Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:54:36

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 80.71m² Plot Reference: Site Reference : Hermitage Lane Plot 23

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))

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

Dwelling Carbon Dioxide Emission Rate (DER) 10.54 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 38.3 kWh/m²

OK 2 Fabric U-values

Element Average

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

Roof (no roof)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

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:	1.02	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	2.03m²	
Windows facing: North West	4.05m²	
Windows facing: North East	8.65m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Floors U-value	0.12 W/m ² K	
Community heating, heat from boilers – mains gas		

Photovoltaic array

		Hear	Details:						
Assessor Name:	Zahid Ashraf	0301	Strom	o Nium	bor		STDO	001082	
Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.5.9	
		Propert	y Address	Plot 23					
Address :									
1. Overall dwelling dime	ensions:	•	(2)		A I I .	last (Cost)		V - l	
Ground floor		AI	rea(m²) 80.71	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	 (1n) [(4)]` ''	201.77	
Dwelling volume	۵,۰(۱۵,۰(۱۵,۰(۱۵,۰(۱۵,۰	(,	00.71)+(3c)+(3c	d)+(3e)+	.(3n) =	204.77	7(5)
				(54) (55)	, , (00) , (00	., (66)	.(0)	201.77	(5)
2. Ventilation rate:		condary	other		total			m³ per hou	r
Number of chimneys	heating he	ating +	0	7 - F	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	Ј <u>Г</u>	0	x 2	20 =	0	(6b)
Number of intermittent fa				J -	0	x	10 =	0	(7a)
Number of passive vents				L	0		10 =	0	(7b)
Number of flueless gas f				L			40 =	<u> </u>	(7c)
Number of flueless gas fi	1163			L	0			0	(70)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)	+(6b)+(7a)+(7b))+(7c) =	Γ	0		÷ (5) =	0	(8)
	peen carried out or is intended	, proceed to (17), otherwise (ontinue fr	rom (9) to	(16)	•		
Number of storeys in the Additional infiltration	ne dwelling (ns)					[(9).	-1]x0.1 =	0	(9)
	.25 for steel or timber fra	ame or 0.35	for masoni	v constr	uction	[(0)]	1]x0.1 =	0	(11)
	resent, use the value correspo	onding to the gre	eater wall are	a (after					` ′
deducting areas of opening	ngs); if equal user 0.35 floor, enter 0.2 (unseale:	d) or 0.1 (se:	aled) else	enter ()			i	0	(12)
If no draught lobby, en	•	a) or o.1 (see	aica), cisc	Critci o				0	(13)
•	s and doors draught stri	pped					-	0	(14)
Window infiltration		•	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has b ad	peen done or a d	degree air pe	meability	is being u	sed		4	(19)
Shelter factor	,u		(20) = 1 -	0.075 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	x (20) =				0.14	(21)
Infiltration rate modified f	or monthly wind speed								_
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
		_	-		•	•	•	•	

0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calculate effe		•	rate for t	he appli	cable ca	se				<u> </u>	ļ		
If mechanic												0.5	(23
If exhaust air h		0		, ,	,	. `	,, .	•) = (23a)			0.5	(23
If balanced wit	n heat reco	very: effic	ency in %	allowing f	or in-use fa	actor (from	n Table 4h)) =				79.05	(2:
a) If balance						ery (MVI	HR) (24a	<u> </u>	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(24
b) If balance								<u> </u>	<u> </u>		<u> </u>	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				E v (22h	. \			
$\begin{array}{c} \text{II } (\angle\angle\text{D})\text{I} \\ \text{24c} \text{m} = 0 \end{array}$	n < 0.5 x	(23b), t	hen (24d	$\frac{(230)}{0}$	o); otnerv	wise (24)	C) = (220)	0) m + 0.	5 × (230	0	0		(2
									U		U		(2
d) If natural if (22b)r			oie nous m = (22b	•					0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (240	c) or (24	d) in box	(25)				l	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(2
0 115-415-5-6													
3. Heat losse		•			Net Ar		اميدالا		AXU		مرياه درما		X k
ELEMENT	Gros area		Openin m		Net An A ,n		U-valı W/m2		(W/I	K)	k-value kJ/m²-ł		/K
Doors					2	X	1.4	=	2.8				(20
Vindows Type	e 1				2.025	; x1,	/[1/(1.4)+	0.04] =	2.68				(2
Vindows Type	e 2				4.05	x1,	/[1/(1.4)+	0.04] =	5.37	=			(2
Vindows Type	e 3				8.651	x1,	/[1/(1.4)+	0.04] =	11.47	=			(2
loor					22.71	1 x	0.12	─ 	2.72532	<u> </u>			(2
						=							
Walls Type1	64.6	5	14.73	3 I	49.92	X	0.15		7.49			7 —	╡`
Walls Type1 Walls Type2	64.6		14.73	3	49.92	=	0.15	= [= [7.49				(2
Walls Type2	4.09	€	14.73	3	2.09	×	0.15	= [7.49 0.3				(2)
Valls Type2 Total area of e	4.09 elements	9 , m²	2		2.09	×	0.14	= [0.3	as aiven in	paragraph	13.2	(2
Valls Type2 Total area of e	4.09 elements	, m² ows, use e	2 effective win	ndow U-ve	2.09 91.45 alue calcula	×	0.14	= [0.3	as given in	paragraph	3.2	(2
Valls Type2 Total area of each for windows and the include the area.	4.09 elements I roof winder as on both	, m ² ows, use e sides of in	2 effective winternal wall	ndow U-ve	2.09 91.45 alue calcula	x sated using	0.14	= [/[(1/U-valu	0.3	as given in	paragraph	32.83	(2
Valls Type2 Total area of each for windows and the include the area fabric heat loss	4.09 elements I roof winder as on both ss, W/K =	y, m² pows, use e sides of in = S (A x	2 effective winternal wall	ndow U-ve	2.09 91.45 alue calcula	x sated using	0.14	= [/[(1/U-valu + (32) =	0.3				(2) (3) (3)
Valls Type2	4.09 elements I roof winder as on both as, W/K = Cm = S(, m ² ows, use e sides of interpretation (A x A x A x A x B)	2 affective winternal wall U)	ndow U-va	2.09 91.45 alue calculatitions	x sated using	0.14	= [/[(1/U-valu + (32) = ((28)	0.3 e)+0.04] a	2) + (32a).		32.83	(2 (3 (3 (3 (3
Valls Type2 Total area of ending for windows and include the area for the sign assess.	4.09 Alelements A roof winddens on both A roof, W/K = Cm = S(A parame A roof, when the sements who	ows, use esides of ine S (A x A x k) ter (TMF)	2 effective winternal wall U) $P = Cm \div tails of the$	ndow U-ve s and part	2.09 91.45 alue calculations	x ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44	(2 (3 (3 (3 (3
Valls Type2 Total area of eaction windows and the include the area fabric heat loss feat capacity. Thermal mass for design assessan be used instead	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame and of a deci	, m² cows, use e sides of int = S (A x A x k) ter (TMF) ere the de tailed calcu	2 Iffective winternal wall U) P = Cm ÷ tails of the culation.	ndow U-va s and part - TFA) ir constructi	2.09 91.45 hlue calculations h kJ/m²K	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44 100	(2 (2 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and include the area fabric heat loss feat capacity. Thermal mass for design assess an be used instead for the fact of	4.09 Elements I roof winddens on both Ess, W/K = Cm = S(Exparame Exments whe ad of a decese : S (Lements)	ows, use esides of interest the detailed calcular XY) calcular xY) calcular xY) calcular xxy	effective winternal wall U) $P = Cm \div tails of the ulation.$ culated to	ndow U-vas and part - TFA) ir constructi	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44	(2 (2 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and include the area fabric heat loss leat capacity. Thermal mass for design assession be used instead faetails of thermal	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame aments wh ad of a der es : S (L al bridging	ows, use esides of interest the detailed calcular XY) calcular xY) calcular xY) calcular xxy	effective winternal wall U) $P = Cm \div tails of the ulation.$ culated to	ndow U-vas and part - TFA) ir constructi	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44 100	(2 (2 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and the include the area for the following the included the area for the included the area for the included the area for the included the inclu	4.09 elements I roof winddens on both ess, W/K = Cm = S(experiments when ad of a den ess : S (L al bridging at loss	, m² cows, use esides of ine S (A x A x k) ter (TMF) ere the detailed calculation x Y) calculate not kn	effective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) =	TFA) ir constructiusing Ap	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) +	0.3 re)+0.04] a .(30) + (32 tive Values values of	2) + (32a). : Low : TMP in Ta	(32e) = able 1f	32.83 2431.44 100 10.92	(2)
Valls Type2 Total area of each for windows and include the area fabric heat loss feat capacity. Thermal mass for design assessan be used instead fabric hermal bridges for details of thermal fabric hermal fabric hermal fabric hermal fabric	4.09 elements I roof winddens on both ess, W/K = Cm = S(experiments when ad of a den ess : S (L al bridging at loss	, m² cows, use esides of ine S (A x A x k) ter (TMF) ere the detailed calculation x Y) calculate not kn	effective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) =	TFA) ir constructiusing Ap	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) +	0.3 e)+0.04] a .(30) + (32) tive Value: e values of (36) =	2) + (32a). : Low : TMP in Ta	(32e) = able 1f	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of eaction windows and include the area fabric heat loss leat capacity. Thermal mass for design assess an be used instead fabric heat fabri	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame and of a decestion es : S (L al bridging at loss at loss ca	, m² cows, use e sides of int = S (A x A x k) ter (TMF ere the de tailed calculated are not kn	effective wind sternal wall U) P = Cm ÷ tails of the culation. culated to cown (36) =	TFA) ir constructiusing Ap	2.09 91.45 alue calculations h kJ/m²K fon are not	ated using	0.14 formula 1. (26)(30) ecisely the	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	0.3 (30) + (32) tive Value: values of (36) = = 0.33 × (2) + (32a). : Low : <i>TMP in Ta</i> 25)m x (5)	(32e) = able 1f	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of eactive for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess an be used instead fabric heat f	4.09 elements I roof winder as on both es, W/K = Cm = S(parame esments wh ad of a der es : S (L al bridging at loss at loss ca Feb 18.52	, m² cows, use esides of interested the detailed calculated Mar 18.29	effective winternal wall U) P = Cm ÷ tails of the culation. culated to cown (36) = I monthly Apr	ndow U-vals and part TFA) ir constructi using Ap 0.05 x (3	2.09 91.45 alue calculations kJ/m²K fon are not spendix h 1) Jun	x ated using	0.14 formula 1. (26)(30) ecisely the	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m Sep 16.21	0.3 (30) + (32 tive Values of (36) = = 0.33 × (Oct	2) + (32a). : Low : TMP in Ta 25)m x (5) Nov 17.37	(32e) = able 1f Dec	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.77	0.77	0.77	0.75	0.75	0.74	0.74	0.73	0.74	0.75	0.76	0.76		
	!		Į.	<u> </u>	Į.	Į.	<u> </u>		Average =	Sum(40) ₁	12 /12=	0.75	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		48		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t	` ,		se target c		7.9		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								I F	1	1			
(44)m= 107.7	103.78	99.86	95.95	92.03	88.11	88.11	92.03	95.95	99.86	103.78	107.7		
				<u> </u>				<u> </u>	<u> </u>	lm(44) ₁₁₂ =	<u> </u>	1174.86	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		`
(45)m= 159.71	139.68	144.14	125.66	120.58	104.05	96.42	110.64	111.96	130.48	142.43	154.67		
L			I	<u>I</u>	I	<u>I</u>			Total = Su	ım(45) ₁₁₂ =	=	1540.42	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			'		
(46)m= 23.96	20.95	21.62	18.85	18.09	15.61	14.46	16.6	16.79	19.57	21.36	23.2		(46)
Water storage				!			!		!	·	!		
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			-			, ,						
Otherwise if no		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		oclared I	occ fact	or ic kno	wp (k\\/k	n/dov/):							(40)
•				JI IS KIIO	vvii (Kvvi	ı/uay).					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			-							0	02		(51)
If community h	-			- (,				<u> </u>	.02		(- /
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter (50) or	(54) in (55)								1.	.03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	I s dedicate	I d solar sto	<u>l</u> rage, (57)	<u>I</u> m = (56)m		<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	I 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)
Primary circuit	loss (ar	nnual) fro	m Table				•	•	•		0		(58)
Primary circuit	•	,			59)m = (′58) ± 36	35 × (41)	ım			=		(/
(modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
			L			L							

Combi loss calculate	d for each	, month	(61)m –	(60) · 3	65 v (41	/m						
$\begin{array}{c c} \text{Combinoss calculate} \\ \text{(61)m=} & 0 & 0 \\ \end{array}$	0	0	01)111 =	00) + 3	03 × (41)	0	0	0	0	0	1	(61)
Total heat required for											[(50)m + (61)m	(-)
(62)m= 214.99 189.6		179.16	175.86	157.54	151.69	165.9		185.76	195.92	209.95	(39)111 + (01)111	(62)
Solar DHW input calculate			<u> </u>		<u> </u>						I	(-)
(add additional lines									morrio wan	or modung,		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from water he	ater	<u> </u>	<u> </u>			<u> </u>	· ·	<u> </u>		<u> </u>	ı	
(64)m= 214.99 189.6		179.16	175.86	157.54	151.69	165.9	2 165.46	185.76	195.92	209.95]	
	1	<u>!</u>	Į		<u>Į</u>	C	utput from w	ater heate	 er (annual)₁	l12	2191.26	(64)
Heat gains from water	er heating	, kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	ı + (61)m] + 0.8	k [(46)m	ı + (57)m	+ (59)m	1	•
(65)m= 97.32 86.39	 	84.58	84.31	77.39	76.28	81.0		87.61	90.15	95.65]	(65)
include (57)m in ca	alculation	of (65)m	only if c	vlinder	is in the	dwellir	ng or hot w	ater is f	rom com	munity h	ı neating	
5. Internal gains (se				,			<u> </u>			,	<u> </u>	
Metabolic gains (Tab			,									
Jan Feb	1 '	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 123.81 123.8	123.81	123.81	123.81	123.81	123.81	123.8	1 123.81	123.81	123.81	123.81]	(66)
Lighting gains (calcu	lated in A	pendix	L, equat	ion L9 c	r L9a), a	lso se	e Table 5				•	
(67)m= 20.07 17.83	14.5	10.98	8.21	6.93	7.49	9.73	13.06	16.58	19.35	20.63		(67)
Appliances gains (ca	lculated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	ble 5	•		•	
(68)m= 220.92 223.2	217.43	205.14	189.61	175.02	165.27	162.9	8 168.76	181.06	196.58	211.17		(68)
Cooking gains (calcu	lated in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5		•	•	
(69)m= 35.38 35.38	35.38	35.38	35.38	35.38	35.38	35.3	35.38	35.38	35.38	35.38		(69)
Pumps and fans gair	ıs (Table :	5a)					•				•	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evapora	ion (nega	tive valu	es) (Tab	le 5)			•		•		•	
(71)m= -99.05 -99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.0	5 -99.05	-99.05	-99.05	-99.05		(71)
Water heating gains	(Table 5)		-		-		-	-	-	-		
(72)m= 130.81 128.5	123.85	117.47	113.32	107.49	102.53	108.8	8 111.14	117.75	125.21	128.56		(72)
Total internal gains	=			(66)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 431.95 429.73	3 415.93	393.73	371.28	349.58	335.43	341.7	4 353.1	375.53	401.29	420.5		(73)
6. Solar gains:												
Solar gains are calculate	d using sola	r flux from	Table 6a	and assoc	ciated equa	tions to	convert to th	ne applica		tion.		
Orientation: Access		Area		Flu	ıx ble 6a		g_ Table 6b	-	FF		Gains	
Table 6		m²		Ta	Die ba	. –		_ '	Table 6c		(W)	,
Northeast 0.9x 0.7	7 ×	8.6	S5	X	11.28	x	0.63	x [0.7	=	29.83	(75)
Northeast 0.9x 0.7	7 ×	8.6	S5	X	22.97	X	0.63	x [0.7	=	60.72	(75)
Northeast 0.9x 0.7	7 ×	8.6	S5	х	41.38	x	0.63	x	0.7	=	109.4	(75)
Northeast 0.9x 0.7	7 ×	8.6	S5	x	67.96	x	0.63	x [0.7	=	179.67	(75)
Northeast 0.9x 0.7	7 ×	8.6	S5	X	91.35	x	0.63	X	0.7	=	241.51	(75)

