open flues:

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

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

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: 0.62 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 11					
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			ea(m²)	14-2	Av. He		_	Volume(m ³	<u>-</u>
			50.54	(1a) x		2.5	(2a) =	126.36	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(In)	50.54	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	126.36	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	= [0)	(40 =	0	(6a)
Number of open flues	0 + 0	= + [0	<u> </u>	0	<u> </u>	20 =	0	(6b)
Number of intermittent fa	ins				2	,	c 10 =	20	(7a)
Number of passive vents	;				0	<u> </u>	c 10 =	0	(7b)
Number of flueless gas fi				L	0		(40 =	0	(7c)
rvambor or naciose gao n				L				0	(10)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	20		÷ (5) =	0.16	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			
Number of storeys in the Additional infiltration	he dwelling (ns)							0	(9)
	.25 for steel or timber frame of	or 0 35 fc	or macon	ry coneti	ruction	[(9	9)-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	uction			0	(11)
deducting areas of opening									_
·	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0 s and doors draught stripped							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(14)
Infiltration rate					- 12) + (13) ·	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic met	es per h	our per s	quare m	etre of e	envelop	e area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20]$ -	-(8), otherv	vise (18) =	(16)				0.41	(18)
	es if a pressurisation test has been d	one or a de	egree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (19)] =			3	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	`	. •/]			0.78	(21)
Infiltration rate modified f	•		() (-	, (-,				0.32	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1	<u>, </u>			1		ı	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
	2)	1	1	1	•	•	1	1	
Wind Factor (22a)m = (2.32)m $= (2.32)$ m		T 0.05	0.00		1 4 00	1 4 40	1440	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		

0.4	0.4	0.39	0.35	0.34	0.3	0.3	(21a) x	0.32	0.34	0.36	0.27	l		
Calculate effe	1				l		0.29	0.32	0.34	0.36	0.37			
If mechanic		-		• • •								()	(2
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			()	(2
If balanced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				()	(2
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]		
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(2
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (I	MV) (24b)m = (22	2b)m + (2	23b)				
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(2
c) If whole h	nouse ex m < 0.5 ×			•	•				5 × (23b	o)				
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(
d) If natural if (22b)r	ventilation = 1, the				•				0.5]			•		
.4d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(:
Effective air			<u> </u>	` `	´`	c) or (24	d) in box	(25)				ı		
25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(2
3. Heat losse	es and he	eat loss p	oaramete	er:										
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		A) kJ/	
oors					2	X	1	=	2					(
/indows														
-					8.651	₁ x1	/[1/(1.4)+	0.04] =	11.47					(
	19.	7	8.65		8.651 11.05	=	/[1/(1.4)+ 0.18	0.04] =	11.47					_ `
/alls Type1	19.		8.65			x								
/alls Type1 /alls Type2	19.	7			11.05	x x	0.18	=	1.99					
Ialls Type1 Ialls Type2 otal area of e	19. elements	7 , m² ows, use e	2 effective wi	ndow U-ve	11.05 17.7 39.4 alue calcul	5 x	0.18	= =	1.99 3.19	as given in	n paragraph	3.2		
/alls Type1 /alls Type2 otal area of e for windows and include the are abric heat los	19. elements d roof wind as on both ss, W/K:	ows, use e sides of ir = S (A x	2 effective wi	ndow U-ve	11.05 17.7 39.4 alue calcul	5 x	0.18	= = /[(1/U-valu	1.99 3.19	as given in	n paragraph		64	
Valls Type1 Valls Type2 Total area of each of the second to the area of the ar	19. elements d roof wind as on both ss, W/K:	ows, use e sides of ir = S (A x	2 effective wi	ndow U-ve	11.05 17.7 39.4 alue calcul	5 x	0.18 0.18	= = /[(1/U-valu) + (32) =	1.99 3.19	ŭ	, , ,	18.	64	
Valls Type1 Valls Type2 Total area of ending the area Tabric heat lose The table the area Tabric heat lose The table the area The table the t	19. d roof wind as on both ss, W/K: Cm = S(s parame	7 ows, use e sides of ir = S (A x k) eter (TMF	2 effective winternal walk U) $P = Cm \div$	ndow U-valls and part	11.05 17.7 39.4 alue calcul titions	x x	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = = = = = = = = = = = = = = = = = =	1.99 3.19 <i>ie)+0.04]</i> a	2) + (32a) : Medium	(32e) =	18.	2.46	
Valls Type1 Valls Type2 Total area of eatingle the area Tabric heat lose Ileat capacity Thermal mass For design assess	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh	7 ows, use e sides of ir = S (A x (A x k) eter (TMF)	effective winternal walk U) P = Cm : tails of the	ndow U-valls and part	11.05 17.7 39.4 alue calcul titions	x x	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = = = = = = = = = = = = = = = = = =	1.99 3.19 <i>ie)+0.04]</i> a	2) + (32a) : Medium	(32e) =	18.	2.46	
Valls Type1 Valls Type2 Total area of eater windows and the include the area fabric heat lost leat capacity thermal mass for design assessan be used instead	19. elements of roof windows, W/K: Cm = S(s parame sments whead of a de	7 ows, use esides of in = S (A x (A x k) eter (TMF) ere the de tailed calculations	affective winternal wall U) P = Cm ÷ tails of the culation.	ndow U-vals and part	11.05 17.7 39.4 alue calcultitions n kJ/m²K	x x ated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = = = = = = = = = = = = = = = = = =	1.99 3.19 <i>ie)+0.04]</i> a	2) + (32a) : Medium	(32e) =	18. 402 25	2.46	
Valls Type1 Valls Type2 Total area of eating of the strict	19. elements droof wind as on both ss, W/K: Cm = S(s parame sments whe ead of a de es : S (L	ows, use esides of ir = S (A x (A x k) eter (TMF) erer the detailed calce x Y) cal	effective winternal walk U) P = Cm : tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	11.05 17.7 39.4 alue calcultitions n kJ/m²K ion are not	x x ated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = = = = = = = = = = = = = = = = = =	1.99 3.19 <i>ie)+0.04]</i> a	2) + (32a) : Medium	(32e) =	18.	2.46	
Valls Type1 Valls Type2 Total area of eactive for windows and include the area fabric heat loss leat capacity. Thermal mass for design assession be used instead thermal bridged details of thermal fabric hear the cotal fabric hear sections.	19. elements d roof winde as on both ss, W/K: Cm = S(s parame sments whe ead of a de es : S (L al bridging	ows, use esides of ir = S (A x (A x k) eter (TMF) erer the detailed calce x Y) cal	effective winternal walk U) P = Cm : tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	11.05 17.7 39.4 alue calcultitions n kJ/m²K ion are not	x x ated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = /[(1/U-valu) + (32) = ((28). Indicative	1.99 3.19 <i>ie)+0.04]</i> a	2) + (32a) : Medium	(32e) =	18. 402 25	2.46	
Valls Type1 Valls Type2 Total area of eating of the street	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss	ows, use essides of ir S (A x k) Ster (TMF) There the destailed calculation (x Y) calculate	effective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) =	ndow U-vels and part - TFA) ir construction	11.05 17.7 39.4 alue calcultitions n kJ/m²K ion are not	x x ated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = 	1.99 3.19 3.19 3.19 3.(30) + (32) 4.(30) + (32) 4.(30) + (32) 5.(30) + (32) 6.(30) + (32) 6.(30) + (32) 7.(30) + (3 : Medium : <i>TMP in T</i>	(32e) =	18. 402 25. 7.4	2.46	
Valls Type1 Valls Type2 otal area of eatinclude the area abric heat lost leat capacity hermal mass or design assess an be used instead hermal bridg details of thermotal fabric hermal cotal fabric hermal	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss	ows, use essides of ir S (A x k) Ster (TMF) There the destailed calculation (x Y) calculate	effective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) =	ndow U-vels and part - TFA) ir construction	11.05 17.7 39.4 alue calcultitions n kJ/m²K ion are not	x x ated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = 	1.99 3.19 3.19 3.19 3.19 3.19 3.19 3.19	3 : Medium : <i>TMP in T</i>	(32e) =	18. 402 25. 7.4	2.46	
Valls Type1 Valls Type2 Otal area of eat of windows and include the area abric heat lose eat capacity hermal massor design assessing be used insteaded ails of thermotal fabric hermal bridged etails of thermotal fabric hermal bridged etails of thermotal fabric hermal bridged etails of thermotal fabric hermal fabric hermal bridged etails of thermotal fabric hermal f	elements of roof winder as on both as on both as, W/K: Cm = S(s parame and of a deres: S (Leaf bridging part loss at loss care	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not kn	effective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) =	ndow U-vals and part TFA) ir constructi using Ap	11.05 17.7 39.4 alue calcultitions h kJ/m²K ion are not	x x ated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = 	1.99 3.19 3.19 3.19 3.19 3.19 3.19 3.19	2) + (32a) : Medium : <i>TMP in T</i> 25)m x (5	(32e) =	18. 402 25. 7.4	2.46	
Valls Type1 Valls Type2 otal area of ending of the area of entilation head long of the area of the are	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.11	ows, use esides of ir S (A x k) eter (TMF) ere the detailed calculated are not known alculated Mar 23.98	effective winternal walk U) P = Cm -tails of the culation. culated to cown (36) =	ndow U-vals and part TFA) ir construction using Ap = 0.05 x (3)	11.05 17.7 39.4 alue calcultitions kJ/m²K ion are not opendix k 1) Jun	x x lated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = /[(1/U-value) + (32) = ((28). Indicative (33) + (38)m Sep 22.94	1.99 3.19 3.19 3.19 3.19 3.19 3.19 3.19	2) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.49	(32e) = Fable 1f	18. 402 25. 7.4	2.46	
Valls Type1 Valls Type2 otal area of eaction windows and include the area abric heat lost leat capacity hermal mass or design assessan be used insteadetails of thermotal fabric hereatilation hereati	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.11	ows, use esides of ir S (A x k) eter (TMF) ere the detailed calculated are not known alculated Mar 23.98	effective winternal walk U) P = Cm -tails of the culation. culated to cown (36) =	ndow U-vals and part TFA) ir construction using Ap = 0.05 x (3)	11.05 17.7 39.4 alue calcultitions kJ/m²K ion are not opendix k 1) Jun	x x lated using	0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = /[(1/U-value) + (32) = ((28). Indicative (33) + (38)m Sep 22.94	1.99 3.19 3.19 3.19 3.19 3.19 3.19 3.19	2) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.49	(32e) = Fable 1f	18. 402 25. 7.4	2.46	
Valls Type1 Valls Type2 Total area of eater windows and include the area abric heat lost leat capacity hermal mass or design assessan be used instead details of thermal bridg details of thermal fotal fabric hermal segment of the se	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.11 coefficiel	ows, use esides of ir = S (A x (A x k) eter (TMF) ere the detailed calculated are not known alculated Mar 23.98 nt, W/K	effective winternal walk U) P = Cm - tails of the valuation. culated uniternal walk own (36) = I monthly Apr 23.38	ndow U-vels and part - TFA) in construction using Ap = 0.05 x (3) May 23.26	11.05 17.7 39.4 alue calcultitions n kJ/m²K ion are not opendix l 1) Jun 22.73	x x ated using t known process.	0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = 	1.99 3.19 3.19 3.19 3.19 3.19 3.19 3.19	25)m x (5 Nov 23.49 38)m 49.2	(32e) = Fable 1f Dec 23.73	18. 402 25. 7.4	2.46	
Valls Type1 Valls Type2 otal area of experiments of the area of experiments of the area of	19. elements d roof wind as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.11 coefficier 49.82	ows, use esides of ir = S (A x (A x k) eter (TMF) ere the detailed calculated are not known alculated Mar 23.98 ent, W/K 49.69	effective winternal walk U) P = Cm + tails of the valuation. culated to cown (36) = tails monthly Apr 23.38	ndow U-vels and part - TFA) in construction using Ap = 0.05 x (3) May 23.26	11.05 17.7 39.4 alue calcultitions n kJ/m²K ion are not opendix l 1) Jun 22.73	x x ated using t known process.	0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18	= = 	1.99 3.19 3.19 3.19 3.19 3.19 3.19 3.19	22) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.49 38)m 49.2 Sum(39)	(32e) = Fable 1f Dec 23.73	18. 402 25. 7.0 25.	2.46	