								,			_				_
Northeast _{0.9x}	0.77	X	8.6	5	X	9	7.38	X		0.63	X	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	9	91.1	X		0.63	X	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	7	2.63	X		0.63	X	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	5	0.42	X		0.63	X	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	2	8.07	X		0.63	X	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	1	4.2	X		0.63	X	0.7	=	37.53	(75)
Northeast 0.9x	0.77	X	8.6	5	X	9).21	X		0.63	X	0.7	=	24.36	(75)
Southwest _{0.9x}	0.77	X	2.0	3	X	3	6.79			0.63	X	0.7	=	22.77	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	6	2.67			0.63	X	0.7	=	38.79	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	8	5.75]		0.63	X	0.7	=	53.07	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	10	06.25]		0.63	X	0.7	=	65.76	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	11	19.01]		0.63	x	0.7	=	73.65	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	11	18.15]		0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	11	13.91			0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	10)4.39]		0.63	x	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	x	2.0	3	X	9	2.85]		0.63	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	6	9.27	Ī		0.63	x	0.7	<u>=</u>	42.87	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	4	4.07	Ī		0.63	x	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	3	1.49	Ī		0.63	×	0.7	=	19.49	(79)
Northwest _{0.9x}	0.77	X	4.0	5	X	1	1.28	X		0.63	x	0.7	=	13.97	(81)
Northwest _{0.9x}	0.77	X	4.0	5	X	2	2.97	X		0.63	x	0.7	=	28.43	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	4	1.38	X		0.63	×	0.7		51.22	(81)
Northwest _{0.9x}	0.77	X	4.0	5	X	6	7.96	X		0.63	x	0.7	_ =	84.11	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	9	1.35	X		0.63	x	0.7		113.06	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	9	7.38	X		0.63	×	0.7	=	120.54	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	9	91.1	X		0.63	x	0.7	-	112.76	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X		2.63	X		0.63	x	0.7	-	89.89	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	5	0.42	X		0.63	x	0.7	=	62.41	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	2	8.07	X		0.63	x	0.7	-	34.74	(81)
Northwest 0.9x	0.77	x	4.0	5	X	1	4.2	X		0.63	x	0.7	-	17.57	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	9	9.21	X		0.63	×	0.7		11.4	(81)
_						<u> </u>		_							
Solar gains in	watts, ca	lculated	for each	n month	า			(83)m	n = St	um(74)m	(82)m				
(83)m= 66.57	127.93	213.68	329.53	428.22	4	51.13	424.11	346	.51	253.18	151.8	82.38	55.25]	(83)
Total gains – ii	nternal a	nd solar	(84)m =	(73)m	+ (83)m	watts							-	
(84)m= 498.51	557.67	629.62	723.26	799.5	8	300.7	759.54	688	.25	606.28	527.34	483.67	475.76		(84)
7. Mean inter	nal temp	erature	(heating	seasoi	า)										
Temperature	during h	eating p	eriods in	the liv	ing	area f	rom Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisation fac	tor for g	ains for I	iving are	a, h1,n	n (s	ee Ta	ble 9a)								
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(86)m= 0.96	0.93	0.89	0.78	0.63		0.46	0.34	0.3	39	0.61	0.84	0.93	0.96]	(86)
Mean interna	l temper	ature in	living are	ea T1 (f	ollo	w ste	os 3 to 7	7 in T	able	9c)		•		-	
(87)m= 19.56	19.77	20.13	20.56	20.84	_	20.96	20.99	20.		20.89	20.52	19.98	19.52]	(87)
					_				!					_	

T		ما بمصادريات		سام مام اس		مال مال	fuero Te	bla O Ti	۱۵ (۵C)					
(88)m=	20.28	20.28	eating p	20.29	20.3	20.31	20.31	20.31	20.3	20.3	20.29	20.29		(88)
			ains for i						20.3	20.3	20.29	20.29		(00)
(89)m=	0.95	0.93	0.87	0.76	0.59	0.41	0.29	0.33	0.57	0.82	0.92	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 7	r 7 in Tabl	e 9c)				
(90)m=	18.32	18.63	19.14	19.75	20.11	20.27	20.3	20.3	20.19	19.7	18.94	18.28		(90)
		<u>!</u>	<u> </u>	,					f	LA = Livin	g area ÷ (4	1) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lina) = fl	_A × T1	+ (1 – fL	A) × T2			L		
(92)m=	18.74	19.02	19.48	20.03	20.36	20.51	20.54	20.53	20.43	19.98	19.3	18.7		(92)
Apply	adjustr	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.74	19.02	19.48	20.03	20.36	20.51	20.54	20.53	20.43	19.98	19.3	18.7		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains			ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.94	0.91	0.86	0.75	0.59	0.42	0.3	0.35	0.57	0.8	0.91	0.94		(94)
			, W = (94											
(95)m=	466.34	507.56	539.99	542.12	475.69	340.26	231.59	240.74	348.14	424.27	438.85	448.4		(95)
			rnal tem	i			40.0	40.4	444	40.0	7.4	40		(06)
(96)m=	4.3	4.9	6.5 an intern	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(97)m=	902.74	879.54	805.44	677.55	525.4	351.48	234.2	244.93	379.66	569.06	745.43	893.29		(97)
` '		l	ement fo						l	l				,
(98)m=	324.68	249.97	197.49	97.51	36.98	0	0	0	0	107.72	220.74	331		
		ı						Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1566.1	(98)
Space	e heatin	g require	ement in	kWh/m²	/year							Ī	19.4	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme								
			ace hea								unity sch	neme.	0	(301)
	-			-		-	_	1 4510 1	., •	0110		l I		(302)
	-		from co	-	-				0115			[1	(302)
	-		y obtain he s, geotherr							up to tour (otner neat	sources; tr	ne latter	_
Fractio	n of hea	at from C	Commun	ity boiler	S								1	(303a)
Fractio	n of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for conf	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	communi	ity heatii	ng syste	m					1.05	(306)
-	heating	_										,	kWh/year	–
Annua	l space	heating	requirem	ient									1566.1	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [1644.4	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

					_
Space heating requirement from secon	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2191.26	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	2300.83	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	39.45	(313)
Cooling System Energy Efficiency Ratio	0			0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dv mechanical ventilation - balanced, extra	<u> </u>	iide		313.86	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330b	b) + (330g) =	313.86	(331)
Energy for lighting (calculated in Apper	ndix L)			354.49	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-815.12	(333)
Electricity generated by wind turbine (A	appendix M) (negative quantit	y)		0	(334)
12b. CO2 Emissions - Community hea	ting scheme				
- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1					
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and v		kWh/year	kg CO2/kWh	kg CO2/year	(367a)
CO2 from other sources of space and v	water heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year	(367a) (367)
CO2 from other sources of space and verticiency of heat source 1 (%)	water heating (not CHP) If there is CHP using two	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue	94 906.56	
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	water heating (not CHP) If there is CHP using two [(307b)+(310b)	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	94 906.56 20.48	(367)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) [(313) [(363)	kWh/year fuels repeat (363) to i)] x 100 ÷ (367b) x i x (366) + (368)(372	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	94 906.56 20.48 927.04	(367)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community see	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) (363) (363) (309)	kWh/year fuels repeat (363) to i)] x 100 ÷ (367b) x i x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	94 906.56 20.48 927.04	(367) (372) (373)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) [(313) [(363) [(309) [(kWh/year fuels repeat (363) to i)] x 100 ÷ (367b) x i x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	94 906.56 20.48 927.04	(367) (372) (373) (374)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) sion heater or instantaneous water heating (373)	fuels repeat (363) to o)] x 100 ÷ (367b) x ox (366) + (368)(372 x heater (312) x + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	94 906.56 20.48 927.04 0 927.04	(367) (372) (373) (374) (375)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see CO2 associated with water from immerity source) Total CO2 associated with space and verifications.	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) sion heater or instantaneous vater heating (373) ups and fans within dwelling	fuels repeat (363) to o)] x 100 ÷ (367b) x ox (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0 = 0.22 =	94 906.56 20.48 927.04 0 927.04 162.89	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and verification community so community	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) sion heater or instantaneous vater heating (373) ups and fans within dwelling ing (332)	fuels repeat (363) to o)] x 100 ÷ (367b) x ox (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 =	94 906.56 20.48 927.04 0 927.04 162.89	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and verification CO2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) sion heater or instantaneous vater heating (373) ups and fans within dwelling ing (332)	fuels repeat (363) to o)] x 100 ÷ (367b) x ox (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	94 906.56 20.48 927.04 0 927.04 162.89 183.98	(367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sources CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and verification CO2 associated with electricity for pum CO2 associated with electricity for light Energy saving/generation technologies Item 1	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) sion heater or instantaneous vater heating (373) ups and fans within dwelling ing (332) (333) to (334) as applicable	fuels repeat (363) to o)] x 100 ÷ (367b) x ox (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	94 906.56 20.48 927.04 0 927.04 162.89 183.98	(367) (372) (373) (374) (375) (376) (378) (379) (380)

SAP 2012 Overheating Assessment

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

Property Details: Plot 23

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

False

Blinds, curtains, shutters:

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

Overheating Details:

Night ventilation:

Summer ventilation heat loss coefficient: 399.51 (P1)

Transmission heat loss coefficient: 43.8

Summer heat loss coefficient: 443.27 (P2)

Overhangs:

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South West (SW)	0	1
North West (NW)	0	1
North East (NE)	0	1

Solar shading:

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

Solar gains:

Orientation		Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
South West (SW)	0.9 x	2.03	119.92	0.63	0.7	0.9	86.75
North West (NW)	0.9 x	4.05	98.85	0.63	0.7	0.9	143
North East (NE)	0.9 x	8.65	98.85	0.63	0.7	0.9	305.45
						Total	535.2 (P3/P4)

Internal gains:

	June	July	August
Internal gains	487.89	469.77	478.32
Total summer gains	1063.08	1004.97	926.13 (P5)
Summer gain/loss ratio	2.4	2.27	2.09 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.7	21.47	21.19 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

		User	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 23					
Address :									
Overall dwelling dimens	nsions:	Λ	na/m²\		۸۰، ۵۰	iaht/m\		Valuma/m³	4
Ground floor			ea(m²) 80.71	(1a) x		i ght(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA - (1s	a)+(1b)+(1c)+(1d)+(1e)+		80.71	(4)				201.77	
	<i>i</i> j	· · · · · · · · · · · · · · · · · · ·	60.71	J)+(3c)+(3c	4) 1 (30) 1	(2n) -		7
Dwelling volume				(3a)+(3b)+(30)+(30	u)+(3e)+	(311) =	201.77	(5)
2. Ventilation rate:	main second	larv	other		total			m³ per hou	r
Number of abises are	heating heatin	<u>g</u> _		- 			40 =	-	_
Number of chimneys		+	0	_	0			0	(6a)
Number of open flues	0 + 0	+	0	_ = [0	X	20 =	0	(6b)
Number of intermittent far	ns				3	Х	10 =	30	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fir	res				0	х	40 =	0	(7c)
							Air ch	nanges per ho	NII r
Infiltration due to obimno	va fluor and fone - (62)±(6b)	т(2a)т(2b)т	-(7c) -	Г					_
·	rs, flues and fans = $(6a)+(6b)$ een carried out or is intended, prod			continue fi	30 rom (9) to	(16)	÷ (5) =	0.15	(8)
Number of storeys in th		(),			(-)	(-)		0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame			•	ruction			0	(11)
if both types of wall are pro deducting areas of openin	esent, use the value correspondin gs): if equal user 0.35	g to the grea	ater wall are	ea (after					
	oor, enter 0.2 (unsealed) o	0.1 (sea	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
•	and doors draught stripped	k						0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	arron and in authin ma				12) + (13)			0	(16)
•	q50, expressed in cubic me ty value, then $(18) = [(17) \div 20]$	•	•	•	ietre oi e	envelope	e area	3	(17)
•	s if a pressurisation test has been				is being u	sed		0.3	(10)
Number of sides sheltered	d							1	(19)
Shelter factor			(20) = 1 -	`	19)] =			0.92	(20)
Infiltration rate incorporati	_		(21) = (18	s) x (20) =				0.28	(21)
Infiltration rate modified fo			 		<u> </u>	 	T	1	
	Mar Apr May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe			1 0.7	<u> </u>	1 40	1 45	1 4 7	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	?)m ÷ 4							_	
(22a)m= 1.27 1.25 1	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.35	0.35	0.34	0.3	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.32		
Calculate effe	ctive air	_		he appli	cable ca	se	<u> </u>						
If mechanic											ļ	0	(23
If exhaust air h		0 11		, ,	,	. `	,, .	•) = (23a)			0	(23
If balanced wit		•	-	_								0	(23
a) If balance						- ` ` 	- ^ ` `	· ·	 		``	÷ 100]	
24a)m= 0		0	0	0	0	0	0	0	0	0	0		(2
b) If balance							<u> </u>	<u> </u>	 			1	(2)
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	iouse ex n < 0.5 ×			•	•				5 v (23h	,)			
$\frac{11(220)1}{24c)m=0}$	0.5 x	0	0) – (23L 0	0	0	0	0	0	0	0		(2
d) If natural									Ŭ				,_
,	n = 1, the			•	•				0.5]				
24d)m= 0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		•	•	•	
25)m= 0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(2
3. Heat losse	s and he	not loca r	oromoto	or:									
S. Fleat losse ELEMENT	Gros	•	Openin		Net Ar	00	U-valı	10	AXU		k-value	.	AXk
ELEIVIENI	area		m		A,n		W/m2		(W/I	〈)	kJ/m ² ·ł		kJ/K
Doors					2	х	1.4	=	2.8				(2
Vindows Type	e 1				2.025	x1,	/[1/(1.4)+	0.04] =	2.68				(2
Vindows Type	e 2				4.05	x1,	/[1/(1.4)+	0.04] =	5.37	=			(2
Vindows Type	e 3				8.651	x1,	/[1/(1.4)+	0.04] =	11.47	=			(2
loor					22.71	1 x	0.12		2.72532	<u></u>			(2
						=							
Valls Type1	64.6	55	14.73	3	49.92	<u> </u>	0.15	<u> </u>	7.49			7	
• •	64.6		14.73	3		2 x	0.15	= [7.49				(2
Valls Type1 Valls Type2 Fotal area of e	4.09	9	14.73	3	2.09	×	0.15	=	7.49 0.3				(2
Valls Type2 Total area of e	4.09 elements	9 , m²	2		2.09	x	0.14	= [0.3	s given in	paragraph	3.2	(2
Valls Type2 Total area of e	4.09 elements	, m² ows, use e	2 ffective with	ndow U-va	2.09 91.45 alue calcula	x	0.14	= [0.3	as given in	paragraph	3.2	(2
Valls Type2 Total area of e for windows and * include the are	4.09 elements I roof winder as on both	y, m ² ows, use e	2 ffective will ternal wall	ndow U-va	2.09 91.45 alue calcula	x sated using	0.14	= [/[(1/U-valu	0.3	ns given in	paragraph	32.83	(2)
Valls Type2 Total area of eaction windows and the time the are fabric heat lost	4.09 elements I roof winder as on both ss, W/K =	y, m² ows, use e sides of in = S (A x	2 ffective will ternal wall	ndow U-va	2.09 91.45 alue calcula	x sated using	0.14	= [/[(1/U-valu + (32) =	0.3				(2 (3 (3 (3
Valls Type2 Total area of each for windows and the include the are fabric heat lost leat capacity	4.09 elements I roof winder as on both as, W/K = Cm = S(y, m² ows, use e sides of interpretation = S (A x k)	2 ffective winternal wall	ndow U-va	2.09 91.45 alue calculations	x sated using	0.14	= [/[(1/U-valu + (32) = ((28)	0.3 re)+0.04] a	2) + (32a).		32.83	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Fotal area of end for windows and include the are fabric heat lost Heat capacity Thermal mass for design asses	4.09 Alelements A roof winddens on both A roof, W/K = Cm = S(A parame A roof, when the sements who	y, m² cows, use esides of intermediate (A x k) ter (TMF)	ffective winternal wall U) $P = Cm \div$ tails of the	ndow U-va s and part	2.09 91.45 alue calcula itions	x ated using	0.14 of formula 1 (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 re)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44	(2 (3 (3 (3
Valls Type2 Total area of eaction windows and a include the are fabric heat lost leat capacity. Thermal mass for design assessan be used instead.	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame and of a deci	y, m² cows, use e sides of int = S (A x k) ter (TMF) ere the de tailed calcu	ffective winternal wall U) $P = Cm \div tails of the ulation.$	ndow U-va s and part - TFA) ir constructi	2.09 91.45 slue calculations kJ/m²K fon are not	ated using	0.14 of formula 1 (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 re)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44 100	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of ending for windows and include the are fabric heat local leat capacity. Thermal mass for design assess an be used instead thermal bridge.	4.09 Elements I roof winddens on both Ess, W/K = Cm = S(Exparame Exments whe ad of a decese : S (Lements)	y, m² cows, use esides of interest (A x k) ter (TMF) ere the detailed calcu	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	2.09 91.45 alue calculations kJ/m²K fon are not	ated using	0.14 of formula 1 (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 re)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and include the area fabric heat local leat capacity. Thermal mass for design assess and be used instead thermal bridge details of thermal	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame aments wh ad of a der es : S (L al bridging	y, m² cows, use esides of interest (A x k) ter (TMF) ere the detailed calcu	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	2.09 91.45 alue calculations kJ/m²K fon are not	ated using	0.14 of formula 1 (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative	0.3 re)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44 100	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of ending for windows and include the are fabric heat look the deat capacity. Thermal mass for design asses	4.09 elements I roof winddens on both ess, W/K = Cm = S(experiments when ad of a den ess : S (L al bridging at loss	, m² cows, use e sides of in a sides of in	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to cown (36) =	ndow U-vals and part - TFA) ir constructi using Ap	2.09 91.45 alue calculations kJ/m²K fon are not	ated using	0.14 of formula 1 (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) +	0.3 (ae)+0.04] a (30) + (32 tive Values e values of	2) + (32a). : Low TMP in Ta	(32e) = 	32.83 2431.44 100 10.92	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of ending for windows and include the are fabric heat lost leat capacity. Thermal mass for design assess and be used instead thermal bridged details of thermal fotal fabric hermal fabric he	4.09 elements I roof winddens on both ess, W/K = Cm = S(experiments when ad of a den ess : S (L al bridging at loss	, m² cows, use e sides of in a sides of in	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to cown (36) =	ndow U-vals and part - TFA) ir constructi using Ap	2.09 91.45 alue calculations kJ/m²K fon are not	ated using	0.14 of formula 1 (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) +	0.3 (30) + (32) (30) + (32) (36) =	2) + (32a). : Low TMP in Ta	(32e) = 	32.83 2431.44 100 10.92	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and the include the area fabric heat look leat capacity. Thermal mass for design assess an be used instantial bridge feetails of thermal fabric head feetails of thermal feetails of thermal fabric head feetails of thermal feetails of thermal feetails of thermal fabric head feetails on	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame and of a decestion es : S (L al bridging at loss at loss ca	y, m² cows, use e sides of in = S (A x k) ter (TMF) ere the de tailed calculated are not kn	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir construction using Ap	2.09 91.45 alue calculations a kJ/m²K fon are not	ated using	0.14 of formula 1. (26)(30) ecisely the	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	0.3 (30) + (32) tive Values values of (36) = = 0.33 × (2) + (32a). : Low <i>TMP in Ta</i> 25)m x (5)	(32e) = able 1f	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of eaction windows and include the are fabric heat lost leat capacity. Thermal mass for design assess an be used instantial factails of thermal fotal fabric head f	4.09 elements I roof winder as on both es, W/K = Cm = S(experiments whe ad of a der es : S (L al bridging eat loss at loss ca Feb 37.26	y, m² cows, use esides of interested the detailed calculated Mar 37.11	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	ndow U-vals and part - TFA) ir constructi using Ap = 0.05 x (3	2.09 91.45 alue calculations a kJ/m²K fon are not spendix h 1) Jun	x ated using	0.14 formula 1 (26)(30) ecisely the	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m Sep 35.83	0.3 (30) + (32) tive Values of (36) = = 0.33 × (Oct	2) + (32a). : Low : TMP in Ta 25)m x (5) Nov 36.51	(32e) = able 1f Dec	32.83 2431.44 100 10.92	(2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m= 1.01	1	1	0.99	0.99	0.98	0.98	0.98	0.99	0.99	0.99	1		
umber of day	s in moi	nth (Tahl	le 1a)		-	-	-	,	Average =	Sum(40) _{1.}	12 /12=	0.99	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing enei	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		48		(42
nnual averag educe the annua ot more that 125	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		7.9		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	ı litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m= 107.7	103.78	99.86	95.95	92.03	88.11	88.11	92.03	95.95	99.86	103.78	107.7	4474.00	
nergy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	<u> </u>	1174.86	(44
5)m= 159.71	139.68	144.14	125.66	120.58	104.05	96.42	110.64	111.96	130.48	142.43	154.67		
inotantanagua	otor booti	na ot noint	of upo /no	, hot water	r otorogo)	antar O in	havea (46		Total = Su	m(45) ₁₁₂ =		1540.42	(4
instantaneous w									l 0	l 0			(4)
6)m= 0 /ater storage	0 loss:	0	0	0	0	0	0	0	0	0	0		(4)
torage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
community h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
/ater storage i) If manufacti		eclared lo	oss facto	or is kno	wn (kWh	n/day).					0		(4
emperature fa) 10 KHO	**** (1.000)	"day).					0		(4
nergy lost fro				ear			(48) x (49)) =			0		(5
) If manufact		•	•		or is not		(10)11(10)				0		(0
ot water stora	•			e 2 (kW	h/litre/da	ıy)					0		(5
community h	_		on 4.3										
olume factor	-		2h							-	0		(5)
emperature fa											0		(5
nergy lost fro		_	, kVVh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(5
Enter (50) or (, ,	,	or oooh	month			(/EC) /	EE) (44).	•		0		(5
ater storage	1055 Cai	cuiateu i	or each	monun			((56)m = (55) x (41)	···				
6)m= 0 cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 n = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendix	ίΗ	(5
7)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
rimary circuit	loss (ar	nual) fro	m Table	3					=		0		(58
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fi	rom Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
`													

Ohilana	l l - 4 l	.		(04)	(00) - 0	OF (44)	\						
Combi loss ca	liculated 0	for each	montn 0	(61)m =	(60) ÷ 3	05 × (41))m 0	T 0	0	Ιο	0	1	(61)
				<u> </u>			ļ				ļ	(E0)m + (61)m	(01)
(62)m= 135.75	118.73	122.52	106.81	102.49	88.44	81.95	94.04		110.91	121.07	131.47	· (59)m + (61)m]	(62)
Solar DHW input		l		<u> </u>]	(02)
(add additiona									CONTINU	ion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter		<u>I</u>				Į.			<u> </u>	1	
(64)m= 135.75	_	122.52	106.81	102.49	88.44	81.95	94.04	95.17	110.91	121.07	131.47]	
		l .	l .	<u>!</u>			Οι	ıtput from w	ater heate	r (annual)	112	1309.36	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n]	-
(65)m= 33.94	29.68	30.63	26.7	25.62	22.11	20.49	23.51	23.79	27.73	30.27	32.87	1	(65)
include (57)	m in calc	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):				_					
Metabolic gair	·			,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 123.81	123.81	123.81	123.81	123.81	123.81	123.81	123.81	123.81	123.81	123.81	123.81	1	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5		-	-	-	
(67)m= 20.07	17.83	14.5	10.98	8.21	6.93	7.49	9.73	13.06	16.58	19.35	20.63]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		_	-	
(68)m= 220.92	223.21	217.43	205.14	189.61	175.02	165.27	162.98	168.76	181.06	196.58	211.17]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-	-	-	
(69)m= 35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.38]	(69)
Pumps and fa	ns gains	(Table 5	ōa)									_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 45.62	44.17	41.17	37.09	34.44	30.71	27.54	31.6	33.04	37.27	42.04	44.18]	(72)
Total internal	gains =				(66))m + (67)m	n + (68)m	n + (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 346.75	345.35	333.24	313.34	292.4	272.8	260.44	264.45	275	295.05	318.11	336.12]	(73)
6. Solar gain													
Solar gains are		•				•	tions to		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
_							, –				_		٦
Northeast 0.9x	0.77	X	8.6			11.28)	0.63	×	0.7	=	29.83	(75)
Northeast 0.9x	0.77	X	8.6		-	22.97	X	0.63		0.7	=	60.72](75)
Northeast 0.9x	0.77	X	8.6			11.38] X	0.63	×	0.7	=	109.4	[(75)
Northeast 0.9x	0.77	X	8.6	==	<u> </u>	67.96]	0.63	×	0.7	=	179.67	[(75)
Northeast _{0.9x}	0.77	X	8.6	35	x (91.35	X	0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	×	0.65	x	07.20	1 x	0.63	× [0.7		257.47	(75)
Northeast 0.9x	0.77	╡	8.65)]	97.38	1	0.63	╡╞	0.7		257.47	(75)
Northeast 0.9x	0.77	」 ^x	8.65	X	91.1] x] x	0.63		0.7	=	240.86	(75)
Northeast 0.9x	0.77	-	8.65	x x	72.63 50.42] ^] x	0.63	^	0.7		192.02	(75)
Northeast 0.9x	0.77	^ x	8.65	^ x	28.07] ^] x	0.63	^	0.7		74.21	(75)
Northeast 0.9x	0.77	-	8.65 8.65	^ x	14.2] ^] x		^ L _x [0.7	- -	37.53	(75)
Northeast 0.9x	0.77	→ x	8.65	^ x	9.21] ^] x	0.63	^ L x [0.7		24.36	(75)
Southwest _{0.9x}	0.77	- x	2.03	l ^	36.79] ^]	0.63	^ L x [0.7		22.77	(79)
Southwest _{0.9x}	0.77	X	2.03	x	62.67]]	0.63	^ L x [0.7		38.79	(79)
Southwest _{0.9x}	0.77	^ x	2.03	x	85.75]]	0.63	^ L x [0.7		53.07	(79)
Southwest _{0.9x}	0.77	= x	2.03	x	106.25]]	0.63	^ L x [0.7		65.76	(79)
Southwest _{0.9x}	0.77	^ x	2.03	l ^	119.01]]	0.63	^ L x [0.7		73.65	(79)
Southwest _{0.9x}	0.77	= x	2.03	l x	118.15]]	0.63	^ L x [0.7		73.12	(79)
Southwest _{0.9x}	0.77	= x	2.03	x	113.91]]	0.63	^ L x [0.7		70.49	(79)
Southwest _{0.9x}	0.77	×	2.03	x	104.39]]	0.63		0.7		64.6	(79)
Southwest _{0.9x}	0.77	ا ×	2.03	l X	92.85]	0.63		0.7		57.46	(79)
Southwest _{0.9x}	0.77	= x	2.03	x	69.27]	0.63	_ x [0.7	= -	42.87	(79)
Southwest _{0.9x}	0.77	ا ×	2.03	l X	44.07]	0.63	_ x [0.7	_	27.27	(79)
Southwest _{0.9x}	0.77	= x	2.03	X	31.49	1	0.63	╡ᇵ	0.7	= -	19.49	(79)
Northwest _{0.9x}	0.77	= x	4.05	l X	11.28]]	0.63	x	0.7	= =	13.97	(81)
Northwest _{0.9x}	0.77	×	4.05	X	22.97)] x	0.63	= x	0.7	=	28.43	(81)
Northwest _{0.9x}	0.77	×	4.05	X	41.38) x	0.63	- x	0.7		51.22	(81)
Northwest _{0.9x}	0.77	×	4.05	х	67.96	X	0.63	= x	0.7	=	84.11	(81)
Northwest _{0.9x}	0.77	×	4.05	х	91.35	X	0.63	= x	0.7	=	113.06	(81)
Northwest _{0.9x}	0.77	×	4.05	x	97.38	x	0.63	= x [0.7	-	120.54	(81)
Northwest _{0.9x}	0.77	×	4.05	x	91.1	X	0.63	= x [0.7	=	112.76	(81)
Northwest _{0.9x}	0.77	×	4.05	х	72.63	X	0.63	_ x [0.7	=	89.89	(81)
Northwest _{0.9x}	0.77	×	4.05	х	50.42	x	0.63	_ x [0.7	=	62.41	(81)
Northwest _{0.9x}	0.77	x	4.05	x	28.07	x	0.63	x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	×	4.05	x	14.2	x	0.63	x	0.7	<u> </u>	17.57	(81)
Northwest _{0.9x}	0.77	×	4.05	x	9.21	x	0.63	x	0.7	=	11.4	(81)
						•						
Solar gains in w	atts, calcu	ulated	for each mon	th		(83)m	n = Sum(74)m .	(82)m			•	
` '		13.68	329.53 428.23		51.13 424.11	346	.51 253.18	151.81	82.38	55.25		(83)
Total gains – int			` 	`							I	
(84)m= 413.32	473.29 54	16.93	642.88 720.62	2 7	23.93 684.55	610	.97 528.18	446.86	400.49	391.37		(84)
7. Mean intern	al tempera	ature (heating seaso	n)								
Temperature d	luring heat	ting pe	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation facto	_			Ť							I	
Jan		Mar	Apr Ma		Jun Jul	 	ug Sep	Oct	Nov	Dec		(5.5)
(86)m= 0.98	0.96	0.94	0.87 0.75		0.6 0.47	0.5	0.76	0.91	0.97	0.98		(86)
Mean internal	temperatu	re in li	ving area T1	(follo	w steps 3 to 7	7 in T	able 9c)		1	· · · · · · · · · · · · · · · · · · ·		
(87)m= 18.78	19.02	9.46	20.04 20.53	2	20.83 20.94	20.	91 20.65	20.01	19.29	18.73		(87)