Number of days in month (Table 1a)

INUITIDE	ei oi day	5 111 11101	illii (Tabi	ie ia)	ı	ı	ī	ī	ı	I	1	1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
\ ccum	and accu	inanov l	NI									74	I	(42)
	ned occu A > 13.9		м + 1.76 х	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)1 + 0.0	0013 x (ΓFA -13.		71		(42)
	A £ 13.9				(•		, ,1 -			-,			
			ater usag							a taraat a		.72		(43)
		_	hot water person per			-	-	to acnieve	a water us	se target o	Σ			
	Jan	Feb	Mar			Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
Hot wat			day for ea	Apr ach month	May Vd,m = fa		ļ	Aug (43)	J Sep	Oct	1400	Dec		
(44)m=	82.19	79.2	76.22	73.23	70.24	67.25	67.25	70.24	73.23	76.22	79.2	82.19		
(44)111=	02.10	75.2	70.22	73.23	70.24	07.20	07.20	70.24		l	m(44) ₁₁₂ =		896.65	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	m x nm x E	OTm / 3600			. ,		000.00	
(45)m=	121.89	106.61	110.01	95.91	92.03	79.41	73.59	84.44	85.45	99.58	108.7	118.04		
			<u> </u>				ļ	ļ		I Total = Su	m(45) ₁₁₂ =	! =	1175.66	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)			'		_
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		•				•	•	•			•		
Storag	je volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	_	ınd no ta		-			` '						
			hot wate	r (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
	storage		eclared l	nee facti	nr ie kna	wn (k\//	J/day).					0	1	(40)
					טו וא פו וט	WII (KVVI	i/uay).					0		(48)
•			m Table					(40) (40)				0		(49)
٠.			storage eclared c	-		or is not		(48) x (49)) =			0		(50)
			factor fr									0		(51)
			ee section											
	e factor											0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
٠.			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (. , .	•									0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	ım Tahlı	3		•	•	•		i e	0		(58)
	•	`	culated f			59)m =	(58) ÷ 36	65 × (41)	m					, ,
	-		rom Tabl			•	. ,	, ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	culated	for each	month	(61)m –	(60) ÷ 30	65 v (41)m	•	•	•		1	
(61)m=	0	0	0	0	0 0	00) + 3	05 x (41)	0	0	0	0	0		(61)
(51)111-					<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	I	(= 1)

Total heat required for water	er heating	calculate	d for	each month	(62)m	= 0.85 × ((45)m +	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 103.61 90.62 93.	51 81.5	2 78.22	67	.5 62.55	71.77	72.63	84.65	92.4	100.34		(62)
Solar DHW input calculated using	Appendix (or Appendi	x H (ne	gative quantit	y) (enter	'0' if no sola	r contribu	ution to wate	er heating)	•	
(add additional lines if FGH	RS and/o	r WWHR	app	lies, see Ap	pendix	(G)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0		(63)
Output from water heater								-	•	•	
(64)m= 103.61 90.62 93.8	51 81.5	2 78.22	67	.5 62.55	71.77	72.63	84.65	92.4	100.34		
	•	•	•	•	0	utput from wa	ater heat	er (annual) ₁	112	999.31	(64)
Heat gains from water heat	ing, kWh	month 0.2	.5 ´ [C	.85 × (45)m	n + (61	m] + 0.8 x	c [(46)n	n + (57)m	+ (59)m]	
(65)m= 25.9 22.65 23.	38 20.3	3 19.56	16.	87 15.64	17.94	18.16	21.16	23.1	25.08		(65)
include (57)m in calculati	on of (65	m only if	cylind	er is in the	dwellin	g or hot w	ater is	from com	munity h	neating	
5. Internal gains (see Tab	le 5 and	5a):							·		
Metabolic gains (Table 5), \		,									
	ar Ap	r May	Jı	ın Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 85.31 85.31 85.3			85.	31 85.31	85.31		85.31	85.31	85.31		(66)
Lighting gains (calculated in	Append	ix L. equa	tion L	9 or L9a). a	ılso se	e Table 5	<u> </u>	-1	!	ı	
(67)m= 13.65 12.12 9.8			4.7		6.62	8.88	11.28	13.16	14.03		(67)
Appliances gains (calculate	d in Appe	endix L. ed	uatio	n L13 or L1	3a), al	so see Tal	ble 5		1	l	
(68)m= 148.65 150.19 146			117		109.6		121.83	132.27	142.09]	(68)
Cooking gains (calculated i	!	_ !	tion I	 15 or l 15a	l also	see Table	5		<u> </u>	l	
(69)m= 31.53 31.53 31.5	- i -		31.		31.53		31.53	31.53	31.53		(69)
Pumps and fans gains (Tab		1 000	1	1 000	0	000	000	1 000	1 000	l	, ,
(70)m =		0		0	0	0	0	0	0		(70)
Losses e.g. evaporation (ne	l		<u> </u>					1 -		I	, ,
(71)m= -68.25 -68.25 -68.		 	-68		-68.2	-68.25	-68.25	-68.25	-68.25	1	(71)
Water heating gains (Table		9 00.20	1 00			7 00.20	00.20	1 00.20	1 00.20	l	, ,
(72)m= 34.81 33.71 31.4	<u> </u>	1 26.28	23.	44 21.02	24.12	25.22	28.44	32.08	33.72	1	(72)
	72 20.0	20.20	20.	(66)m + (67)n			<u> </u>	<u> </u>	<u> </u>		()
Total internal gains = (73)m= 245.71 244.62 236	.18 222.3	9 208.04	194		188.9		210.14		238.43	1	(73)
6. Solar gains:	.10 222.0	208.04	194	.51 165.91	100.9	190.24	210.14	220.11	230.43		(10)
Solar gains are calculated using	solar flux fr	om Table 6a	and a	ssociated equa	ations to	convert to th	e applica	able orientat	tion.		
Orientation: Access Facto				Flux		g_		FF		Gains	
Table 6d		1 ²		Table 6a		Table 6b	-	Table 6c		(W)	
Northeast 0.9x 0.77	х	8.65	хГ	11.28] _x [0.63	x [0.7		29.83	(75)
Northeast 0.9x 0.77	x	8.65	x	22.97	」] _x	0.63	x	0.7	╡ -	60.72] (75)
Northeast 0.9x 0.77	X	8.65	x	41.38	」] _x	0.63	x	0.7	╡ -	109.4] (75)
Northeast 0.9x 0.77	x	8.65	x [67.96]	0.63	x [0.7	= =	179.67	(75)
Northeast 0.9x 0.77	x	8.65	x [91.35] ^ <u>L</u>] _x [0.63	^ L	0.7	= =	241.51](75)
Northeast 0.9x 0.77	x	8.65	× [97.38	」^∟ 1 _× Γ	0.63	^ L x [0.7		257.47](75)
Northeast 0.9x 0.77		0.00	· L	07.00	ı ^ L	5.00	^	0.7		l -0111	
	x	8.65	хГ	91 1	i _x F	0.63	Ħ x i	0.7		240.86	(75)
0.77	x	8.65	х	91.1	x	0.63	X	0.7		240.86	(75)