Tomr	oroturo	durina h	acetina n	oriodo ir	root of	ومنالمييل	from To	bla O T	h2 (0C)					
	20.08	20.08	neating p	20.09	20.09		i e	i e		20.09	20.09	20.09		(88)
(88)m=		<u> </u>	<u> </u>			20.1	20.1	20.1	20.09	20.09	20.09	20.08		(00)
		<u>_</u>	ains for i			· ·		9a)				1		
(89)m=	0.97	0.96	0.93	0.85	0.71	0.54	0.39	0.45	0.7	0.9	0.96	0.98		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.03	18.27	18.7	19.27	19.72	19.99	20.07	20.05	19.85	19.25	18.55	17.99		(90)
							•	•	1	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mear	interna	l temner	ature (fo	r the wh	ole dwe	lling) – fl	Δ ~ T1	⊥ (1 _ fl	Δ) v T2			'		
(92)m=	18.29	18.53	18.96	19.53	20	20.27	20.37	20.35	20.12	19.51	18.8	18.24		(92)
			he mean											, ,
(93)m=	18.29	18.53	18.96	19.53	20	20.27	20.37	20.35	20.12	19.51	18.8	18.24		(93)
		L	uirement											
			ternal ter		re ohtain	ed at st	en 11 of	Table 9	h so tha	t Ti m=(76)m an	d re-calc	ulate	
			or gains	•		iou at ott	SP 11 01	Table 5	o, 50 tria	(11,111—(7 0)111 arr	a re care	diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.96	0.95	0.91	0.83	0.71	0.55	0.41	0.47	0.71	0.88	0.95	0.97		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	398.12	448.02	498.43	536.7	511.9	398.85	282.68	288.78	372.37	394.58	379.69	378.8		(95)
Mont	nly aver	age exte	ernal tem	perature	from Ta	able 8	•	•						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	•	•		
(97)m=	1135.46	1104.04	1007.52	851.86	663.84	450.26	298.73	312.6	479.2	712.67	939.31	1131.22		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
Spac (98)m=	e heatin 548.58	g require 440.85	ement fo 378.76	r each n 226.91	nonth, k\ 113.05	Wh/mon	th = 0.02	24 x [(97)m – (95 0)m] x (4 ²	1)m 402.93	559.8		
-								0	0		402.93	<u> </u>	2907.53	(98)
(98)m=	548.58	440.85	378.76	226.91	113.05			0	0	236.65	402.93	<u> </u>		= ```
(98)m=	548.58 e heatin	440.85 g require	378.76 ement in	226.91 kWh/m²	113.05			0	0	236.65	402.93	<u> </u>	2907.53	(98)
(98)m= Spac 8c. S	548.58 e heatin	440.85 g require	378.76 ement in quiremen	226.91 kWh/m²	113.05 ² /year	0		0	0	236.65	402.93	<u> </u>		= ```
(98)m= Spac 8c. S	548.58 e heatin pace co	g require	378.76 ement in quiremen	226.91 kWh/m² t August.	113.05 ² /year See Tal	0 ble 10b	0	0 Tota	0 Il per year	236.65 (kWh/year	402.93) = Sum(9	8) _{15,912} =		= ```
(98)m= Spac 8c. S Calcu	e heatin pace co	g require	arement in quirement July and Mar	kWh/m² t August. Apr	113.05 P/year See Tal May	0 ble 10b Jun	0 Jul	0 Tota	0 li per year	236.65 (kWh/year	402.93) = Sum(9 Nov	8) _{15,912} =		= ```
(98)m= Spac 8c. S Calcu	e heatin pace co plated fo Jan loss rate	g require	378.76 ement in quiremen	kWh/m² t August. Apr using 28	113.05 2/year See Tab May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug and exte	0 ll per year Sep	236.65 (kWh/year	402.93 Sum(9) Nov e from T	8) _{15,912} = Dec able 10)		(99)
(98)m= Spac 8c. S Calcu Heat (100)m=	e heatin pace co llated fo Jan loss rate	g require coling recorder June, coling Feb e Lm (call	areast and areast and areast a	kWh/m² t August. Apr	113.05 P/year See Tal May	0 ble 10b Jun	0 Jul	0 Tota	0 li per year	236.65 (kWh/year	402.93) = Sum(9 Nov	8) _{15,912} =		= ```
Spac 8c. S Calcu Heat (100)m= Utilisa	e heatin pace co plated fo Jan loss rate 0 ation face	g require oling rec r June, Feb e Lm (ca	area area area area area area area area	kWh/m² t August. Apr using 25	113.05 2/year See Tab May 5°C inter 0	0 ble 10b Jun nal temp 745.82	Jul perature 587.13	O Total Aug and exte	0 old per year Sep ernal ten	236.65 (kWh/year Oct nperatur 0	402.93 T) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10)		(99)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m=	e heatin pace co lated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca	area area area area area area area area	kWh/m² t August. Apr using 25	See Tal May 5°C inter	0 Die 10b Jun rnal temp 745.82	Jul perature	0 Tota Aug and exte	0 ll per year Sep	236.65 (kWh/year	402.93 Sum(9) Nov e from T	8) _{15,912} = Dec able 10)		(100)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin pace co plated fo Jan loss rate o ation face	g require oling rec r June, Feb e Lm (ca 0 ctor for lo	area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x	See Tab May 5°C inter 0	0 ble 10b Jun nal temp 745.82 0.82	0 Jul perature 587.13	O Total Aug and extended 602.1	0 on the second of the second	Oct nperatur 0	402.93 Nov e from T 0	8) _{15,912} = Dec Table 10) 0		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace co lated fo Jan loss rate 0 ation face il loss, h	g require r June, . Feb e Lm (ca 0 ctor for lo	ement in quirement July and Mar alculated 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 100)m x	See Tale May 5°C inter 0 (101)m 0	0 Die 10b Jun rnal temp 745.82 0.82	Jul perature 587.13	O Total Aug and extended 602.1 0.84	Sep ernal ten 0	236.65 (kWh/year Oct nperatur 0	402.93 T) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10)		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin pace co llated fo Jan loss rate 0 ation face ul loss, h 0 s (solar e	g require coling recorder June, where I can be considered as a second color for local color fo	area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	See Tab May 5°C inter 0 (101)m 0 cable we	ole 10b Jun rnal temp 745.82 0.82 612.1	Jul perature 587.13 0.87 512.07 egion, se	Aug and extended a	Sep ernal ten 0 0 10)	Oct nperatur 0	402.93 Sum(9 Nov e from T 0 0	8) _{15,912} = Dec Table 10) 0		(100) (101) (102)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar g	g require r June, c Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca	area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	See Tate May 5°C inter 0 0 (101)m 0 cable we	0 Jun rnal temp 745.82 0.82 612.1 eather re	Jul perature 587.13 0.87 512.07 egion, se 890.5	0 Tota Aug and exte 602.1 0.84 505.32 e Table 806.05	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	402.93 Nov e from T 0 0 0	8) _{15,912} = Dec Table 10) 0	36.02	(100)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	be heating pace control lated for Jan loss rate of the latent for Jan loss, he color of the latent for Jan loss, he color of the cooling of the cooling for the latent for Jan loss, he color of the latent for Jan loss, he color of the cooling for the latent for Jan loss, he color of the cooling for the latent for Jan loss, he color of the latent for Jan loss rate of the latent	g require oling rec r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tab May 5°C inter 0 (101)m 0 cable we	0 Jun rnal temp 745.82 0.82 612.1 eather re	Jul perature 587.13 0.87 512.07 egion, se 890.5	0 Tota Aug and exte 602.1 0.84 505.32 e Table 806.05	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	402.93 Nov e from T 0 0 0	8) _{15,912} = Dec Table 10) 0	36.02	(100) (101) (102)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co llated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar g 0 c cooling 04)m to	g require oling rec r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	arment in Quirement In Quiremen	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tab May 5°C inter 0 (101)m 0 cable we	0 Jun rnal temp 745.82 0.82 612.1 eather re	Jul perature 587.13 0.87 512.07 egion, se 890.5	0 Tota Aug and exte 602.1 0.84 505.32 e Table 806.05	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	402.93 Nov e from T 0 0 0	8) _{15,912} = Dec Table 10) 0	36.02	(100) (101) (102)
Space	e heatin pace co llated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar g 0 c cooling 04)m to	g require coling recovery r June, very Feb e Lm (ca color for locator for loca	area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Take May 5°C inter 0 0 (101)m 0 cable we whole comm	ole 10b Jun rnal temp 745.82 0.82 612.1 eather re 938.4	Jul perature 587.13 0.87 512.07 egion, see 890.5 continue	0 Tota Aug and exte 602.1 0.84 505.32 ee Table 806.05 ous (kW	0 0 0	236.65 (kWh/year Oct nperatur 0 0 24 x [(10	402.93 Nov e from T 0 0	8) _{15,912} = Dec Table 10) 0 0 102)m];	36.02	(100) (101) (102)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar g 0 c cooling 04)m to	g require oling rec r June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 g require zero if (area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Take May 5°C inter 0 0 (101)m 0 cable we whole comm	ole 10b Jun rnal temp 745.82 0.82 612.1 eather re 938.4	Jul perature 587.13 0.87 512.07 egion, see 890.5 continue	0 Tota Aug and exte 602.1 0.84 505.32 ee Table 806.05 ous (kW	0 1 10 0 0 10 0 10 0	Oct nperatur 0 0 24 x [(10	402.93 Nov e from T 0 0 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m];	36.02	(100) (101) (102) (103)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 0 l loss, h 0 s (solar (0 e cooling 04)m to d fraction	g require r June, v Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require zero if (area area area area area area area area	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Take May 5°C inter 0 0 (101)m 0 cable we whole comm	ole 10b Jun rnal temp 745.82 0.82 612.1 eather re 938.4	Jul perature 587.13 0.87 512.07 egion, see 890.5 continue	0 Tota Aug and exte 602.1 0.84 505.32 ee Table 806.05 ous (kW	0 1 10 0 0 10 0 10 0	236.65 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(402.93 Nov e from T 0 0 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m];	36.02 « (41)m	(100) (101) (102) (103)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face in the second of the seco	g require r June, v Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require zero if (are are a second of the second	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Take May 5°C inter 0 0 (101)m 0 cable we whole comm	ole 10b Jun rnal temp 745.82 0.82 612.1 eather re 938.4	Jul perature 587.13 0.87 512.07 egion, see 890.5 continue	0 Tota Aug and exte 602.1 0.84 505.32 ee Table 806.05 ous (kW	0 1 10 0 0 10 0 10 0	236.65 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(402.93 Nov e from T 0 0 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m];	36.02 « (41)m	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Interm	e heatin pace co llated fo Jan loss rate 0 ation face in the second of the seco	g require oling rec r June, Feb e Lm (ca 0 ctor for lo 0 mLm (V 0 gains ca 0 g require zero if (0 n actor (Ta	able 10b	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole co	ole 10b Jun rnal temp 745.82 0.82 612.1 eather re 938.4 dwelling,	Jul perature 587.13 0.87 512.07 egion, see 890.5 continue	0 Tota Aug and extended 602.1 0.84 505.32 The Table 806.05 Tota 223.74	0 1 1 1 1 1 1 1 1 1	236.65 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(cooled a	Nov Sum(9 Nov Property Property	8) _{15,912} = Dec able 10) 0 0 102)m] x	36.02 « (41)m	(100) (101) (102) (103)

Space cooling requirement for month = (104)m × (105) × (106)m												_	
(107)m= 0	0	0	0	0	58.73	70.39	55.93	0	0	0	0		
								Total	= Sum(107)	=	185.06	(107)
Space cooling	requiren	nent in k	:Wh/m²/y	/ear				(107)	÷ (4) =			2.29	(108)
8f. Fabric Ene	rgy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11) Fabric Energy Efficiency (99) + (108) = 38												38.32	(109)

SAP Input

Property Details: Plot 23

Address:

Located in: England Region: Thames valley

UPRN:

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

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown
No related party
Indicative Value Low

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

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 80.71 m² 2.5 m

Living area: 27.569 m² (fraction 0.342)

Front of dwelling faces: South East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
SE	Manufacturer	Solid			
SW	Manufacturer	Windows	double-glazed	Yes	
NW	Manufacturer	Windows	double-glazed	Yes	
NE	Manufacturer	Windows	double-glazed	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
SE	mm	0	0	1.4	2	1
SW	16mm or more	0.7	0.63	1.4	2.025	1
NW	16mm or more	0.7	0.63	1.4	4.05	1
NE	16mm or more	0.7	0.63	1.4	8.651	1

Name: SE	Type-Name:	Location: Corridor Wall	Orient: South East	Width: 0	Height: 0
SW		External Wall	South West	0	0
NW		External Wall	North 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:	Карра:
External Elemen	<u>ts</u>						
External Wall	64.647	14.73	49.92	0.15	0	False	N/A
Corridor Wall	4.087	2	2.09	0.15	0.4	False	N/A
Exposed Floor	22.711			0.12			N/A

Internal Elements

Party Elements

Thermal bridges:

SAP Input

Thermal bridges:		User-define	User-defined (individual PSI-values) Y-Value = 0.1195							
3		Length	Psi-value							
		7.495	0.293	E2	Other lintels (including other steel lintels)					
		26.7	0.049	E4	Jamb					
		32.58	0.069	E7	Party floor between dwellings (in blocks of flats)					
	[Approved]	5.45	0.09	E16	Corner (normal)					
		8.175	0.104	E25	Staggered party wall between dwellings					
	[Approved]	2.725	0.06	E18	Party wall between dwellings					
		22.032	0.087	E21	Exposed floor (inverted)					
		17.867	0.098	E24	Eaves (insulation at ceiling level - inverted)					
		17.023	0	P3	Intermediate floor between dwellings (in blocks of flats)					

Yes (As designed) Pressure test:

Balanced with heat recovery Ventilation:

Number of wet rooms: Kitchen + 2

Ductwork: Insulation, rigid

Approved Installation Scheme: True

0 Number of chimneys: 0 Number of open flues: Number of fans: 0 0 Number of passive stacks: Number of sides sheltered: 1 3 Pressure test:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers - mains gas, heat fraction 1, efficiency 94

Piping>=1991, pre-insulated, low temp, variable flow

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

Boiler interlock: Yes

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

thermostats

Control code: 2312

Secondary heating system: None

From main heating system Water heating:

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

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

Low energy lights:

Low rise urban / suburban Terrain type:

English EPC language: No Wind turbine:

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.99

Tilt of collector: 30°

SAP Input

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home:

Nο

Assessor Name: Zahid Ashraf Stroma Number: STRO001082 Software Version: Version: 1.0.5.9			l Iser I	Details:						
## Action Control Cont		Stroma FSAP 2012		Strom Softwa	are Ve	rsion:				
Area(m²)	Addross :	F	roperty	Address	: Plot 23					
Ground floor Go.71 (1a) x Z.5 (2a) = Z01.77 (3a)		ensions:								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)	<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Dwelling volume	Ground floor		3	80.71	(1a) x	2	2.5	(2a) =	201.77	(3a)
2. Ventilation rate: main heating heati	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) [;	80.71	(4)					
Number of chimneys	Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	201.77	(5)
Number of chimneys	2. Ventilation rate:									
Number of chimneys			ry	other		total			m³ per hoι	ır
Number of intermittent fans Number of passive vents \[0 \text{x} 10 = 0 (7b) \] Number of flueless gas fires \[0 \text{x} 10 = 0 (7b) \] Number of flueless gas fires \[0 \text{x} 40 = 0 (7c) \] \[\text{Air changes per hour} \] Infiltration due to chimneys, flues and fans = \(\left(6b) + \left(7a) + \left(7b) + \rect{(7c)} = 30 \text{to} \\ \text{10} \\ \text{to} \] Infiltration due to chimneys, flues and fans = \(\left(6b) + \left(7a) + \left(7b) + \rect{(7c)} = 30 \text{to} \\ \text{10} \\ \text{to} \text{to} \\ \\ \text{to}	Number of chimneys		+ [0	=	0	X 4	40 =	0	(6a)
Number of passive vents	Number of open flues	0 + 0	- + -	0	<u> </u>	0	x2	20 =	0	(6b)
Number of flueless gas fires	Number of intermittent fa	ins				3	x ′	10 =	30	(7a)
Air changes per hour	Number of passive vents	3			F	0	x -	10 =	0	(7b)
Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30	Number of flueless gas f	ires			_ [0	x 4	40 =	0	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30	_				L					`
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)								Air ch	anges per ho	our
Number of storeys in the dwelling (ns)		•			_ [÷ (5) =	0.15	(8)
Additional infiltration			ed to (17),	otherwise (continue fr	rom (9) to	(16)		0	(a)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 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	•	no awaiing (no)					[(9)-	-1]x0.1 =		_
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)	Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction	- ,			=
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration Unifiltration rate Window in permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = (20) = (20) 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			o the grea	ter wall are	ea (after					
If no draught lobby, enter 0.05, else enter 0	,	3 /·	.1 (seal	ed), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (14) + 100] = 0.015$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0.016$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$	If no draught lobby, en	ter 0.05, else enter 0	`	,.						=
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 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.4 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.92$ (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.37$ (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 $(22a)m = (22)m \div 4$	Percentage of window	s and doors draught stripped							0	(14)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = (21)$ 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 $(22a)m = (22)m \div 4$	Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $(21) = (18) \times (20) =$ 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 $(22a)m = (22)m \div 4$									0	(16)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.92 (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.37 (21)$ 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 $(22a)m = (22)m \div 4$,	·	•	•	•	etre of e	envelope	area		= '
Number of sides sheltered Shelter factor $ (20) = 1 - [0.075 \times (19)] = 0.92 $ (20) $ [10] $	•					is beina u	sed		0.4	(18)
Infiltration rate incorporating shelter factor				g. 00 a po					1	(19)
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.92	(20)
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 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.37	(21)
Monthly average wind speed from Table 7 (22)m= $\begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m \div 4	Infiltration rate modified f	for monthly wind speed			1		1	1	1	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m ÷ 4	 				1			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 = (2	2)m ÷ 4								
			0.95	0.92	11	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43		
Calculate effe		•	rate for t	he appli	cable ca	se			!	!	!		_
If mechanical			andiv N. (2	3h) - (22c	a) v Emy (aguation (I	VEVV othor	wico (22h) - (232)			0	(23
If exhaust air h) = (23a)			0	(23
If balanced with		-	-	_					21.) (001) [4 (00.)	0	(23
a) If balance					1			<u> </u>	 	- 	<u>`</u>	÷ 100] I	(24
(24a)m= 0	0		0	0	0	0	0	0	0	0	0		(24)
b) If balance	ea mech	anicai ve		without	neat red	overy (r	//V) (24b	0 = (22)	2b)m + () 0	23b)		1	(24
(= 10)			0						0		0		(24
c) If whole h				•	/e input v o); otherv				5 v (23h	<i>)</i>			
(24c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	<u> </u>	n or wh	ole hous	e nositiv	ve input	Ventilati	n from l						•
,				•	erwise (2				0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	•	•	•	•	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25
3. Heat losse	c and he	nat loce r	aramat	or:									
S. Fleat losse ELEMENT	S and the	_	Openin		Net Ar	202	U-valı	10	AXU		k-value	Λ	Χk
ELEWIENI	area		r		A,r		W/m2		(W/I	K)	kJ/m²·l		I/K
Doors					2	X	1	_ =	2				(26
Windows Type	e 1				2.025	₅ x1	/[1/(1.4)+	0.04] =	2.68	\equiv			(27
Windows Type	2				4.05	x1	/[1/(1.4)+	0.04] =	5.37	=			(27
Windows Type	e 3				8.651	x1	/[1/(1.4)+	0.04] =	11.47	=			(27
Floor					22.71	1 x	0.13	i	2.95243	<u></u>			(28
Walls Type1	64.6	65	14.7	3	49.92	2 x	0.18	╡┇	8.99	≓ i			(29
Walls Type2	4.0	=	2		2.09	=	0.18	≓ ₌¦	0.38	=			` (29
Total area of e					91.45	=	00		0.00				\ (31
* for windows and			ffective wi	ndow U-va			ı formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	(01
** include the area									, ,	Ü	, , ,		
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				33.84	(33
Heat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	2431.44	(34
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design asses				construct	ion are no	t known pi	ecisely the	indicative	e values of	TMP in T	able 1f		
<i>can be used inste</i> Thermal bridg				icina Ar	nondiy l							40.47	
if details of therma	•	,		• .	•	`						16.47	(36
Total fabric he		are not kn	own (30) -	- 0.00 X (0	, , ,			(33) +	(36) =			50.31	(37
Ventilation hea	at loss ca	alculated	l monthl	y				(38)m	= 0.33 × ([25)m x (5])		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 40.65	40.37	40.09	38.77	38.53	37.38	37.38	37.17	37.82	38.53	39.02	39.54		(38
Heat transfer	coefficie	nt. W/K	<u> </u>	<u> </u>		!		(39)m	= (37) + (37)	38)m		ı	
		, **/!						(50)	() . (/ · · ·			
(39)m= 90.96	90.68	90.4	89.08	88.84	87.69	87.69	87.48	88.13	88.84	89.33	89.85		

eat loss	parar	meter (F	HLP), W/	m²K		•	•		(40)m	= (39)m ÷	(4)			
0)m=	1.13	1.12	1.12	1.1	1.1	1.09	1.09	1.08	1.09	1.1	1.11	1.11		
ımharı	of days	e in mor	nth (Tabl	lo 1a)						Average =	Sum(40) ₁	12 /12=	1.1	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m=	31	28	31	30	31	30	31	31	30	31	30	31		(
· <u>L</u>	<u>I</u> _					<u> </u>	<u> </u>	Į	Į	<u> </u>				
. Wate	r heati	ng ener	gy requi	rement:								kWh/ye	ear:	
sumed	d occu	pancy, I	N								2	48		(
if TFA :	> 13.9	, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13.		-10		`
if TFA :		•	ater usac	ne in litre	s ner ds	y Vd av	erane –	(25 x N)	± 36		02	3.01		(
duce the	annua	l average	hot water	usage by	5% if the a	lwelling is	designed t	to achieve		se target o		5.01		(
more th	at 125 l	litres per p	person per	day (all w	ater use, l	not and co	ld)				•			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
_			day for ea			ctor from I	able 1c x	(43) 1						
)m= 1	02.31	98.59	94.87	91.15	87.43	83.71	83.71	87.43	91.15	94.87	98.59	102.31		_
erav con	ntent of l	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x F.	OTm / 3600		Total = Su oth (see Ta	· /		1116.12	
	51.72	132.7	136.93	119.38	114.55	98.85	91.6	105.11	106.36	123.96	135.31	146.94		
)III=	31.72	132.1	130.93	119.30	114.55	90.00	91.0	103.11		Total = Su	l	L	1463.4	_
nstantan	eous wa	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar – Su	111(43)112 -	-	1405.4	
)m=	0	0	0	0	0	0	0	0	0	0	0	0		(
ater sto	orage	oss:						<u> </u>	<u> </u>	<u> </u>		<u> </u>		
orage v	volume	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(
	-	_	nd no ta		-			, ,		(61.1/	4>			
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
ater sto If man	-		eclared le	oss facto	or is kno	wn (kWh	n/dav).					0		(
			m Table) 10 KHO	WII (ICVVI	i, aay).					0		
•			storage		oor			(48) x (49)	\ _					(
• • •			eclared o	-		or is not		(40) X (49)	, –			0		(
			factor fr	-								0		(
	-	_	ee secti	on 4.3										
-		rom Tal										0		(
mpera	ture fa	actor fro	m Table	2b								0		
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(
,	, ,	54) in (5	•									0		
ater sto	orage I	loss cal	culated f	or each	month	_	_	((56)m = (55) × (41)	m 	_			
)m=	0	0	0	0	0	0	0	0	0	0	0	0		(
ylinder c	ontains	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	
)m=	0	0	0	0	0	0	0	0	0	0	0	0		(
marv c	circuit	loss (an	nual) fro	m Table	3							0		(
•		•	•			59)m = ((58) ÷ 36	65 × (41)	m					
-					,	•	. ,	, ,		r thermo	stat)			
modifi	eu by	iactor ii	om rab			Joial Wai	or moun	.9 44			olal			

Combi loss ca	lculated	for each	month (61)m =	(60) ± 3	865 v (41)m							
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
	uired for	water he	eating ca	alculated	l for ead	h month	(62)ı	—— m =	0.85 × (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 128.97	112.79	116.39	101.47	97.37	84.02	77.86	89.3	_	90.41	105.36	115.01	124.9]	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	: H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	.	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from w	ater hea	ter			•						•	•	-	
(64)m= 128.97	112.79	116.39	101.47	97.37	84.02	77.86	89.3	34	90.41	105.36	115.01	124.9]	
								Outp	out from wa	ater heate	er (annual)	112	1243.89	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	n]	
(65)m= 32.24	28.2	29.1	25.37	24.34	21.01	19.46	22.3	34	22.6	26.34	28.75	31.22]	(65)
include (57)	m in calc	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 123.81	123.81	123.81	123.81	123.81	123.81	123.81	123.	.81	123.81	123.81	123.81	123.81		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee -	Table 5			-	_	
(67)m= 20.07	17.83	14.5	10.98	8.21	6.93	7.49	9.7	3	13.06	16.58	19.35	20.63]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Tal	ble 5	•	•	-	
(68)m= 220.92	223.21	217.43	205.14	189.61	175.02	165.27	162.	.98	168.76	181.06	196.58	211.17		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	0 SE	e Table	5	•	•	•	
(69)m= 35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.3	38	35.38	35.38	35.38	35.38]	(69)
Pumps and fa	ns gains	(Table 5	ōa)										-	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)	•					•	•	-	
(71)m= -99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.	05	-99.05	-99.05	-99.05	-99.05]	(71)
Water heating	gains (T	able 5)				•	•						-	
(72)m= 43.34	41.96	39.11	35.23	32.72	29.17	26.16	30.0	02	31.39	35.4	39.93	41.97]	(72)
Total internal	gains =				(60	6)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	-	
(73)m= 344.47	343.14	331.19	311.49	290.68	271.26	259.06	262.	.87	273.35	293.18	316.01	333.91]	(73)
6. Solar gains	s:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations t	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:			Area			UX		_	g_ able 6b	7	FF		Gains	
_	Table 6d		m²			able 6a			able ob	_ ' 	able 6c		(W)	_
Northeast _{0.9x}	0.77	X	8.6	55	x	11.28	X		0.63	x	0.7	=	29.83	(75)
Northeast _{0.9x}	0.77	х	8.6	55	x	22.97	X		0.63	x	0.7	=	60.72	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	41.38	X		0.63	x	0.7	=	109.4	(75)
Northeast _{0.9x}	0.77	X	8.6	65	X	67.96	X		0.63	×	0.7	=	179.67	(75)
Northeast _{0.9x}	0.77	X	8.6	55	X	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	x	8.65		x	97.38	1 x	0.63		×Г	0.7		257.47	(75)
Northeast _{0.9x}	0.77	X	8.65		x 🗀	91.1]]	0.63		_x [0.7	= =	240.86	(75)
Northeast _{0.9x}	0.77	X	8.65		x 🗀	72.63) x	0.63		x [0.7	= =	192.02	(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		× 「	0.7		74.21	(75)
Northeast _{0.9x}	0.77	x	8.65		x	14.2	X	0.63		× F	0.7	=	37.53	(75)
Northeast _{0.9x}	0.77	X	8.65		x	9.21	X	0.63	<u> </u>	хГ	0.7		24.36	(75)
Southwest _{0.9x}	0.77	x	2.03		х 🖳	36.79	j	0.63		× Ī	0.7	=	22.77	(79)
Southwest _{0.9x}	0.77	X	2.03		x	62.67	ĺ	0.63	:	x [0.7	=	38.79	(79)
Southwest _{0.9x}	0.77	X	2.03		x	85.75	j	0.63		×Ē	0.7	=	53.07	(79)
Southwest _{0.9x}	0.77	X	2.03		x	106.25]	0.63		× [0.7	=	65.76	(79)
Southwest _{0.9x}	0.77	X	2.03		x	119.01]	0.63		x [0.7	=	73.65	(79)
Southwest _{0.9x}	0.77	X	2.03		x	118.15]	0.63		x [0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.03		x	113.91]	0.63	:	x [0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	X	2.03		x	104.39]	0.63		x [0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	X	2.03		x	92.85]	0.63		x [0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	X	2.03		x	69.27]	0.63		x [0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	X	2.03		x	44.07]	0.63		x [0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.03		x	31.49]	0.63		x [0.7	=	19.49	(79)
Northwest _{0.9x}	0.77	X	4.05		x	11.28	X	0.63		x [0.7	=	13.97	(81)
Northwest _{0.9x}	0.77	X	4.05		x	22.97	X	0.63	:	x [0.7	=	28.43	(81)
Northwest _{0.9x}	0.77	X	4.05		x	41.38	X	0.63		x [0.7	=	51.22	(81)
Northwest _{0.9x}	0.77	X	4.05		x	67.96	X	0.63	:	x [0.7	=	84.11	(81)
Northwest 0.9x	0.77	X	4.05		x	91.35	X	0.63		x [0.7	=	113.06	(81)
Northwest 0.9x	0.77	X	4.05		x	97.38	X	0.63		x [0.7	=	120.54	(81)
Northwest 0.9x	0.77	X	4.05		x	91.1	X	0.63		x [0.7	=	112.76	(81)
Northwest _{0.9x}	0.77	X	4.05		x	72.63	X	0.63		x [0.7	=	89.89	(81)
Northwest _{0.9x}	0.77	X	4.05		х	50.42	X	0.63		x [0.7	=	62.41	(81)
Northwest _{0.9x}	0.77	X	4.05		x	28.07	X	0.63		× [0.7	=	34.74	(81)
Northwest 0.9x	0.77	X	4.05		x	14.2	X	0.63	:	x [0.7	=	17.57	(81)
Northwest _{0.9x}	0.77	X	4.05		x	9.21	X	0.63		x [0.7	=	11.4	(81)
Solar gains in w		T T	-				–	n = Sum(74)			1 1		1	(00)
` '		213.68		428.22	451.13		346	.51 253.1	8 151	1.81	82.38	55.25		(83)
Total gains – int		544.87	` 	718.9	722.39		609	.39 526.5	:2 4/	45	398.39	389.16	1	(84)
` '						9 663.17	609	.39 520.5	03 42	+0	390.39	309.10		(04)
7. Mean interna						. (TI 4 (00)						7(05)
Temperature d	_	•			•		oie 9	, In1 (°C)					21	(85)
Utilisation facto	Feb	Mar			<u> </u>		Ι ,		<u> </u>	\ot	Nov	Doo]	
(86)m= 1	1	0.99	Apr 0.97	May 0.89	Jun 0.72	Jul 0.55	0.6	ug Se 3 0.89		oct 99	Nov 1	Dec 1		(86)
· · · <u>L </u>	<u>l</u> _					!		!	1 0				J	(55)
Mean internal t	· -	- 1		<u> </u>		-i			4 1 00	40	20.04	10.60	1	(87)
(87)m= 19.7	19.84	20.1	20.47	20.78	20.95	20.99	20.	98 20.8	+ 20	.43	20.01	19.69		(01)

ı emp	oroturo	during h	ooting n	oriode ir	roct of	dwolling	from To	hlo O Ti	h2 (°C)					
(88)m=	19.98	19.98	neating p	20	20	20.01	20.01	20.01	20.01	20	20	19.99		(88)
		ļ	<u> </u>						20.01	20	20	19.99		(00)
			ains for i			· `				0.00				(00)
(89)m=	1	1	0.99	0.96	0.85	0.63	0.43	0.51	0.83	0.98	1	1		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.79	18.93	19.19	19.56	19.85	19.99	20.01	20.01	19.91	19.53	19.11	18.78		(90)
		=							f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mear	interna	l temner	ature (fo	r the wh	ole dwel	ling) – fl	Δ ν Τ1	⊥ (1 _ fl	Δ) v T2			'		
(92)m=	19.1	19.24	19.5	19.87	20.17	20.32	20.34	20.34	20.23	19.84	19.42	19.09		(92)
			he mean								10.42	10.00		(/
(93)m=	19.1	19.24	19.5	19.87	20.17	20.32	20.34	20.34	20.23	19.84	19.42	19.09		(93)
		l	uirement		20.11	20.02	20.01	20.01	20.20	10.01	10.12	10.00		(00)
			ernal ter		ro obtain	ad at st	on 11 of	Table O	h so tha	t Ti m=(76)m an	d ro-calc	ulato	
			or gains	•		eu ai sii	ър птог	i able si	0, 50 tria	it 11,111=(rojili alli	u re-caic	uiale	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilis	ation fac	<u> </u>	ains, hm	•	- 7			- 3						
(94)m=	1	1	0.99	0.96	0.86	0.66	0.48	0.55	0.85	0.98	1	1		(94)
Usefu	∟ ul gains,	hmGm	, W = (94	1)m x (84	4)m				ı	l				
(95)m=		469.42	539.17	614.39	616.34	476.38	324.68	337.05	447.67	436.39	397.07	388.69		(95)
		ı age exte	rnal tem	perature	from Ta	able 8			ļ					
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '	loss rate	e for me	an intern	al tempe	erature.	 _m . W =	L =[(39)m :	x [(93)m	i – (96)m	<u> </u>				
(97)m=	1346.6	1300.59	1	977.18	752.38	501.38	328.33	344.69	540.11	820.83	1100.37	1338.12		(97)
	e heatin	a reauire	ement fo	r each m	nonth. k\	Vh/mont	th = 0.02	24 x [(97	ı)m – (95)ml x (4	1)m			
(98)m=	696.56	558.55	473.24	261.21	101.21	0	0	0	0	286.02	506.37	706.37		
, ,		<u> </u>	l					Tota	l per vear	(kWh/year) = Sum(9)	8)1 50 12 =	3589.53	(98)
Space	a haatin	a roquir	omont in	k\N/b/m²	hoor					(,	,(-	- / 10,012		= ` `
Spac	e nealin	g require	ement in	KVVII/III-	уеаг								44.47	(99)
8c. S	pace co	oling red	quiremen	it										
Calcu			July and						1	1				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		`	lculated							r i				(400)
(100)m=		0	0	0	0	824.28	648.9	664.83	0	0	0	0		(100)
	ation fac	i								1				(101)
(101)m=		0	0	0	0	0.89	0.94	0.91	0	0	0	0		(101)
		·	Vatts) = (<u> </u>				1	1				(400)
	0	l 0	I 0	0	0	732.68	610.06	604.27	0	0	0	0		(102)
(102)m=										Ů				
Gains	s (solar	gains ca	lculated	for appli	cable we	eather re	egion, se		10)					(122)
Gains (103)m=	s (solar o	gains ca	lculated 0	for appli	cable we	eather re	egion, se 889.12	804.47	10)	0	0	0		(103)
Gains (103)m=	s (solar o	gains ca 0 g require	lculated 0 ement for	for appli 0 r month,	cable we	eather re	egion, se 889.12	804.47	10)	0		0	x (41)m	(103)
Gains (103)m= Space set (1	s (solar g	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	936.86 Iwelling,	egion, se 889.12 continue	804.47 Dus (kW	$ \begin{array}{c} 10) \\ 0 \\ (h) = 0.0 \end{array} $	0 24 x [(10	03)m – (0 102)m] x	x (41)m	(103)
Gains (103)m=	s (solar g	gains ca 0 g require	lculated 0 ement for	for appli 0 r month,	cable we	eather re	egion, se 889.12	804.47	$ \begin{array}{c c} 10) \\ 0 \\ /h) = 0.0 \end{array} $	0 24 x [(10	03)m – (°	0 102)m];		
Gains (103)m= Spac set (1 (104)m=	s (solar of the cooling of the cooli	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	936.86 Iwelling,	egion, se 889.12 continue	804.47 Dus (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ $ \begin{array}{c} 0 & \\ \text{Total} \end{array} $	0 24 x [(10 0 = Sum(03)m - (* 0 104)	0 102)m] 2 0	503.58	(104)
Gains (103)m= Space set (1 (104)m=	s (solar of the cooling of the cooli	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	936.86 Iwelling,	egion, se 889.12 continue	804.47 Dus (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ $ \begin{array}{c} 0 & \\ \text{Total} \end{array} $	0 24 x [(10	03)m - (* 0 104)	0 102)m] 2 0		
Gains (103)m= Spac set (1 (104)m= Cooled Interm	s (solar (0 e cooling 04)m to 0	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	936.86 Iwelling,	egion, se 889.12 continue	804.47 Dus (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ $ \begin{array}{c} 0 & \\ \text{Total} \end{array} $	0 24 x [(10 0 = Sum(03)m - (* 0 104)	0 102)m] 2 0	503.58	(104)
Gains (103)m= Space set (1 (104)m=	s (solar (0 e cooling 04)m to 0	gains ca 0 g require zero if (0 actor (Ta	lculated 0 ement fo 104)m < 0	for appli 0 r month, 3 × (98 0	cable we 0 whole common 0	936.86 Jwelling,	egion, se 889.12 continue 207.62	804.47 Dus (kW 148.95	10) 0 /h) = 0.0 Total f C =	0 24 x [(10 0 = Sum(cooled a	03)m - (104) 104) area ÷ (4	0 102)m] 2 0 = 4) =	503.58	(104)

Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n					_	
(107)m=	0	0	0	0	0	36.75	51.91	37.24	0	0	0	0		
·	Total = Sum(107) = Space cooling requirement in $kWh/m^2/vear$ (107) \div (4) =													
Space	Space cooling requirement in kWh/m²/year (107) ÷ (4) =													
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabrio	Energ	y Efficier	ncy						(99)	+ (108) :	=		46.03	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								52.94	(109)

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			001082 n: 1.0.5.9	
Address :	F	Property	Address	Plot 23					
Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			80.71	(1a) x	2	2.5	(2a) =	201.77	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) [80.71	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	201.77	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	0	<u> </u>	10 =	0	(7a)
Number of passive vents				Ī	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				L					
				_		<u>_</u>	Air ch	anges per ho	our —
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$			ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		iu io (17),	otrierwise (onunue n	om (9) to ((10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)
if both types of wall are pri deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	(- N		0	(15)
Infiltration rate	250		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	envelope	area	3	(17)
•	s if a pressurisation test has been do				is being u	sed		0.15	(10)
Number of sides sheltere	d							1	(19)
Shelter factor			(20) = 1 -		19)] =			0.92	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.14	(21)
Infiltration rate modified for	- 	T	1 .			.		l	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9	3.8	3.7	4	4.3	4.5	4.7		
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	ا ^{4.5}	4.1		
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		

0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calculate effe		•	rate for t	he appli	cable ca	se				<u> </u>	<u> </u>		
If mechanic												0.5	(23
If exhaust air h		0		, ,	,	. `	,, .	•) = (23a)			0.5	(23
If balanced wit	n heat reco	very: effic	ency in %	allowing f	or in-use fa	actor (from	n Table 4h)) =				79.05	(2:
a) If balance						ery (MVI	HR) (24a	<u> </u>	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(24
b) If balance								<u> </u>	<u> </u>		<u> </u>	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				E v (22h	. \			
$\begin{array}{c} \text{II } (\angle\angle\text{D})\text{I} \\ \text{24c} \text{m} = 0 \end{array}$	n < 0.5 x	(23b), t	hen (24d	$\frac{(230)}{0}$	o); otnerv	wise (24)	C) = (220)	0) m + 0.	5 × (230	0	0		(2
									U		U		(2
d) If natural if (22b)r			oie nous m = (22b	•					0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (240	c) or (24	d) in box	(25)				l	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(2
0 115-415-5-6													
3. Heat losse		•			Net Ar		اميدالا		AXU		مرياه درما		X k
ELEMENT	Gros area		Openin m		Net An A ,n		U-valı W/m2		(W/I	K)	k-value kJ/m²-ł		/K
Doors					2	X	1.4	=	2.8				(20
Vindows Type	e 1				2.025	; x1,	/[1/(1.4)+	0.04] =	2.68				(2
Vindows Type	e 2				4.05	x1,	/[1/(1.4)+	0.04] =	5.37	=			(2
Vindows Type	e 3				8.651	x1,	/[1/(1.4)+	0.04] =	11.47	=			(2
loor					22.71	1 x	0.12	─ 	2.72532	<u> </u>			(2
						=							
Walls Type1	64.6	5	14.73	3 I	49.92	X	0.15		7.49			7 —	╡`
Walls Type1 Walls Type2	64.6		14.73	3	49.92	=	0.15	= [= [7.49				(2
Walls Type2	4.09	€	14.73	3	2.09	×	0.15	= [7.49 0.3				(2)
Valls Type2 Total area of e	4.09 elements	9 , m²	2		2.09	×	0.14	= [0.3	as aiven in	paragraph	13.2	(2
Valls Type2 Total area of e	4.09 elements	, m² ows, use e	2 effective win	ndow U-ve	2.09 91.45 alue calcula	×	0.14	= [0.3	as given in	paragraph	3.2	(2
Valls Type2 Total area of each for windows and the include the area.	4.09 elements I roof winder as on both	, m ² ows, use e sides of in	2 effective winternal wall	ndow U-ve	2.09 91.45 alue calcula	x sated using	0.14	= [/[(1/U-valu	0.3	as given in	paragraph	32.83	(2
Valls Type2 Total area of each for windows and the include the area fabric heat loss	4.09 elements I roof winder as on both ss, W/K =	y, m² pows, use e sides of in = S (A x	2 effective winternal wall	ndow U-ve	2.09 91.45 alue calcula	x sated using	0.14	= [/[(1/U-valu + (32) =	0.3				(2) (3) (3)
Valls Type2	4.09 elements I roof winder as on both as, W/K = Cm = S(, m ² ows, use e sides of interpretation (A x A x A x A x B)	2 affective winternal wall U)	ndow U-va	2.09 91.45 alue calculatitions	x sated using	0.14	= [/[(1/U-valu + (32) = ((28)	0.3 e)+0.04] a	2) + (32a).		32.83	(2 (3 (3 (3 (3
Valls Type2 Total area of ending for windows and include the area for the sign assess.	4.09 Alelements A roof winddens on both A roof, W/K = Cm = S(A parame A roof, when the sements who	ows, use esides of ine S (A x A x k) ter (TMF)	2 effective winternal wall U) $P = Cm \div tails of the$	ndow U-ve s and part	2.09 91.45 alue calculations	x ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44	(2 (3 (3 (3 (3
Valls Type2 Total area of eaction windows and the include the area fabric heat loss feat capacity. Thermal mass for design assessan be used instead	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame and of a deci	, m² cows, use e sides of int = S (A x A x k) ter (TMF) ere the de tailed calcu	2 Iffective winternal wall U) P = Cm ÷ tails of the culation.	ndow U-va s and part - TFA) ir constructi	2.09 91.45 hlue calculations h kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44 100	(2 (2 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and include the area fabric heat loss feat capacity. Thermal mass for design assess an be used instead for the fact of	4.09 Elements I roof winddens on both Ess, W/K = Cm = S(Exparame Exments whe ad of a decese : S (Lements)	ows, use esides of interest the detailed calcular XY) calcular xY) calcular xY) calcular xxy	effective winternal wall U) $P = Cm \div tails of the ulation.$ culated to	ndow U-vas and part - TFA) ir constructi	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44	(2 (2 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and include the area fabric heat loss leat capacity. Thermal mass for design assession be used instead faetails of thermal	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame aments wh ad of a der es : S (L al bridging	ows, use esides of interest the detailed calcular XY) calcular xY) calcular xY) calcular xxy	effective winternal wall U) $P = Cm \div tails of the ulation.$ culated to	ndow U-vas and part - TFA) ir constructi	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative	0.3 e)+0.04] a .(30) + (32 tive Value:	2) + (32a). : Low	(32e) =	32.83 2431.44 100	(2 (2 (3 (3 (3 (3 (3
Valls Type2 Total area of each for windows and the include the area for the following the included the area for the included the area for the included the area for the included the inclu	4.09 elements I roof winddens on both ess, W/K = Cm = S(experiments when ad of a den ess : S (L al bridging at loss	, m² cows, use esides of ine S (A x A x k) ter (TMF) ere the detailed calculation x Y) calculate not kn	effective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) =	TFA) ir constructiusing Ap	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) +	0.3 re)+0.04] a .(30) + (32 tive Values values of	2) + (32a). : Low : TMP in Ta	(32e) = able 1f	32.83 2431.44 100 10.92	(2)
Valls Type2 Total area of each for windows and include the area fabric heat loss feat capacity. Thermal mass for design assessan be used instead fabric hermal bridges for details of thermal fabric hermal fabric hermal fabric hermal fabric	4.09 elements I roof winddens on both ess, W/K = Cm = S(experiments when ad of a den ess : S (L al bridging at loss	, m² cows, use esides of ine S (A x A x k) ter (TMF) ere the detailed calculation x Y) calculate not kn	effective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) =	TFA) ir constructiusing Ap	2.09 91.45 alue calculations kJ/m²K ion are not	ated using	0.14 formula 1. (26)(30)	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) +	0.3 e)+0.04] a .(30) + (32) tive Value: e values of (36) =	2) + (32a). : Low : TMP in Ta	(32e) = able 1f	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of eaction windows and include the area fabric heat loss leat capacity. Thermal mass for design assess an be used instead fabric heat fabri	4.09 elements I roof winder as on both as, W/K = Cm = S(a parame and of a decestion es : S (L al bridging at loss at loss ca	, m² cows, use e sides of int = S (A x A x k) ter (TMF ere the de tailed calculated are not kn	effective wind sternal wall U) P = Cm ÷ tails of the culation. culated to cown (36) =	TFA) ir constructiusing Ap	2.09 91.45 alue calculations h kJ/m²K fon are not	ated using	0.14 formula 1. (26)(30) ecisely the	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	0.3 (30) + (32) tive Value: values of (36) = = 0.33 × (2) + (32a). : Low : <i>TMP in Ta</i> 25)m x (5)	(32e) = able 1f	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type2 Total area of eactive for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess an be used instead fabric heat f	4.09 elements I roof winder as on both es, W/K = Cm = S(parame esments wh ad of a der es : S (L al bridging at loss at loss ca Feb 18.52	, m² cows, use esides of interested the detailed calculated Mar 18.29	effective winternal wall U) P = Cm ÷ tails of the culation. culated to cown (36) = I monthly Apr	ndow U-vals and part TFA) ir constructi using Ap 0.05 x (3	2.09 91.45 alue calculations kJ/m²K fon are not spendix h 1) Jun	x ated using	0.14 formula 1. (26)(30) ecisely the	= [/[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m Sep 16.21	0.3 (30) + (32 tive Values of (36) = = 0.33 × (Oct	2) + (32a). : Low : TMP in Ta 25)m x (5) Nov 17.37	(32e) = able 1f Dec	32.83 2431.44 100 10.92	(2 (2 (3 (3 (3 (3 (3

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.77	0.77	0.77	0.75	0.75	0.74	0.74	0.73	0.74	0.75	0.76	0.76		
	!		Į.	<u> </u>	Į.	Į.	<u> </u>		Average =	Sum(40) ₁	12 /12=	0.75	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		48		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t	` ,		se target c		7.9		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								I F	1	1			
(44)m= 107.7	103.78	99.86	95.95	92.03	88.11	88.11	92.03	95.95	99.86	103.78	107.7		
				<u> </u>				<u> </u>	<u> </u>	lm(44) ₁₁₂ =	<u> </u>	1174.86	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		`
(45)m= 159.71	139.68	144.14	125.66	120.58	104.05	96.42	110.64	111.96	130.48	142.43	154.67		
L			I	<u>I</u>	I	<u>I</u>			Total = Su	ım(45) ₁₁₂ =	=	1540.42	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			'		
(46)m= 23.96	20.95	21.62	18.85	18.09	15.61	14.46	16.6	16.79	19.57	21.36	23.2		(46)
Water storage				!			!		!	·	!		
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			-			, ,						
Otherwise if no		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		oclared I	occ fact	or ic kno	wp (k\\/k	n/dov/):							(40)
•				JI IS KIIO	vvii (Kvvi	ı/uay).					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			-							0	02		(51)
If community h	-			- (,				0.	.02		(- /
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter (50) or	(54) in (55)								1.	.03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	I s dedicate	I d solar sto	<u>l</u> rage, (57)	<u>I</u> m = (56)m		<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	I 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)
Primary circuit	loss (ar	nnual) fro	m Table				•	•	•		0		(58)
Primary circuit	•	,			59)m = ((58) ± 36	35 × (41)	ım			=		(/
(modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
			L			L							