Northeas	st _{0.9x}	0.77	X	8.6	65	x	5	0.42	x		0.63	x	0.7	=	133.31	(75)
Northeas	st _{0.9x}	0.77	x	8.6	65	x	2	8.07	x		0.63	_ x _	0.7	=	74.21	(75)
Northeas	st _{0.9x}	0.77	х	8.6	S5	x		14.2	x		0.63	_ x _	0.7	=	37.53	(75)
Northeas	st _{0.9x}	0.77	×	8.6	S5	x	9	9.21	x		0.63	_ x _	0.7	=	24.36	(75)
	_															_
Solar ga	ains in v	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	29.83	60.72	109.4	179.67	241.51	1	57.47	240.86	192	.02	133.31	74.21	37.53	24.36		(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts							l	
(84)m=	275.54	305.34	345.58	402.06	449.55	4	51.98	426.77	381	.01	329.55	284.34	263.64	262.79		(84)
7 Mea	an inter	nal temr	erature	(heating	season)										
			eating p	`		<i>'</i>	area i	from Tak	nle 9	Th	1 (°C)				21	(85)
•		_	ains for I			_			JIC 0,	,	1 (0)				21	
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec]	
(86)m=	1	1	0.99	0.96	0.86	+	0.66	0.5	0.5	Ť	0.86	0.98	1	1		(86)
` ' L								<u> </u>				0.30	ļ <u>'</u>	ļ <u>'</u>		(00)
Г			ature in		· ·	_		i							1	
(87)m=	19.93	20.05	20.28	20.6	20.87	2	20.98	21	20.	99	20.9	20.56	20.19	19.91		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	9, Tł	n2 (°C)					
(88)m=	20.09	20.1	20.1	20.11	20.11	2	20.12	20.12	20.	12	20.11	20.11	20.11	20.1		(88)
Utilisat	tion fac	tor for a	ains for i	est of d	welling.	h2.	m (se	ee Table	9a)	•			•	•	•	
(89)m=	1	1	0.99	0.95	0.81	Т	0.58	0.4	0.4	17	0.8	0.98	1	1		(89)
Maani	intornal	tompor	oturo in	the rest	of dwall	ina	T2 (f	ollow oto	\	to 7	7 in Tabl	0.00)	!	!		
(90)m=	19.11	19.23	ature in	19.78	20.02	Ť	20.11	20.12	20.		20.06	19.75	19.38	19.1		(90)
(50)111=	10.11	10.20	10.40	10.70	20.02	<u></u>		20.12		<u>'- </u>			g area ÷ (4		0.43	(91)
													g a. oa . (•,	0.43	(01)
Г			ature (fo			_			+ (1	– fL			1	1	1	
(92)m=	19.46	19.58	19.81	20.14	20.39		20.48	20.5	20		20.42	20.1	19.73	19.45		(92)
	_		he mean			_		1	·			·			1	
(93)m=	19.46	19.58	19.81	20.14	20.39	2	20.48	20.5	20	.5	20.42	20.1	19.73	19.45		(93)
			uirement													
			ernal ter or gains	•		ned	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=(76)m an	d re-cald	culate	
Г	Jan	Feb	Mar	Apr	May	Π	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec		
L Utilisat			ains, hm		iviay	<u> </u>	Juli	Jui		ug	Оер	Oct	1100	Dec		
(94)m=	1	1	0.99	0.95	0.83		0.61	0.44	0.5	51	0.82	0.98	1	1		(94)
L	l l gains.	hmGm	W = (94		L 4)m				<u> </u>	!			l	l .	l	
	274.98	304.11	341.47	382.12	372.16	2	77.53	187.86	195	.87	270.92	277.68	262.55	262.38		(95)
L	lv avera	age exte	rnal tem	perature	from T	ı abl	e 8		<u> </u>	!			l	l	1	
(96)m=	4.3	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	Lm	ı , W =	-[(39)m	x [(9:	 3)m-	– (96)m]	<u>I</u>	<u>I</u>	<u> </u>	
	757.43	731.43	661.43	551.59	425.32	_	285	188.77	197	_	307.51	465.13	621.45	753.86		(97)
Space	heating	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x [(97)	m – (95)m] x (4	1)m	!	l	
· -	358.95	287.16	238.05	122.02	39.55		0	0	0	Í	0	139.47	258.41	365.66		
L								•		Total	l per year	(kWh/yea) = Sum(9	8) _{15,912} =	1809.26	(98)
Snace	heatin	a require	ement in	kWh/m²	?/vear										35.8	<u> </u> (99)
Space	· · · · · · · · · · · ·	y roquire			, y Jui										55.0	

8c. Sp	ace co	oling req	uiremer	it										
Calcu	lated fo	r June, J	luly and	August.	See Tab	ole 10b							•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	Lm (ca	lculated	using 2	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	455.34	358.46	367.4	0	0	0	0		(100)
Utilisa	ition fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.94	0.97	0.95	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (100)m x	(101)m									
(102)m=	0	0	0	0	0	428.22	348.59	350.46	0	0	0	0		(102)
Gains	(solar o	gains cal	lculated	for appli	cable we	eather re	gion, se	e Table	10)				'	
(103)m=	0	0	0	0	0	592.99	562.31	509.84	0	0	0	0		(103)
•		•				lwelling,	continue	ous (kW	h = 0.02	24 x [(10	03)m – (102)m]:	x (41)m	
set (1	04)m to	zero if (104)m <	3 × (98)m								İ	
(104)m=	0	0	0	0	0	118.64	159.01	118.58	0	0	0	0		
										= Sum(,	=	396.22	(104)
	fraction								f C =	cooled	area ÷ (4	1) =	1	(105)
i			able 10b											
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
					(101)	(40=)	(400)		Total	' = Sum(104)	=	0	(106)
•	— Ť				(104)m								[
(107)m=	0	0	0	0	0	29.66	39.75	29.65	0	0	0	0		– , ,
									Total	= Sum(107)	=	99.06	(107)
Space	cooling	requirer	nent in k	:Wh/m²/y	/ear				(107)	\div (4) =			1.96	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				-
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		37.75	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								43.42	(109)

Assessor Name: Zahid Ashraf Stroma Number: STRO001082 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.9 Property Address: Plot 11 Address: 1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 50.54 (4) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 126.36 (5) 2. Ventilation rate: main secondary heating heating Number of chimneys 0 + 0 + 0 = 0
Address: 1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³) (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Dwelling volume
1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³) Ground floor Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 126.36 $
Ground floor
Ground floor 50.54 (1a) x 2.5 (2a) = 126.36 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 50.54 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 126.36$ (5) 2. Ventilation rate: Main secondary heating heating heating Number of chimneys 0 + 0 + 0 = 0 × 40 = 0 (6a)
Dwelling volume $ (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 126.36 $
2. Ventilation rate: main secondary other total m³ per hour heating Number of chimneys 0 + 0 = 0 x 40 = 0 (6a)
2. Ventilation rate: main secondary other total m³ per hour heating Number of chimneys 0 + 0 = 0 x 40 = 0 (6a)
Number of chimneys main heating heating heating + 0 + 0 = 0 x 40 = 0 (6a)
Number of chimneys $0 + 0 + 0 = 0 \times 40 = 0$ (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$ (6b)
Number of intermittent fans $0 \times 10 = 0$ (7a)
Number of passive vents
Number of flueless gas fires 0
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 $
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)
Number of storeys in the dwelling (ns) 0 (9) Additional infiltration $[(9)-1]x0.1 = 0$ (10)
Additional infiltration $ [(9)-1]x0.1 = $
if both types of wall are present, use the value corresponding to the greater wall area (after
deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0
Percentage of windows and doors draught stripped 0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0 $ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.15 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered 3 (19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.78$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.12$ (21)
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 4
(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