Combi loss so	laulatad	for ooob	month	(64)m	(60) · 2(SE (41	١,,,,						
Combi loss ca	o loculated	o each	0	0	00) + 30	05 × (41)	0	T 0	0	T 0	0	1	(61)
			<u> </u>	<u> </u>							<u> </u>	J · (59)m + (61)m	()
(62)m= 214.99	189.61	199.42	179.16	175.86	157.54	151.69	165.92	·	185.76	195.92	209.95	(39)111 + (01)111	(62)
Solar DHW input			<u> </u>	<u> </u>		<u> </u>]	(-)
(add additiona											ooag)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter	Į.			ļ.	Į.				•	1	
(64)m= 214.99	189.61	199.42	179.16	175.86	157.54	151.69	165.92	165.46	185.76	195.92	209.95]	
			ı				Ou	tput from w	ater heate	r (annual)	112	2191.26	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n]	_
(65)m= 97.32	86.39	92.15	84.58	84.31	77.39	76.28	81.01	80.02	87.61	90.15	95.65	1	(65)
include (57)	m in calc	culation (of (65)m	only if c	ylinder i	s in the	dwelling	g or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):									
Metabolic gair	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57]	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-	-	-	
(67)m= 50.18	44.57	36.25	27.44	20.51	17.32	18.71	24.32	32.65	41.45	48.38	51.58]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5	-	_	-	
(68)m= 329.73	333.15	324.53	306.17	283	261.22	246.68	243.25	251.88	270.23	293.4	315.18]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also s	see Table	5	-	-	-	
(69)m= 52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33]	(69)
Pumps and fa	ns gains	(Table 5	5a)									-	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 130.81	128.55	123.85	117.47	113.32	107.49	102.53	108.88	111.14	117.75	125.21	128.56]	(72)
Total internal	gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 612.58	608.13	586.49	552.94	518.7	487.89	469.77	478.32	497.52	531.29	568.85	597.17		(73)
6. Solar gains													
Solar gains are		•				•	itions to d		ne applical		tion.		
Orientation: /	Access F Table 6d	actor	Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Northeast _{0.9x}							. –				_		7,75
Northeast 0.9x	0.77	X	8.6			1.28	X	0.63	×	0.7	=	29.83	(75)
Northeast 0.9x	0.77	X	8.6			22.97		0.63		0.7	=	60.72	(75)
Northeast 0.9x	0.77	X	8.6			11.38]	0.63		0.7	=	109.4	(75)
Northeast 0.9x	0.77	×	8.6	==	-	37.96		0.63		0.7	=	179.67	(75)
Normeast 0.9x	0.77	X	8.6	55	X 6	91.35	X	0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	×	0.65	x	07.20	1 x	0.62	x [0.7		257.47	(75)
Northeast 0.9x	0.77	=	8.65)]	97.38	1	0.63	≓ ¦	0.7	=	257.47	(75)
Northeast 0.9x	0.77	= ×	8.65	X	91.1] x] x	0.63		0.7	=	240.86	(75) (75)
Northeast 0.9x	0.77	X x	8.65	x x	72.63] ^] x	0.63		0.7		192.02	(75)
Northeast 0.9x	0.77	=	8.65	! !	50.42	1	0.63	≓ ¦	0.7	=	133.31	= `
Northeast 0.9x	0.77	_ x	8.65	X	28.07] X] ,	0.63	×	0.7		74.21	(75)
Northeast 0.9x	0.77	_ x	8.65	l x	14.2] X] .,	0.63	×	0.7	=	37.53	(75)
Southwest _{0.9x}	0.77	x	8.65	X 	9.21] X]	0.63	×	0.7	=	24.36	(75)
Southwest _{0.9x}	0.77	X	2.03	X I	36.79] 1	0.63	×	0.7	=	22.77	(79)
<u></u>	0.77	X	2.03	X	62.67] 1	0.63	× [0.7	=	38.79	(79)
Southweste s	0.77	×	2.03	X	85.75] 1	0.63	× [0.7	=	53.07	(79)
Southwesto a	0.77	×	2.03	X	106.25]	0.63	×	0.7	=	65.76	(79)
Southwest _{0.9x}	0.77	×	2.03	X	119.01]	0.63	×	0.7	=	73.65	(79)
Southwest _{0.9x}	0.77	×	2.03	X	118.15]	0.63	× [0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.03	Х	113.91]	0.63	X	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	×	2.03	Х	104.39]	0.63	x	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	X	2.03	X	92.85	_	0.63	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	X	2.03	X	69.27	_	0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	X	2.03	Х	44.07]	0.63	x	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.03	X	31.49]	0.63	x	0.7	=	19.49	(79)
Northwest _{0.9x}	0.77	X	4.05	X	11.28	X	0.63	X	0.7	=	13.97	(81)
Northwest _{0.9x}	0.77	X	4.05	X	22.97	X	0.63	x	0.7	=	28.43	(81)
Northwest _{0.9x}	0.77	X	4.05	X	41.38	X	0.63	х	0.7	=	51.22	(81)
Northwest 0.9x	0.77	X	4.05	X	67.96	X	0.63	x	0.7	=	84.11	(81)
Northwest 0.9x	0.77	X	4.05	x	91.35	X	0.63	Х	0.7	=	113.06	(81)
Northwest 0.9x	0.77	X	4.05	X	97.38	X	0.63	x	0.7	=	120.54	(81)
Northwest 0.9x	0.77	X	4.05	X	91.1	X	0.63	X	0.7	=	112.76	(81)
Northwest 0.9x	0.77	X	4.05	x	72.63	X	0.63	Х	0.7	=	89.89	(81)
Northwest 0.9x	0.77	X	4.05	X	50.42	X	0.63	x	0.7	=	62.41	(81)
Northwest _{0.9x}	0.77	X	4.05	X	28.07	X	0.63	x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	x	4.05	x	14.2	X	0.63	x	0.7	=	17.57	(81)
Northwest _{0.9x}	0.77	x	4.05	x	9.21	X	0.63	х	0.7	=	11.4	(81)
				-		_						
Solar gains in w		ulated	for each mon	th_		(83)m	n = Sum(74)m	(82)m			•	
` ′			329.53 428.22		51.13 424.11	346	.51 253.18	151.81	82.38	55.25		(83)
Total gains – int			` 	`						·	I	
(84)m= 679.15	736.06 8	00.17	882.47 946.9	2 9	39.01 893.89	824	.83 750.7	683.11	651.23	652.43		(84)
7. Mean intern	al temper	ature (heating seaso	n)								
Temperature d	luring hea	ating pe	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation factor	or for gain	s for li	ving area, h1,	m (s	ee Table 9a)			,			1	
Jan	Feb	Mar	Apr Ma	<u>/</u>	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.9	0.87	0.82	0.7 0.55		0.4 0.29	0.3	33 0.52	0.74	0.87	0.91		(86)
Mean_internal	temperatu	ıre in li	ving area T1	(follo	w steps 3 to 7	7 in T	able 9c)				_	
(87)m= 19.91	20.09 2	20.37	20.7 20.89	2	20.99	20.	99 20.94	20.69	20.27	19.88		(87)

Temn	erature	during h	neating p	eriode ir	rest of	dwelling	from Ta	hle 0 T	h2 (°C)					
(88)m=	20.28	20.28	20.28	20.29	20.3	20.31	20.31	20.31	20.3	20.3	20.29	20.29		(88)
. ,		!	ains for					<u> </u>				_00		, ,
(89)m=	0.89	0.86	0.8	0.67	0.52	0.36	0.25	0.28	0.47	0.71	0.85	0.9		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	e 9c)				
(90)m=	18.82	19.07	19.47	19.92	20.18	20.28	20.3	20.3	20.24	19.92	19.34	18.78		(90)
		Į.						Į.	f	LA = Livin	g area ÷ (4	1) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	_A × T1	+ (1 – fL	.A) × T2			•		
(92)m=	19.19	19.42	19.78	20.19	20.42	20.52	20.54	20.54	20.48	20.18	19.66	19.16		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	re appro	opriate				
(93)m=	19.19	19.42	19.78	20.19	20.42	20.52	20.54	20.54	20.48	20.18	19.66	19.16		(93)
			uirement											
			ternal ter or gains	•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	,									
(94)m=	0.88	0.84	0.78	0.67	0.52	0.37	0.26	0.29	0.48	0.71	0.83	0.89		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	594.99	621.88	627.63	591.89	495.43	345.19	232.83	242.87	363.74	484.78	543.15	577.86		(95)
			ernal tem					I				· ·		4
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat (97)m=	930.69	904.21	an intern 823.95	al tempe 687.36	528.99	Lm , W = 352.32	=[(39)m : 234.41	x [(93)m 245.29	- (96)m 382.44	581.22	767.57	921.12		(97)
, ,			ement fo									921.12		(37)
(98)m=	249.76	189.73	146.06	68.74	24.97	0	0.02	0	0	71.75	161.58	255.38		
(00)		1000	1.0.00				Ů		l per year		<u> </u>		1167.99	(98)
Space	e heatin	a reauire	ement in	kWh/m²	² /vear					(,(-		14.47	(99)
•		•	nts – Cor			scheme								
			ace hea		The state of the s			ting prov	ided by	a comm	unity sch	neme.		
			from se								·		0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
	-		y obtain he s, geotherr							up to four (other heat	sources; tl	ne latter	
Fractio	n of hea	at from C	Commun	ity boiler	'S								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g											kWh/yea	<u>-</u>
Annua	l space	heating	requirem	nent									1167.99	╛
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (305	5) x (306) =	=	1226.39	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

			i		_
Space heating requirement from second	ondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2191.26	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305)	x (306) =	2300.83	(310a)
Electricity used for heat distribution	0	.01 × [(307a)(307e) + (3	310a)(310e)] =	35.27	(313)
Cooling System Energy Efficiency Ra	itio			0	(314)
Space cooling (if there is a fixed cooli	ing system, if not enter 0)	= (107) ÷ (314) =		0	(315)
Electricity for pumps and fans within one mechanical ventilation - balanced, ex	<u> </u>	de		313.86	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a) + (330b) + (3	30g) =	313.86	(331)
Energy for lighting (calculated in Appe	endix L)			354.49	(332)
Electricity generated by PVs (Append	lix M) (negative quantity)			-815.12	(333)
Electricity generated by wind turbine	(Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heatin	g scheme				
	Fuel kWh/year	Fuel Pri (Table 1		Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24	x 0.01 =	52	(340a)
Water heating from CHP	(310a) x	4.24	x 0.01 =	97.56	(342a)
· ·		4.24 Fuel Pri	ce_	97.56	
Pumps and fans	(331)		ce x 0.01 =	97.56 41.4	(349)
Pumps and fans Energy for lighting	(331)	Fuel Pri	ce_		(349)
Pumps and fans	(331)	Fuel Pri	ce x 0.01 =	41.4	(349)
Pumps and fans Energy for lighting	(331) (332) 2)	Fuel Pri	ce x 0.01 =	41.4 46.76	(349)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies	(331) (332) 2) es = (340a)(342e) + (345)(354) =	Fuel Pri	ce x 0.01 =	41.4 46.76 120	(349) (350) (351)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost	(331) (332) 2) es = (340a)(342e) + (345)(354) =	Fuel Pri	ce x 0.01 =	41.4 46.76 120	(349) (350) (351)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin	(331) (332) 2) es = (340a)(342e) + (345)(354) =	Fuel Pri	ce x 0.01 =	41.4 46.76 120 357.71	(349) (350) (351) (355)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme	Fuel Pri	ce x 0.01 =	41.4 46.76 120 357.71	(349) (350) (351) (355) (356)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] =	Fuel Pri 13.19 13.19	x 0.01 = x 0.01 =	41.4 46.76 120 357.71 0.42 1.2 83.33	(349) (350) (351) (355) (356) (357)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Fuel Pri 13.19 13.19	x 0.01 = x 0.01 = x 0.01 =	41.4 46.76 120 357.71 0.42 1.2 83.33	(349) (350) (351) (355) (356) (357)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Fuel Pri 13.19 13.19 inergy Em Wh/year kg	x 0.01 = x 0.01 = x 0.01 = ission factor CO2/kWh	41.4 46.76 120 357.71 0.42 1.2 83.33 Emissions kg CO2/year	(349) (350) (351) (355) (356) (357)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heatin CO2 from other sources of space and	(331) (332) 2) 2) 2s = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme Exact water heating (not CHP) If there is CHP using two forms	Fuel Pri 13.19 13.19 inergy Em Wh/year kg	x 0.01 = x 0.01 = x 0.01 = ission factor CO2/kWh	41.4 46.76 120 357.71 0.42 1.2 83.33 Emissions kg CO2/year	(349) (350) (351) (355) (356) (357) (358)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heatin CO2 from other sources of space and Efficiency of heat source 1 (%)	(331) (332) 2) 2) 2s = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme Exact water heating (not CHP) If there is CHP using two forms	Fuel Pri 13.19 13.19 13.19 the second of	x 0.01 = x 0	41.4 46.76 120 357.71 0.42 1.2 83.33 Emissions kg CO2/year	(349) (350) (351) (355) (356) (357) (358)

Total CO2 associated with community	systems	(363)(366) + (368)(37	2)	=	828.81	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	=	0	(374)
CO2 associated with water from imme	rsion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =			828.81	(376)
CO2 associated with electricity for pun	nps and fans within dwe	elling (331)) x	0.52	=	162.89	(378)
CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous heater (312) x (309) x (309) x (309) x		(379)				
	s (333) to (334) as appl	icable	0.52 × 0.01	= [-423.05	(380)
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 pimps and fans within dwelling (332)) x CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO33) to (334) as applicable litern 1 CO52						
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9.33	(384)
El rating (section 14)					91.98	(385)
13b. Primary Energy – Community hea	ating scheme					
			•			
		•			•	
CO2 associated with space heating (secondary) (309) x		(367a)				
Efficiency of heat source 1 (%)	If there is CHP us	sing two fuels repeat (363) to		fuel	94	」` ¬
Efficiency of heat source 1 (%) Energy associated with heat source 1	If there is CHP us	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x		fuel =	94 4577.87	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution	If there is CHP us	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x	1.22	fuel = =	94 4577.87 108.29	(367)
CO2 associated with space heating (secondary) (309) x 0 = 0 (374) CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 = 0 (375) Total CO2 associated with space and water heating (373) + (374) + (375) = (328) 828.81 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 162.89 (378) CO2 associated with electricity for lighting (332)) x 0.52 = 163.96 (379) Energy saving/generation technologies (333) to (334) as applicable ltem 1 (352) x (352) x (353) 0.52 x (353) 0.52 x (354) 0.52 x (354) 0.52 x (355) 0.53 0.53 0.53 0.53 0.53 0.53 0.53 0.53						
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli	If there is CHP us [(307b) ity systems ess specified otherwise	sing two fuels repeat (363) to c)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 c, see C7 in Appendix C	1.22	fuel = = = =	94 4577.87 108.29 4686.16 4686.16	(367) (372) (373) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli	If there is CHP us [(307b) ity systems ess specified otherwise (secondary)	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3736) c, see C7 in Appendix C (309) x	1.22	fuel	94 4577.87 108.29 4686.16 4686.16	(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 commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from imr	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) nersion heater or instar	sing two fuels repeat (363) to 0)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) e, see C7 in Appendix C (309) x Intaneous heater(312) x	1.22	fuel	94 4577.87 108.29 4686.16 4686.16 0	(367) (372) (373) (373) (374) (375)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from immodule to the space are sourced to the series of t	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) nersion heater or instar	sing two fuels repeat (363) to 0)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) e, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) =	1.22 (2) (2) (3) (4) (5)	fuel	94 4577.87 108.29 4686.16 4686.16 0 0	(367) (372) (373) (373) (374) (375) (376)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from immortal Energy associated with space are Energy associated with space cooling	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) mersion heater or instar and water heating	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) a, see C7 in Appendix C (309) x attaneous heater(312) x (373) + (374) + (375) = (315) x	1.22 2) 0 1.22 3.07	fuel	94 4577.87 108.29 4686.16 4686.16 0 4686.16	(367) (372) (373) (373) (374) (375) (376) (377)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from immortal Energy associated with space and Energy associated with space cooling Energy associated with electricity for p	ity systems ess specified otherwise (secondary) mersion heater or instar id water heating umps and fans within d	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) b, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) = (315) x dwelling (331)) x	1.22 0 1.22 3.07 3.07	fuel	94 4577.87 108.29 4686.16 4686.16 0 0 4686.16 0 963.55	(367) (372) (373) (373) (374) (375) (376) (377) (378)

sum of (376)...(382) =

Total Primary Energy, kWh/year

4235.6

(383)