Colouista atta	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		ı	1	ı	1		
If mechanical If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h	n) = (23a)			0.5	(23
If balanced with) = (23a)			0.5	(23
a) If balance		•	•	_					2h\m + (23h) ~ [1 _ (23c)	79.05	(2:
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]	(2
b) If balance	L				<u> </u>	l .	l	<u> </u>	L		ļ -		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	iouse ex	tract ver	itilation o	or positiv	re input v	ventilatio	n from o	utside		ļ.		1	
,	n < 0.5 ×			•	•				.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•								
	n = 1, the	r ` ´	· `		·		 					1	(0
24d)m= 0	. 0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			`	` `	´``	´`		`		0.04	1 004	1	(0
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	eat loss _l	oaramete	er:									
LEMENT	Gros		Openin m		Net Ar		U-val W/m2		AXU	()	k-value kJ/m²-		X k J/K
oors	area	(1112)	Ш	-	A ,r				(W/l	<u>^)</u>	KJ/IIII	r K	
Vindows					8.651	X v1	1.4 /[1/(1.4)+	0.041 -	11.47	\dashv			(2
Valls Type1	19.	,]	0.05	_		_		:		╡ ,		-	\(\rac{1}{2}\)
Valls Type1			8.65	=	11.05	=	0.15	=	1.66			-	—\(\frac{1}{2}\)
	19.		2		17.7	=	0.14	=	2.5				
OTOL STAD OF A													
		•	effective wi	ndow H-v	39.4		ı formula 1	/[(1/ -va	ıe)±0 041 s	as aiven in	naragranl	h 32	
for windows and	d roof wind	ows, use e			alue calcul		ı formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	h 3.2	
for windows and * include the area	l roof wind as on both	ows, use e sides of ir	nternal wali		alue calcul	ated using	formula 1		ue)+0.04] a	as given in	paragraph	h 3.2	(3
for windows and include the area abric heat los	l roof winde as on both ss, W/K :	ows, use e sides of ir = S (A x	nternal wali		alue calcul	ated using) + (32) =	ue)+0.04] a				(3
for windows and tinclude the area abric heat los leat capacity	f roof windo as on both ss, W/K : Cm = S(ows, use e sides of ir = S (A x (A x k)	iternal wali U)	ls and par	alue calcul titions	lated using) + (32) = ((28).		2) + (32a).		18.43	(3
for windows and tinclude the area abric heat los leat capacity thermal mass for design assess	d roof winder as on both ss, W/K = Cm = S(s parame	ows, use e sides of ir = S (A x (A x k) eter (TMF	oternal wali U) P = Cm ÷ tails of the	s and pan	alue calcul titions	ated using	(26)(30)) + (32) = ((28) Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46	(3
for windows and * include the area fabric heat los feat capacity Thermal mass for design assess an be used inste	d roof windons on both SS, W/K = Cm = S(S parame sments when ad of a december of the second of	ows, use e sides of ir = S (A x (A x k) eter (TMF erer the de tailed calc	nternal wall U) P = Cm ÷ tails of the ulation.	s and pan	alue calcul titions n kJ/m²K ion are not	lated using	(26)(30)) + (32) = ((28) Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100	(3
for windows and * include the area cabric heat los deat capacity Thermal mass for design assess an be used inste	I roof winder as on both as, W/K: Cm = S(as parame asments whead of a deces: S (L	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal	eternal wall U) P = Cm ÷ tails of the ulation. culated t	s and pan - TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)) + (32) = ((28) Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46	(3
for windows and include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg details of therma	I roof windo as on both ss, W/K: Cm = S(s parame sments wh had of a de- es: S (L al bridging	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal	eternal wall U) P = Cm ÷ tails of the ulation. culated t	s and pan - TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)) + (32) = ((28). Indica	(30) + (32 itive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100	(3
for windows and * include the area fabric heat los deat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma Total fabric he	I roof winder as on both as, W/K: Cm = S(as parame asments whead of a deces: S (L al bridging at loss	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn	enternal wall O = Cm : tails of the ulation. culated to own (36) =	- TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)	(28). Indicative	(30) + (32 utive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	18.43 402.46 100 5.54	(3
for windows and include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg details of therma fotal fabric he	I roof winder as on both as, W/K: Cm = S(as parame asments whead of a deces: S (L al bridging at loss	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn	enternal wall O = Cm : tails of the ulation. culated to own (36) =	- TFA) ir construct using Ap	alue calcul hitions n kJ/m²K ion are not opendix l	lated using	(26)(30)	(28). Indicative	(30) + (32) tive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	18.43 402.46 100 5.54	(3
for windows and include the area fabric heat loss leat capacity fhermal mass for design assess and be used instead details of thermal bridg details of thermal fotal fabric head fabric head Jan	roof windows on both ss, W/K: Cm = S(s parame sments whe had of a decest is S (L had bridging hat loss at loss ca	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not kn	ternal wall D = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir construct using Ap	n kJ/m²K ion are not opendix I	lated using	(26)(30)	(28) Indicative indicative (33) + (38)m	(30) + (32) tive Value e values of (36) = 1 = 0.33 × (2) + (32a). : Low : <i>TMP in T</i> 25)m x (5	(32e) =	18.43 402.46 100 5.54	(3 (3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess an be used instead details of thermal bridg details of thermal fotal fabric head fabric head and sales are sales and sales are sal	roof winder as on both ss, W/K: Cm = S(s parametes where and of a decest is S (Least bridging teat loss at loss cat lo	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn alculated Mar	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir construct using Ap - 0.05 x (3	alue calcul hitions n kJ/m²K ion are not pendix h 1)	lated using t known pr	recisely the	(33) + (38)m Sep 9.22	(30) + (32) tive Values of evalues of (36) = (36) = (0.33 × (0.35))	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82	(32e) = Fable 1f	18.43 402.46 100 5.54	(3 (3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
	roof winder as on both ss, W/K: Cm = S(s parametes where and of a decest is S (Least bridging teat loss at loss cat lo	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calc x Y) cal are not kn alculated Mar	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir construct using Ap - 0.05 x (3	alue calcul hitions n kJ/m²K ion are not pendix h 1)	lated using t known pr	recisely the	(33) + (38)m Sep 9.22	(30) + (32) tive Values of evalues of (36) = (36	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82	(32e) = Fable 1f	18.43 402.46 100 5.54	(3) (3) (3) (3) (3) (3)
for windows and include the area fabric heat los feat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma fotal fabric he fentilation hea Jan 10.55 Heat transfer (39)m= 34.52	roof windows on both ss, W/K: Cm = S(s parame sments when ad of a decest in S (Leal bridging eat loss at loss ca Feb 10.43 coefficier 34.4	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not know alculated Mar 10.31 nt, W/K	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) = H monthly Apr 9.7	- TFA) ir construct using Ap - 0.05 x (3	alue calcul titions n kJ/m²K ion are not opendix l 1) Jun 8.97	t known pr	Aug 8.85	(33) + (38)m Sep (39)m (31) + (38)m (39)m (33) + (38)m	(30) + (32) tive Value e values of (36) = = 0.33 × (Oct 9.58 = (37) + (32)	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82 38)m 33.8	(32e) = Sable 1f Dec 10.06	18.43 402.46 100 5.54	(3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
for windows and * include the area fabric heat los feat capacity Thermal mass for design assess an be used inste Thermal bridg I details of thermal Total fabric hea Ventilation hea Jan 38)m= 10.55	roof windows on both ss, W/K: Cm = S(s parame sments when ad of a decest in S (Leal bridging eat loss at loss ca Feb 10.43 coefficier 34.4	ows, use e sides of ir = S (A x (A x k) eter (TMF ere the de tailed calco x Y) cal are not know alculated Mar 10.31 nt, W/K	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) = H monthly Apr 9.7	- TFA) ir construct using Ap - 0.05 x (3	alue calcul titions n kJ/m²K ion are not opendix l 1) Jun 8.97	t known pr	Aug 8.85	(33) + (38)m Sep (39)m (31) + (38)m	(30) + (32) tive Values of (36) = = 0.33 × (Oct 9.58 = (37) + (32)	2) + (32a). : Low : TMP in T 25)m x (5 Nov 9.82 38)m 33.8 Sum(39).	(32e) = Sable 1f Dec 10.06	18.43 402.46 100 5.54 23.97	(3)

Numbe	er of day	s in moi	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
						•		•		•				
4. Wa	ater heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assum	ned occu	nancy I	N									.71		(42)
if TF	A > 13.9	0, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		.7 1		(42)
	A £ 13.9	•	otor upoc	no in litro	o por de	w Vd ov	orogo –	(25 v NI)	. 26					(40)
	I averag the annua									se target o		3.65		(43)
not more	e that 125	litres per p	person per	day (all w	ater use, i	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	86.52	83.37	80.23	77.08	73.93	70.79	70.79	73.93	77.08	80.23	83.37	86.52		_
Eneravi	content of	hot water	used - cal	culated mo	onthly – 4	190 x Vd r	туптуГ)Tm / 360(m(44) ₁₁₂ =		943.85	(44)
	128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95	104.82	114.42	124.26		
(45)m=	120.31	112.22	115.6	100.96	90.67	63.39	77.40	00.09			m(45) ₁₁₂ =	l	1237.53	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		rotal – ou	III(4 0) 112		1207.00	(```
(46)m=	19.25	16.83	17.37	15.14	14.53	12.54	11.62	13.33	13.49	15.72	17.16	18.64		(46)
	storage										!	!		
_	e volum	` ,		•			_		ame ves	sel		0		(47)
	munity h vise if no	_			_				are) ante	ar '∩' in <i>(</i>	47)			
	storage		not wate	i (uno n	iciuues i	nstantai	ieous cc	JIIIDI DOII	ers) erik	51 0 111 (71)			
	nanufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49) =		1	10		(50)
,	nanufact			•										(-1)
	ater stora munity h	-			e z (KVV	n/iitre/ua	ay)				0.	.02		(51)
	e factor	•									1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
Energy	y lost fro	m 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)	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 cylinde	er contains	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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	y circuit				,	•		, ,						
•	dified by													(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
	loss cal					ì ´	``	<u></u>	1		1			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

(62)m= 183.58 162.14 171.07 154.45 152.15 137.08 132.74 144.16 143.44 160.1 167.92 179.53	62)
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	63)
Output from water heater	
(64)m= 183.58 162.14 171.07 154.45 152.15 137.08 132.74 144.16 143.44 160.1 167.92 179.53	
Output from water heater (annual) ₁₁₂ 1888.37	64)
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 x [(46) m + (57) m + (59) m]	
(65)m= 86.88 77.25 82.72 76.36 76.43 70.59 69.98 73.78 72.7 79.08 80.84 85.54	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)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	,
	68)
	00)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 46.94 46.94 46.94 46.94 46.94 46.94 46.94 46.94 46.94 46.94 (69)m= 46.94	69)
	09)
Pumps and fans gains (Table 5a)	70)
	70)
Losses e.g. evaporation (negative values) (Table 5)	- 4\
	71)
Water heating going (Table 5)	
Water heating gains (Table 5)	
	72)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	72) 73)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 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	
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 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 Table 6d Table 6c (W)	73)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (73)m= 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 Table 6d FIUX BLUE Gains Table 6b Table 6c (W) Northeast 0.9x 0.77 x 8.65 x 11.28 x 0.63 x 0.7 = 29.83 (7)	
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 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 Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 11.28 x 0.63 x 0.7 = 29.83	73)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (70)m + (71)m + (72)m 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 Table 6d Area Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 8.65 x 11.28 x 0.63 x 0.7 = 29.83 (7) Northeast 0.9x 0.77 x 8.65 x 22.97 x 0.63 x 0.7 = 60.72 (7)	73) 75)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 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 Table 6d FIUX G FF Gains Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 8.65 x 11.28 x 0.63 x 0.7 = 29.83 (%) Northeast 0.9x 0.77 x <td< td=""><td>73) 75) 75)</td></td<>	73) 75) 75)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 (73)m= 114.97 (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (74)m+ (72)m (74)m+ (72)m+ (73) 75) 75) 75)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 (73)m= 453.84 450.51 443.19 (74)m= (74)m=<	73) 75) 75) 75) 75)
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 453.84 450.51 435.27 411.8 388.17 366.65 353.83 360.45 373.72 397.37 423.67 443.19 443.19 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 Table 6d Area Flux Table 6b FF Gains Table 6c Table 6d Table 6b Table 6c (W) Northeast 0.9x 0.77 x 8.65 x 22.97 x 0.63 x 0.7 = 29.83 (7) Northeast 0.9x 0.77 x 8.65 x 41.38 x 0.63 x 0.7 = 109.4 (6) Northeast 0.9x 0.77 x </td <td>73) 75) 75) 75) 75) 75)</td>	73) 75) 75) 75) 75) 75)

Northeast 0.9x 0.77 x 8.65 x 50.42 x 0.63 x 0.7 =	133.31	(75)
Northeast 0.9x 0.77 x 8.65 x 28.07 x 0.63 x 0.7 =	74.21	(75)
Northeast 0.9x 0.77 x 8.65 x 14.2 x 0.63 x 0.7 =	37.53	(75)
Northeast 0.9x 0.77 x 8.65 x 9.21 x 0.63 x 0.7 =	24.36	(75)
Solar gains in watts, calculated for each month $(83)m = Sum(74)m(82)m$		
(83)m= 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36	7	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	_	
(84)m= 483.67 511.23 544.67 591.47 629.68 624.12 594.69 552.46 507.03 471.58 461.21 467.55	;	(84)
7. Mean internal temperature (heating season)		
Temperature during heating periods in the living area from Table 9, Th1 (°C)	21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)		I
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	. 7	
(86)m= 0.85 0.82 0.75 0.63 0.48 0.33 0.24 0.27 0.44 0.66 0.8 0.86		(86)
	_	
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.3 20.43 20.63 20.84 20.95 20.99 21 21 20.97 20.84 20.57 20.28	٦	(87)
(87)m= 20.3 20.43 20.63 20.84 20.95 20.99 21 21 20.97 20.84 20.57 20.28	_	(07)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.36 20.36 20.36 20.37 20.37 20.38 20.38 20.39 20.38 20.37 20.37 20.36		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.84 0.8 0.73 0.6 0.45 0.3 0.21 0.24 0.4 0.63 0.78 0.85	7	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_	
(90)m= 19.44 19.61 19.89 20.18 20.32 20.37 20.38 20.38 20.35 20.18 19.82 19.41	٦	(90)
fLA = Living area ÷ (4) =	0.43	(91)
	0.43	(0.)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2	¬	(00)
(92)m= 19.81 19.96 20.21 20.47 20.59 20.64 20.65 20.65 20.62 20.47 20.14 19.79		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	¬	(00)
(93)m= 19.81 19.96 20.21 20.47 20.59 20.64 20.65 20.65 20.62 20.47 20.14 19.79		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-ca the utilisation factor for gains using Table 9a	lculate	
	П	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:	<u>- </u>	
(94)m= 0.83 0.79 0.73 0.6 0.46 0.32 0.22 0.25 0.42 0.63 0.77 0.84	٦	(94)
Useful gains, hmGm , W = (94)m x (84)m		()
(95)m= 399.44 405.65 395.91 357.74 288.84 197.34 133.04 138.93 211.56 299.42 356.05 391.01	П	(95)
Monthly average external temperature from Table 8		(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	٦	(96)
	_	(00)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 535.47 518.2 469.88 389.46 298.37 199.03 133.37 139.45 216.44 331.04 440.7 530.6	٦	(97)
	_	(01)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 101.21 75.64 55.03 22.84 7.09 0 0 0 23.52 60.95 103.86		
		(98)
Total per year (kWh/year) = Sum(98) _{15,912} :		l I
Space heating requirement in kWh/m²/year	8.91	(99)

Oh Enorgy requirements Community heating	shomo —			
9b. Energy requirements – Community heating so This part is used for space heating, space cooling		rovided by a community scheme		
Fraction of space heat from secondary/supplement			0	(301)
Fraction of space heat from community system 1	- (301) =		1	(302)
The community scheme may obtain heat from several sources			he latter	
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers	r power stations. See Ap	репаіх С.	1	(303a)
Fraction of total space heat from Community boile	ers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c)	(3)) for community h	neating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating			kWh/yea	<u>-</u>
Annual space heating requirement			450.12	╛
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	472.63	(307a)
Efficiency of secondary/supplementary heating sy	stem in % (from Ta	ble 4a or Appendix E)	0	(308
Space heating requirement from secondary/suppl	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement If DHW from community scheme:			1888.37	
Water heat from Community boilers		(64) x (303a) x (305) x (306) =	1982.79	(310a)
Electricity used for heat distribution	0	.01 × [(307a)(307e) + (310a)(310e)] =	24.55	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, i	f not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Tabmechanical ventilation - balanced, extract or posit		de	175.36	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	175.36	(331)
Energy for lighting (calculated in Appendix L)			241.09	(332)
Electricity generated by PVs (Appendix M) (negat	ive quantity)		-510.48	(333)
Electricity generated by wind turbine (Appendix M	l) (negative quantity	·)	0	(334)
10b. Fuel costs – Community heating scheme				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	20.04	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	84.07	(342a)
		Fuel Price		_
Pumps and fans	(331)	13.19 x 0.01 =	23.13	(349)

(332)

Energy for lighting

(350)

31.8

x 0.01 =

13.19

Column Column Community Neating scheme (340)(342e) + (145)(354) = (379.04 (355) (355) (356) (366) (342e) + (345)(354) = (379.04 (355) (355) (356) (36	Additional standing charges (Table 12)				120	(351)
Color Colo	Energy saving/generation technologies					_
Energy cost deflator (Table 12)		= (340a)(342e) + (345)	.(354) =		279.04	(355)
SAP rating (section12) 1,23 (357)	11b. SAP rating - Community heating so	cheme				
SAP rating (section12) SaP	Energy cost deflator (Table 12)				0.42	(356)
Energy Emissions Energy Emission factor Emissions Emis	Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0)] =		1.23	(357)
Energy Rimission factor Rig CO2/kWh Rissions	SAP rating (section12)				82.89	(358)
CO2 from other sources of space and water heating (not CHP) (307a) with re is CHP using two fuels repeat (363) to (368) for the second fuel (34 (367a) with re is CHP using two fuels repeat (363) to (368) for the second fuel (367a) with re is CHP using two fuels repeat (363) to (368) for the second fuel (367a) with re is CHP using two fuels repeat (363) to (368) for the second fuel (367a) with re is CHP using two fuels repeat (363) to (368) for the second fuel (367a) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with re is CHP using two fuels repeat (363) to (368) for the second fuel (372) with respect (373) to zero (unless specified otherwise, see C7 in Appendix C (373) with respect (373) to zero (unless specified otherwise, see C7 in Appendix C (372) with water from immersion heater or instantaneous heater(312) with respect (373) to zero (unless specified otherwise, see C7 in Appendix C (322) with respect (373) with respect (373) to zero (unless specified otherwise, see C7 in Appendix C (322) with r	12b. CO2 Emissions - Community heating	ng scheme				
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)						
Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel CO2 associated with heat source 1 [(307b)+(310b) x 100 + (367b) x 0.22 = 564.22 (367) Electrical energy for heat distribution [(313) x 0.52 = 12.74 (372) Total CO2 associated with community systems (363)(366) + (366)(372) CO2 associated with space heating (secondary) (309) x 0 = 576.97 (373) CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 = 0 (374) CO2 associated with space and water heating (373) + (374) + (375) = CO2 associated with space and water heating (373) + (374) + (375) = CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 126.12 (379) Energy saving/generation technologies (333) to (334) as applicable letern Total CO2, kg/year sum of (376)(382) = Dwelling CO2 Emission Rate (383) + (4) = Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel Energy associated with heat source 1 [(307b)+(310b) x 100 + (367b) x 1.22 = 3186.82 (367) Electrical energy for heat distribution [(313) x = 75.38 (372) Total Energy associated with community systems (363)(366) + (366)(372) = 3262.2 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) Energy associated with space heating (secondary) (309) x 0 = 0 (374) (367) (367) (367) (367) (367) (367) (368) (368)(368) (368)(372) = 3262.2 (373) (374) Energy associated with water from immersion heater or instantaneous heater(312) x 1.22 = 0 (375) (376)	CO2 from other courses of chace and wa	oter heating (not CUD)	_	kg 002/kWii	ng OOZiyeai	
Electrical energy for heat distribution	•			(366) for the second fue	94	(367a)
Total CO2 associated with community systems	CO2 associated with heat source 1	[(307b)	+(310b)] x 100 ÷ (367b) x	0.22	564.22	(367)
CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous heater (312) x CO2 associated with water from immersion heater or instantaneous heater (312) x CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling (331)) x CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO332)) x CO2 associated with electricity for lighting CO333) to (334) as applicable ltem 1 CO352 x 0.01 = 264.94 (380) Total CO2, kg/year Sum of (376)(382) = 528.17 (383) Dwelling CO2 Emission Rate (383) + (4) = 10.45 (384) EI rating (section 14) CO352 x 0.01 = 264.94 (380) Total Primary Energy - Community heating scheme Energy kWh/year factor kWh/year Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel Energy associated with heat source 1 (313) x Energy associated with heat source 1 (313) x Energy associated with community systems (363)(366) + (368)(372) Electrical energy for heat distribution (313) x Energy associated with space heating (secondary) Energy associated with space heating (secondary) Energy associated with space heating (secondary) Energy associated with space and water heating (373) + (374) + (375) = CO2 associated with space heating (secondary) Energy associated with space heating (secondary) Energy associated with space heating (secondary) Energy associated with space and water heating (373) + (374) + (375) = Co3 (374) Energy associated with space and water heating (373) + (374) + (375) = CO3 (374) Energy associated with space and water heating	Electrical energy for heat distribution		[(313) x	0.52	12.74	(372)
CO2 associated with water from immersion heater or instantaneous heater (312) x	Total CO2 associated with community sy	stems	(363)(366) + (368)(372	2) =	576.97	(373)
Total CO2 associated with space and water heating (373) + (374) + (375) = 576.97 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 91.01 (378) CO2 associated with electricity for lighting (332))) x 0.52 = 125.12 (379) Energy saving/generation technologies (333) to (334) as applicable ltem 1 0.52 x 0.01 = -264.94 (380) Total CO2, kg/year sum of (376)(382) = 528.17 (333) Dwelling CO2 Emission Rate (383) ÷ (4) = 10.45 (384) El rating (section 14) 92.59 (385) 13b. Primary Energy – Community heating scheme Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 94 (367a) Energy associated with heat source 1 (307b)+(310b) x 100 ÷ (367b) x 1.22 = 3186.82 (367) Electrical energy for heat distribution (313) x = 75.38 (372) Total Energy associated with community systems (363)(366) + (368)(372) = 3262.2 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) 3262.2 (373) Energy associated with space heating (secondary) (309) x 0 = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) x 1.22 = 0 (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3262.2 (376)	CO2 associated with space heating (second	ondary)	(309) x	0	0	(374)
CO2 associated with electricity for pumps and fans within dwelling (331)) x	CO2 associated with water from immersion	on heater or instantar	neous heater (312) x	0.22	0	(375)
Energy saving/generation technologies (333) to (334) as applicable Item 1 Total CO2, kg/year sum of (376)(382) =(383) Dwelling CO2 Emission Rate (383) ÷ (4) =(383) ÷ (4) =(383) ÷ (4) =(383) † (5) =(383) † (5) =(383) † (5) =(383) † (5) =(384) † (5) =(383) † (6) =(383)	Total CO2 associated with space and wa	ter heating	(373) + (374) + (375) =		576.97	(376)
Energy saving/generation technologies (333) to (334) as applicable Item 1 Total CO2, kg/year sum of (376)(382) = 528.17 (383) Dwelling CO2 Emission Rate (383) ÷ (4) = 10.45 (384) El rating (section 14) 92.59 (385) 13b. Primary Energy – Community heating scheme Energy kWh/year primary factor primary kWh/year kWh/year primary primary kWh/year primary kWh/year primary primary kWh/year primary primary kWh/year primary primary kWh/year primary primary primary kWh/year primary	CO2 associated with electricity for pumps	s and fans within dwe	lling (331)) x	0.52	91.01	(378)
Total CO2, kg/year sum of (376)(382) = (383)	CO2 associated with electricity for lighting	g	(332))) x	0.52	125.12	(379)
Total CO2, kg/year sum of $(376)(382) =$ 528.17 (383) Dwelling CO2 Emission Rate $(383) \div (4) =$ 10.45 (384) EI rating (section 14) 92.59 (385) 13b. Primary Energy – Community heating scheme Energy kWh/year Rattor Remarks (383) to (386) for the second fuel 94 (387a) Energy associated with heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 94 (367a) Electrical energy for heat distribution [(313) x = 75.38 (372) Total Energy associated with space heating (secondary) (309) x = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) x 1.22 = 0 (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3262.2 (376)		333) to (334) as applic	cable	0.52 x 0.01 =	-264 94	7(380)
El rating (section 14) 10.45 (384)	Total CO2 kg/year	sum of (376)(382) =	<u> </u>	0.02		` ¬
El rating (section 14) 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 CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 94 (367a) Energy associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 1.22 = 3186.82 (367) Electrical energy for heat distribution [(313) x = 75.38 (372) Total Energy associated with community systems (363)(366) + (368)(372) = 3262.2 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) = 0 (374) Energy associated with space heating (secondary) (309) x 0 = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) x 1.22 = 0 (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3262.2 (376)		(383) ÷ (4) =				=
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) Energy associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x [(313)	•				92.59	=
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) Energy associated with heat source 1 [(307b)+(310b)] × 100 ÷ (367b) × Electrical energy for heat distribution [(313) × [(313	,	ng scheme				
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) Energy associated with heat source 1 [(307b)+(310b)] \times 100 \div (367b) \times Electrical energy for heat distribution [(313) \times Total Energy associated with community systems (363)(366) + (368)(372) Energy associated with space heating (secondary) Energy associated with water from immersion heater or instantaneous heater(312) \times Total Energy associated with space and water heating (373) + (374) + (375) = Energy associated with space and water heating (376)			_			
Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel [367a) Energy associated with heat source 1 [307b)+(310b)] \times 100 ÷ (367b) \times [312] Electrical energy for heat distribution [313) \times [313) \times [3186.82] Total Energy associated with community systems [363)(366) + (368)(372) [373] Energy associated with space heating (secondary) [309) \times				•		
Electrical energy for heat distribution $ [(313) \times $	Energy from other sources of space and	water heating (not CF	kWh/year	•		
Total Energy associated with community systems $(363)(366) + (368)(372)$ = 3262.2 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) = 3262.2 (373) Energy associated with space heating (secondary) $(309) \times $ 0 = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) \times 1.22 = 0 (375) Total Energy associated with space and water heating $(373) + (374) + (375) =$ 3262.2 (376)			kWh/year	factor	kWh/year	(367a)
if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) Energy associated with space heating (secondary) Energy associated with water from immersion heater or instantaneous heater(312) x $ \begin{array}{cccccccccccccccccccccccccccccccccc$	Efficiency of heat source 1 (%)	If there is CHP usi	kWh/year HP) ng two fuels repeat (363) to	factor (366) for the second fue	kWh/year	_
Energy associated with space heating (secondary) (309) x $0 = 0$ (374) Energy associated with water from immersion heater or instantaneous heater(312) x $1.22 = 0$ (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3262.2 (376)	Efficiency of heat source 1 (%) Energy associated with heat source 1	If there is CHP usi	kWh/year HP) ng two fuels repeat (363) to +(310b)] x 100 ÷ (367b) x	(366) for the second fue	kWh/year 94 3186.82	(367)
Energy associated with water from immersion heater or instantaneous heater(312) x $=$ 0 (375) Total Energy associated with space and water heating $(373) + (374) + (375) =$ $=$ 3262.2 (376)	Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution	If there is CHP usi	kWh/year HP) ng two fuels repeat (363) to +(310b)] x 100 ÷ (367b) x [(313) x	(366) for the second fue	kWh/year 94 3186.82 75.38	(367) (372)
Total Energy associated with space and water heating $(373) + (374) + (375) =$ 3262.2 (376)	Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community	If there is CHP using [(307b)] systems	kWh/year HP) ng two fuels repeat (363) to 1+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	factor (366) for the second fue 1.22 = 2)	kWh/year 94 3186.82 75.38 3262.2	(367) (372) (373)
	Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community if it is negative set (373) to zero (unless	If there is CHP using [(307b)] systems s specified otherwise,	kWh/year HP) ng two fuels repeat (363) to 1+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C	factor (366) for the second fue 1.22 = 2)	kWh/year 94 3186.82 75.38 3262.2 3262.2	(367) (372) (373) (373)
Energy associated with space cooling $(315) \times 3.07 = 0$ (377)	Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community if it is negative set (373) to zero (unless Energy associated with space heating (se	If there is CHP using [(307b)] systems s specified otherwise, econdary)	kWh/year HP) ng two fuels repeat (363) to 0+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C (309) x	(366) for the second fue 1.22 = 2) 0 =	kWh/year 94 3186.82 75.38 3262.2 3262.2	(367) (372) (373) (373) (374)
	Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community if it is negative set (373) to zero (unless Energy associated with space heating (see	If there is CHP using [(307b)] systems s specified otherwise, econdary) rsion heater or instant	kWh/year HP) ng two fuels repeat (363) to 1+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C (309) x taneous heater(312) x	(366) for the second fue 1.22 = 2) 0 =	kWh/year 94 3186.82 75.38 3262.2 3262.2 0	(367) (372) (373) (373) (373) (374) (375)

Energy associated with electricity for pumps and fans within dwelling (331)) x 538.35 (378) 3.07 Energy associated with electricity for lighting (379) (332))) x 740.13 3.07 Energy saving/generation technologies Item 1 x 0.01 = -1567.16 (380) 3.07 Total Primary Energy, kWh/year sum of (376)...(382) = (383) 2973.53

		He	er Details:						
Access Name:	Zabid Ashrof	US		n Mirron	CTDO	2004000			
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012)	Stroma Softwa	-				001082 on: 1.0.5.9	
Contware Hame.	Ottoma i O/ti 2012		rty Address:		31011.		V 01010	710.0.0	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		, , , , , , , , , , , , , , , , , , ,	Area(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (4p)		(1a) x		2.5	(2a) =	126.36	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n) _	50.54	(4)	\	n (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	126.36	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	ır
Number of alligners	heating he	eating		1 _ F			40 =		_
Number of chimneys		-	0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ĺ	2		10 =	20	(7a)
Number of passive vents	3			L	0	X '	10 =	0	(7b)
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a))+(6b)+(7a)+(7	b)+(7c) =	Г	20		÷ (5) =	0.16	(8)
	peen carried out or is intended			ontinue fr			. (0) –	0.10	(0)
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber from the research as the value corresponds to			•	uction			0	(11)
deducting areas of openi		onaing to the g	reater wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught stri	ipped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_			0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has				is heina u	sad .		0.41	(18)
Number of sides sheltere		boon done or c	a dogree dir per	modelinty	io boiling a	30 u		3	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.32	(21)
Infiltration rate modified f	for monthly wind speed						'		
Jan Feb	Mar Apr May	Jun Ju	ıl 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								
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95 0.9	0.92	1	1.08	1.12	1.18		
` '		1 3.0	1		L			J	

Adjusted infiltration	on rate (allow	ina for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m						
	0.4 0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37]		
Calculate effectiv	•	rate for t	he appli	cable ca	se								-
If mechanical v		andiv N. (9	92h) - (22a) v Emy (c	auation (VEVV otho	auioo (22h) - (22a))	(23a)
If balanced with he			, ,	,	. ,	,, .	`) = (23a))	(23b)
	-	-	_					2h\ma . (00k) [4 (00.0))	(23c)
a) If balanced r	nechanicai vi	entilation 0	with nea	o lat recove		HR) (248	0 = (2.5)	2b)m + (23b) × [$\frac{1 - (230)}{1}$	1 ÷ 100]]		(24a)
b) If balanced r		ļ			<u> </u>						J		(= .0)
(24b)m= 0		0	0	0	0	0	0	0	0	0	1		(24b)
c) If whole house	ļ		<u> </u>		ļ						J		, ,
•	$0.5 \times (23b)$		-	-				.5 × (23b	o)				
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural ver				•				•	•				
<u> </u>	1, then (24d)	`				 	2b)m² x				1		
` ′	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(24d)
Effective air ch		- ` 	``	<u> </u>	_		<u> </u>	T	T	T	1		(05)
(25)m= 0.58 (0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(25)
3. Heat losses a	nd heat loss	paramet	er:										
ELEMENT	Gross	Openin		Net Ar		U-val		AXU		k-value		ΑX	
D	area (m²)	m	12	A ,r		W/m2	_	(W/I	K)	kJ/m²-	K	kJ/l	
Doors				2	×	1	=	2	<u> </u>				(26)
Windows				8.651	X1	/[1/(1.4)+	0.04] =	11.47	ᆗ ,				(27) ¬
Walls Type1	19.7	8.65	5	11.05	x	0.18	_ =	1.99	<u></u>		╛┆		(29)
Walls Type2	19.7	2		17.7	X	0.18	=	3.19					(29)
Total area of elen	•			39.4									(31)
* for windows and roo ** include the areas o					ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	n paragraph	1 3.2		
Fabric heat loss,	W/K = S (A x)	U)				(26)(30)	+ (32) =				18	.64	(33)
Heat capacity Cm	$I = S(A \times k)$						((28).	(30) + (32	2) + (32a)	(32e) =	402	2.46	(34)
Thermal mass pa	rameter (TM	P = Cm -	: TFA) in	ı kJ/m²K			Indica	tive Value	: Medium		25	50	(35)
For design assessme can be used instead of			constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f			
Thermal bridges:			usina An	nendix k	<						7.	ne	(36)
if details of thermal br	, ,		• .	•	•						7.		7(00)
Total fabric heat I		, ,	·	•			(33) +	(36) =			25	.71	(37)
Ventilation heat lo	ss calculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)			_
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 24.24 2	4.11 23.98	23.38	23.26	22.73	22.73	22.64	22.94	23.26	23.49	23.73			(38)
Heat transfer coe	fficient, W/K						(39)m	= (37) + (37)	38)m				
(39)m= 49.95 4	9.82 49.69	49.08	48.97	48.44	48.44	48.34	48.64	48.97	49.2	49.44			
		1 016						Average =	. ,	112 /12=	49	.08	(39)
Heat loss parame	```	1		0.00	0.00			= (39)m ÷		1	1		
(40)m= 0.99 (0.99 0.98	0.97	0.97	0.96	0.96	0.96	0.96	0.97	0.97	0.98		77	7(40)
								Average =	oum(40)	₁₁₂ /12=	0.9	91	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		71		(42)
Reduce	the annua	ıl average	ater usag hot water person per	usage by	5% if the a	lwelling is	designed t		+ 36 a water us	se target o		.72		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
г			day for ea	ach month									l	
(44)m=	82.19	79.2	76.22	73.23	70.24	67.25	67.25	70.24	73.23	76.22	79.2	82.19		¬
Energy c	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		896.65	(44)
(45)m=	121.89	106.61	110.01	95.91	92.03	79.41	73.59	84.44	85.45	99.58	108.7	118.04		_
If instant	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1175.66	(45)
(46)m=	18.28	15.99	16.5	14.39	13.8	11.91	11.04	12.67	12.82	14.94	16.31	17.71		(46)
	storage		الماريطانم		olor or M	WALLDO	otoro ao	within o	.m.o. 1/00/	- al			1	(47)
•		,					_		ame ves	sei		150		(47)
Otherw	ise if no	stored	nd no ta hot wate		-			' '	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Tempe	rature fa	actor fro	m Table	2b							0.	54		(49)
• • • • • • • • • • • • • • • • • • • •			storage	-				(48) x (49)) =		0.	75		(50)
			eclared of factor fr	-								_		(54)
		•	ee secti		e z (KVV	ii/iitie/ua	iy)					0		(51)
	-	from Tal										0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter ((50) or (54) in (5	55)								0.	75		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)r	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinde	er contains	dedicated	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 Append	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
•		`	nual) fro									0		(58)
-			culated t		,		,	, ,		. 41	-4-4\			
(mod (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	cylinde 22.51	23.26	22.51	23.26		(59)
Comhi	loss cal	culated	for each	month ((61)m =	(60) ± 36	65 × (41))m			•		•	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for	water he	eating ca	alculated	l for e	each month	(62)	m = (0.85 × (4	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 168.49 148.69	156.6	141	138.62	124		131		130.54	146.18	153.79	164.64		(62)
Solar DHW input calculated	using App	endix G or	Appendix	H (ne	gative quantity	y) (ent	er '0'	if no solar	contribu	tion to wate	er heating)		
(add additional lines if	FGHRS	and/or V	VWHRS	appl	ies, see Ap	pend	lix G)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0		(63)
Output from water hea	ter				•		•	•		•		•	
(64)m= 168.49 148.69	156.6	141	138.62	124	.5 120.18	131	.04	130.54	146.18	153.79	164.64		
<u> </u>						•	Outpu	ut from wa	iter heate	er (annual)₁	12	1724.27	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ′ [0	.85 × (45)m	ı + (6	1)m]) + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	
(65)m= 77.8 69.12	73.85	67.96	67.87	62.4	18 61.74	65.	35	64.49	70.39	72.22	76.53		(65)
include (57)m in calc	culation o	of (65)m	only if c	ylind	er is in the o	dwell	ing c	or hot wa	ater is f	rom com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a):	-							·		
Metabolic gains (Table													
Jan Feb	Mar	Apr	May	Ju	ın Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 85.31 85.31	85.31	85.31	85.31	85.3	31 85.31	85.	31	85.31	85.31	85.31	85.31		(66)
Lighting gains (calcula	ted in Ap	pendix	L. equat	ion L	—————9 or L9a). a	lso s	ee T	able 5		<u> </u>	ļ.	ı	
(67)m= 13.65 12.12	9.86	7.47	5.58	4.7		6.6	_	8.88	11.28	13.16	14.03		(67)
Appliances gains (calc	ulated in	Append	dix L. ea	uatio	 n L13 or L1	3a). a	also	see Tab	ole 5	1	<u> </u>	I	
(68)m= 148.65 150.19	146.3	138.03	127.58	117.		109		113.55	121.83	132.27	142.09		(68)
Cooking gains (calcula	ted in Ar	nendix	l equat	ion I	 15 or I 15a`	L) als		e Table	5	<u> </u>			
(69)m= 31.53 31.53	31.53	31.53	31.53	31.5		31.		31.53	31.53	31.53	31.53		(69)
Pumps and fans gains		ia)									ļ		
(70) m= $\frac{3}{3}$ $\frac{3}{3}$	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. evaporation	n (negat	ive valu	es) (Tab	le 5)	I					<u> </u>		<u> </u>	
(71)m= -68.25 -68.25	-68.25	-68.25	-68.25	-68.	25 -68.25	-68.	.25	-68.25	-68.25	-68.25	-68.25]	(71)
Water heating gains (1	ıı Table 5)				I	!	!			<u> </u>		<u> </u>	
(72)m= 104.58 102.85		94.39	91.23	86.7	77 82.99	87.	84	89.56	94.61	100.3	102.86]	(72)
Total internal gains =					(66)m + (67)m								
(73)m= 318.47 316.76	307.02	291.48	275.99	260.	`	255		263.59	279.3	297.33	310.57]	(73)
6. Solar gains:	<u> </u>												
Solar gains are calculated	using solaı	flux from	Table 6a	and as	sociated equa	tions	to con	overt to the	e applica	ble orientat	ion.		
Orientation: Access F	actor	Area			Flux			g_		FF		Gains	
Table 6d		m²			Table 6a			able 6b	7	able 6c		(W)	
Northeast 0.9x 0.77	х	8.6	55	x	11.28	x		0.63	x	0.7	=	29.83	(75)
Northeast 0.9x 0.77	x	8.6	55	x	22.97	x		0.63	x	0.7	_	60.72	(75)
Northeast 0.9x 0.77	x	8.6	55	x $\overline{}$	41.38	x		0.63	_ x [0.7	-	109.4	(75)
Northeast 0.9x 0.77	x	8.6	55	x 🗏	67.96	x		0.63	_ x [0.7	=	179.67	(75)
Northeast 0.9x 0.77	х	8.6	55	x 🗏	91.35	x		0.63	×	0.7	=	241.51	(75)
Northeast _{0.9x} 0.77	х	8.6	55	x $$	97.38	x		0.63	x	0.7		257.47	(75)
Northeast _{0.9x} 0.77	х	8.6	55	x $\overline{\ }$	91.1	x		0.63	x	0.7		240.86	(75)
Northeast _{0.9x} 0.77	х	8.6	55	x 🗏	72.63	x		0.63	×	0.7	=	192.02	(75)

Northea	st 0.9x	0.77	x	8.6	55	x [50	0.42	x		0.63	x	0.7	=	133.31	(75)
Northea	st _{0.9x}	0.77	х	8.6	65	x	28	8.07	x		0.63	x	0.7	=	74.21	(75)
Northea	st 0.9x	0.77	x	8.6	65	x	1	4.2	x		0.63	x	0.7	=	37.53	(75)
Northea	st 0.9x	0.77	x	8.6	65	x	9).21	x		0.63	x	0.7	=	24.36	(75)
	_															
Solar g	ains in	watts, ca	alculated	for eacl	h month				(83)m	= St	um(74)m .	(82)m				
(83)m=	29.83	60.72	109.4	179.67	241.51	25	7.47	240.86	192.	02	133.31	74.21	37.53	24.36		(83)
Total ga	ains – ii	nternal a	nd solar	(84)m =	= (73)m -	+ (8	3)m ,	watts		•			•	-	•	
(84)m=	348.3	377.48	416.42	471.15	517.49	518	8.31	491.74	447.	73	396.89	353.51	334.86	334.93		(84)
7. Mea	an inter	nal temp	erature ((heating	season)										
Tempe	erature	during h	eating p	eriods ir	the livii	ng a	area f	rom Tab	ole 9,	Th	1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for li	iving are	ea, h1,m	(se	e Tal	ble 9a)								
Γ	Jan	Feb	Mar	Apr	May	Ì	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.79	0.	.59	0.43	0.49	9	0.77	0.96	0.99	1		(86)
Mean	interna	l tompor	ature in I	ivina ar	22 T1 (fc	الصلا	v stor	ns 3 to 7	in T	able	. 0c)				J	
(87)m=	20.07	20.18	20.4	20.7	20.91		0.99	21	21	\neg	20.94	20.67	20.32	20.05	1	(87)
L			ļ.						<u> </u>			20.01	20.02	20.00		()
· r			eating p						r —	-	<u> </u>				1	(00)
(88)m=	20.09	20.1	20.1	20.11	20.11	20).12	20.12	20.1	2	20.11	20.11	20.11	20.1		(88)
Utilisa	tion fac	tor for g	ains for r	est of d	welling,	h2,r	n (se	e Table	9a)						_	
(89)m=	0.99	0.99	0.97	0.91	0.74	0.	.51	0.35	0.4	,	0.7	0.94	0.99	1		(89)
Mean	interna	l temper	ature in t	he rest	of dwelli	ng -	T2 (fc	ollow ste	ps 3	to 7	' in Tabl	e 9c)				
(90)m=	18.85	19.02	19.34	19.77	20.03	Ť	0.11	20.12	20.1		20.07	19.74	19.24	18.83		(90)
			·!								f	LA = Livir	ng area ÷ (4	4) =	0.43	(91)
Moon	intorno	l tompor	ature (fo	r tha wh	ala dwa	llina	ا _ دا	Λ ν Τ1	. (1	fl	۸) ی T2					
(92)m=	19.38	19.52	19.8	20.17	20.41		0.49	20.5	20.	\neg	20.45	20.14	19.71	19.36]	(92)
L			ne mean										10.71	10.00		()
(93)m=	19.38	19.52	19.8	20.17	20.41	г —	0.49	20.5	20.		20.45	20.14	19.71	19.36	1	(93)
		ting requ														
•		Ĭ.	ernal ten	nperatui	re obtain	ned a	at ste	en 11 of	Table	9h	so tha	t Ti.m=(76)m an	d re-calo	culate	
			or gains ι					, p o.			,, 00	•, (. 0,			
Γ	Jan	Feb	Mar	Apr	May	J	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm:												-	
(94)m=	0.99	0.99	0.97	0.91	0.76	0.	.54	0.38	0.4	4	0.73	0.94	0.99	0.99		(94)
Usefu	l gains,	hmGm ,	W = (94))m x (8	4)m										,	
(95)m=	345.95	373.13	404.87	429.36	392.96	28	1.27	188.38	197.	14	289.37	333.28	330.36	333.09		(95)
Month	ly aver	age exte	rnal tem	perature	from Ta	able	8								,	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Г	oss rate	for mea	an interna	al tempe	erature,	Lm	, W =	- ,	x [(93	3)m-	- (96)m]	r	1	1	
(97)m=	753.1	728.44	660.82	553.16	426.57	28	5.28	188.82	198.	09	308.86	467.2	620.23	749.27		(97)
. г			ement for							(97)		<u> </u>		1	1	
(98)m=	302.92	238.77	190.42	89.14	25.01		0	0	0		0	99.64	208.71	309.64		_
									٦	Γotal	per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1464.24	(98)
Space	heatin	g require	ement in	kWh/m²	² /year										28.97	(99)

9a. Energy requirements	s – Individual I	neating s	ystems i	ncluding	micro-C	CHP)					
Space heating:						,					7,004
Fraction of space heat f			mentary	•		(201) -				0	(201)
Fraction of space heat f	•	, ,			(202) = 1 -		(202)]			1	(202)
Fraction of total heating	·				(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficiency of main space				- 0/						93.5	(206)
Efficiency of secondary	···			1		_		l	l _	0	(208
Jan Feb Space heating requirem	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
·	190.42 89.14	25.01	0	0	0	0	99.64	208.71	309.64]	
 (211)m = {[(98)m x (204)	I ı1	1 06)						<u> </u>	<u> </u>	I	(211
` ' 	203.66 95.34	26.74	0	0	0	0	106.56	223.22	331.17]	(
<u> </u>	I	!	Į.	ļ.	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u></u>	1566.04	(211
Space heating fuel (sec	ondary), kWh	/month									_
= {[(98)m x (201)] } x 100		1	ı	ı	ı		ı	1	1	1	
(215)m= 0 0	0 0	0	0	0	0 Tota	0	0	0	0	_	7,045
Matan baathan					Tota	I (kWh/yea	ar) =Surri(2	215) _{15,1012}	҈=	0	(215
Water heating Output from water heate	r (calculated a	bove)									
·	156.6 141	138.62	124.5	120.18	131.04	130.54	146.18	153.79	164.64		
Efficiency of water heate	r							•	•	79.8	(216
(217)m= 86.36 86.07	85.34 83.63	81.27	79.8	79.8	79.8	79.8	83.82	85.63	86.47		(217
Fuel for water heating, k											
(219) m = (64) m x $100 \div (219)$ m = 195.09 172.75 1	183.51 168.6	170.57	156.02	150.6	164.21	163.59	174.4	179.61	190.39]	
	l	<u>!</u>	<u> </u>	<u> </u>	Tota	I = Sum(2	19a) ₁₁₂ =	<u>!</u>	<u>!</u>	2069.34	(219
Annual totals							k'	Wh/yeaı	•	kWh/yea	
Space heating fuel used	, main system	1								1566.04	
Water heating fuel used										2069.34	
Electricity for pumps, fan	s and electric	keep-ho	t								
central heating pump:									30		(230
boiler with a fan-assiste	ed flue								45	ĺ	(230
Total electricity for the at	oove, kWh/ye	ar			sum	of (230a).	(230g) =	:		75	(231
Electricity for lighting	, ,									241.09	(232
12a. CO2 emissions – I	ndividual haa	ting evete	ome incl	ıdina mi	oro CUE					241.00	
12a. CO2 emissions – i	Hulviduai Hea	iiig sysie	illo illoit	Juliy IIII	CIO-CI IF						
				ergy /h/year			Emiss kg CO	i on fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main sys	stem 1)		(21	1) x			0.2	16	=	338.26	(261
Space heating (seconda	ry)		(215	5) x			0.5	19	=	0	(263
Water heating			(219	9) x			0.2		=	446.98	(264
Space and water heating	1				+ (263) + (264) =		.~			(265)
Space and water neating	1		(_0	, - (202)	(===) . (. /				785.24	(205)

Electricity for pumps, fans and electric keep-hot $(231) \times 0.519 = 38.93 (267)$ Electricity for lighting $(232) \times 0.519 = 125.12 (268)$ Total CO2, kg/year sum of (265)...(271) = 949.29 (272)

TER = 18.78 (273)