		عوا ا	r Details:						
Access Name:	Zahid Ashraf	USE		a Mirros	b a v .		CTDO	001002	
Assessor Name: Software Name:	Stroma FSAP 2012	2	Stroma Softwa					001082 on: 1.0.5.9	
			ty Address:						
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²) 80.71	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
	0) ((1b) ((10) ((1d) ((10)					2.5	(24) -	201.77	(34)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(111)	80.71	(4)) . (2-) . (2-	1) . (2-) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3C)+(3C	d)+(3e)+	.(3h) =	201.77	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	ır
Number of chimneys	heating he	ating		1 ₌ [40 =		_
Number of chimneys			0		0		20 =	0	(6a)
Number of open flues	0 +	0 +	0] = [0			0	(6b)
Number of intermittent fa				Ĺ	3		10 =	30	(7a)
Number of passive vents				Ĺ	0		10 =	0	(7b)
Number of flueless gas f	ires			L	0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs. flues and fans = (6a))+(6b)+(7a)+(7b)+(7c) =	Г	30		÷ (5) =	0.15	(8)
	peen carried out or is intended			ontinue fr			. (0)	0.10	
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration			_			[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fragressent, use the value correspond			•	uction			0	(11)
deducting areas of openi		onding to the gr	ealer wall are	a (anter					
If suspended wooden	floor, enter 0.2 (unseale	d) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
· ·	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2		_	(45)		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 l				is heina u	sed		0.4	(18)
Number of sides sheltere		occir done or a	acgree an per	modelinty	io boiling a	oou		1	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.37	(21)
Infiltration rate modified f	for monthly wind speed						'		
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95 0.95	5 0.92	1	1.08	1.12	1.18		
					<u> </u>		<u>L</u>	J	

0.47	0.46	0.45	0.41	0.4	d wind s 0.35	0.35	0.34	0.37	0.4	0.41	0.43		
Calculate effe		change i	rate for t	he appli	l	se	<u> </u>				<u> </u>		
If mechanic												0	(2
If exhaust air h		0 11		, ,	,	. ,	,, .	,) = (23a)			0	(2
If balanced wit		•	-	_								0	(2
a) If balance	1					- ` ` 	, ``	í `	- ` `		<u> </u>	÷ 100]	
(24a)m= 0	0	0	0	0	. 0	0	0	0	0	0	0		(2
b) If balance	1					· · · · ·	É Ì	í `				1	(1
24b)m= 0	0	0	0	0	. ,	0	0	0	0	0	0		(2
c) If whole h	nouse ex n < 0.5 ×			•					5 v (23h	,)			
$\frac{11(220)1}{24c)m=0}$	0.5 7	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural			·					<u> </u>				l	,
,	n = 1, the			•	•				0.5]				
24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
3. Heat losse	e and he	at loss r	naramete	or.									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	IE	AXU		k-value	<u>a</u>	ΑΧk
	area		m		A ,r		W/m2		(W/I	K)	kJ/m²·ł		kJ/K
Doors					2	Х	1	= [2				(2
Nindows Type	e 1				2.025	x1,	/[1/(1.4)+	0.04] =	2.68				(2
Windows Type	e 2				4.05	x1,	/[1/(1.4)+	0.041 -	5.37	\equiv			
							- '		5.57				(2
Windows Type	e 3				8.651	x1,	/[1/(1.4)+	· .	11.47	\exists			(2
Windows Type Floor	e 3				8.651 22.71			· .				-	,
Floor	e 3	65	14.73	3		1 ×	/[1/(1.4)+	0.04] =	11.47	 			(2
Floor Walls Type1			14.73	3	22.71	1 ×	/[1/(1.4)+ 0.13	0.04] = [11.47 2.95243	3 []			(2
Floor Walls Type1 Walls Type2	4.09	9		3	22.71 49.92 2.09	1 x 2 x	/[1/(1.4)+	0.04] = [11.47 2.95243 8.99	3 [(2
Floor Walls Type1 Walls Type2 Fotal area of e	64.6 4.09 elements	9 , m²	2		22.71 49.92 2.09 91.45	1 x 2 x x	0.13 0.18 0.18	0.04] = [11.47 2.95243 8.99 0.38		paragraph	3.2	(2
Floor Walls Type1 Walls Type2 Fotal area of e	64.6 4.09 elements	9 , m² ows, use e	2	ndow U-ve	22.71 49.92 2.09 91.45	1 x 2 x x	0.13 0.18 0.18	0.04] = [11.47 2.95243 8.99 0.38		paragraph	3.2	(2
Floor Walls Type1 Walls Type2 Fotal area of eacher include the area	64.6 4.09 elements	9 , m ² ows, use e sides of in	2 ffective will ternal wall	ndow U-ve	22.71 49.92 2.09 91.45	1 x 2 x x 3 dated using	0.13 0.18 0.18	0.04] = [11.47 2.95243 8.99 0.38		paragraph	33.6	(3)
Floor Walls Type1 Walls Type2 Fotal area of each of the servince of the ser	64.6 4.09 elements d roof winddas on both ss, W/K =	9 , m² ows, use e sides of in = S (A x	2 ffective will ternal wall	ndow U-ve	22.71 49.92 2.09 91.45	1 x 2 x x 3 dated using	0.13 0.18 0.18	$0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \\ \end{bmatrix}$ $+ (32) = \begin{bmatrix} \\ \\ \\ \end{bmatrix}$	11.47 2.95243 8.99 0.38	as given in		Γ	(2)
Floor Walls Type1 Walls Type2 Fotal area of earth of the street of th	64.6 4.09 elements d roof winder as on both ss, W/K = Cm = S(9 , m² ows, use e sides of int = S (A x X	2 ffective winternal wall	ndow U-va	22.71 49.92 2.09 91.45 alue calculatitions	1 x 2 x x 3 x ated using	0.13 0.18 0.18	$0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \\ \end{bmatrix}$ $+ (32) = ((28)$	11.47 2.95243 8.99 0.38 re)+0.04] a	as given in 2) + (32a).		33.8	(3)
Floor Walls Type1 Walls Type2 Fotal area of extension of the state	64.6 4.09 elements d roof winder as on both ss, W/K = Cm = S(s parame	y, m² ows, use e sides of in = S (A x (A x k) otter (TMF) ore the de	ffective winternal wall U) $P = Cm \div$ tails of the	ndow U-va Is and part	22.71 49.92 2.09 91.45 alue calculatitions	1 x 2 x x 3 x dated using	0.13 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (e)+0.04] a	as given in 2) + (32a). : Medium	(32e) =	33.8 2431	(3)
Floor Walls Type1 Walls Type2 Total area of extended for windows and extended the area of extended for the area of extended for the area of the extended for	64.6 4.09 elements d roof winder as on both ss, W/K = Cm = S(a parame sments when and of a december of the second of t	9 , m² cows, use e sides of int = S (A x k) tter (TMF) ere the de tailed calcular	ffective winternal wall U) P = Cm ÷ tails of the ulation.	ndow U-ve ls and part - TFA) ir constructi	22.71 49.92 2.09 91.45 alue calculatitions n kJ/m²K ion are not	1 x 2 x 3 x 5 ated using	0.13 0.18 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (e)+0.04] a	as given in 2) + (32a). : Medium	(32e) =	33.8 2431 250	(3)
Floor Walls Type1 Walls Type2 Fotal area of earth of the street of th	64.6 4.09 elements d roof winder as on both ess, W/K = Cm = S(es parame esments whe ead of a decees : S (L	y, m² ows, use e sides of in = S (A x (A x k) eter (TMF) ere the de tailed calcu x Y) calc	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	22.71 49.92 2.09 91.45 alue calculatitions h kJ/m²K ion are not	1 x 2 x 3 x 5 ated using	0.13 0.18 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (e)+0.04] a	as given in 2) + (32a). : Medium	(32e) =	33.8 2431	(34 (34 (34 (35 (35 (35 (35 (35 (35 (35 (35 (35 (35
Floor Walls Type1 Walls Type2 Fotal area of earth of the state of t	elements froof winder as on both as, W/K: Cm = S(a parame and of a deces: S (L al bridging	y, m² ows, use e sides of in = S (A x (A x k) eter (TMF) ere the de tailed calcu x Y) calc	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	22.71 49.92 2.09 91.45 alue calculatitions h kJ/m²K ion are not	1 x 2 x 3 x 5 ated using	0.13 0.18 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (e)+0.04] a	as given in 2) + (32a). : Medium	(32e) =	33.8 2431 250	(3) (4) (5) (4) (6) (6) (7) (7) (7) (7) (8)
Floor Walls Type1 Walls Type2 Fotal area of eart for windows and the include the area fabric heat loss. Heat capacity Thermal mass for design assess and be used instead fabric fedatils of thermal fotal fabric hear fabric hear fabric hear fabric hear fabric fedatils of thermal fabric fedatils of the fabric fedatils o	64.6 4.09 elements d roof winder as on both ess, W/K = Cm = S(est parame essments where and of a decrease is S (L all bridging eat loss	y, m² ows, use e sides of in a	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to cown (36) =	ndow U-vals and part - TFA) ir constructi using Ap	22.71 49.92 2.09 91.45 alue calculatitions h kJ/m²K ion are not	1 x 2 x 3 x 5 ated using	0.13 0.18 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (ae)+0.04] a .(30) + (32) tive Value	as given in 2) + (32a). : Medium	(32e) = able 1f	33.8 2431 250	(3) (3) (4) (4) (5) (5) (6) (7) (7) (7) (8)
Floor Walls Type1 Walls Type2 Fotal area of extension of the state	64.6 4.09 elements d roof winder as on both ess, W/K = Cm = S(est parame essments where ead of a decrease is S (L all bridging eat loss	y, m² ows, use e sides of in a	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to cown (36) =	ndow U-vals and part - TFA) ir constructi using Ap	22.71 49.92 2.09 91.45 alue calculatitions n kJ/m²K ion are not	1 x 2 x 3 x 5 ated using	0.13 0.18 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (30) + (32) tive Value of values of (36) =	as given in 2) + (32a). : Medium	(32e) = able 1f	33.8 2431 250	(3) (3) (4) (4) (5) (5) (6) (7) (7) (7) (8)
Floor Walls Type1 Walls Type2 Fotal area of earth of the state of t	64.6 4.09 elements d roof winddas on both ss, W/K = Cm = S(s parame sments wh ead of a dec es : S (L al bridging eat loss at loss ca	y, m² ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir construction using Ap	22.71 49.92 2.09 91.45 alue calculatitions n kJ/m²K ion are not opendix k 1)	1 × 2 × 3 × 5 ated using	0.13 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 (a) + 0.04] a tive Value e values of (36) = = 0.33 × (as given in 2) + (32a). : Medium : TMP in Ta	(32e) = able 1f	33.8 2431 250	(3) (3) (4) (4) (5) (5) (6) (7) (7) (7) (8)
Floor Walls Type1 Walls Type2 Fotal area of earth of the state of t	64.6 4.09 elements d roof winder as on both ess, W/K = Cm = S(est parame essments where ead of a decrease is S(L all bridging eat loss at loss ca Feb 40.37	y, m² ows, use e sides of in a	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	ndow U-vals and part - TFA) ir constructi using Ap = 0.05 x (3	22.71 49.92 2.09 91.45 alue calculatitions h kJ/m²K ion are not pendix h	1 x 2 x 3 x 3 ated using	0.13 0.18 0.18 0.18 0.18 0.18 (26)(30)	0.04] = [11.47 2.95243 8.99 0.38 .(30) + (32) tive Value e values of (36) = = 0.33 × (25)m x (5) Nov	(32e) = able 1f Dec	33.8 2431 250	(3 (3 (3 (3 (3 (3 (44 (3 (44 (3 (44 (44

Heat loss para	meter (l	HIP) W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.13	1.12	1.12	1.1	1.1	1.09	1.09	1.08	1.09	1.1	1.11	1.11		
(40)1112	1.12	1.12		l '''	1.00	1.00	1.00			Sum(40) ₁ .		1.1	(40)
Number of day	s in mo	nth (Tab	le 1a)					,	rtvorage =	Cum(40)	12712-	111	(10)
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)
				!		ļ	ļ	ļ.	ļ.	!			
4 \\/											1-) 0 //- /		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		48		(42)
Annual averag	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.01		(43)
not more that 125	litres per	person per	аау (ан м	/ater use, i	not ana co	ia)			,		1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 102.31	98.59	94.87	91.15	87.43	83.71	83.71	87.43	91.15	94.87	98.59	102.31		
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1116.12	(44)
(45)m= 151.72	132.7	136.93	119.38	114.55	98.85	91.6	105.11	106.36	123.96	135.31	146.94		
		1		1		1	1	-	Total = Su	m(45) ₁₁₂ =	=	1463.4	(45)
If instantaneous w	ater heati	ing at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)			'		
(46)m= 22.76	19.9	20.54	17.91	17.18	14.83	13.74	15.77	15.95	18.59	20.3	22.04		(46)
Water storage						•		•					
Storage volum	` '	•				_		ame ves	sel		150		(47)
If community h	_			-			, ,	` .	(0): (· 4 ¬ \			
Otherwise if no		not wate	er (tnis ir	ıcıuaes ı	nstantar	neous co	mbi boli	ers) ente	er o in ((47)			
Water storage a) If manufact		eclared l	nss farti	or is kno	wn (k\//ł	n/day).					20		(48)
Temperature fa				01 13 KHO	WII (ICVVI	i/day).					39		(49)
Energy lost fro				oor			(48) x (49)	\ _			54		, ,
b) If manufact		_	-		or is not		(40) X (43)	, –		0.	75		(50)
Hot water stora			-								0		(51)
If community h	•		on 4.3										
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (,								0.	75		(55)
Water storage	loss cal	culated f	or each	month	_		((56)m = (55) × (41)ı	m 				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	loss cal	culated f	for each	month (•	. ,	, ,						
(modified by					ı —					'	<u> </u>		
(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 o	·alculated	for each	month ((61)m –	(60) ± 3	865 v (41)m							
(61)m= 0	0	0	0	0	00) - 0	0 700) 0		0	0	0	0	1	(61)
		<u> </u>		alculated	l for ea	h month							J · (59)m + (61)m	` ,
(62)m= 198.3		183.53	164.47	161.14	143.94		151	_	151.46	170.55	180.4	193.53]	(62)
Solar DHW inpu		using App	L endix G oı	Appendix	L : H (nega	I tive quantity	/) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)]	
(add addition												0,		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from	water hea	ter				•	•					!	•	
(64)m= 198.3	2 174.78	183.53	164.47	161.14	143.94	138.19	151	.7	151.46	170.55	180.4	193.53]	
	•					•		Outp	out from wa	ater heate	er (annual)	l12	2012.02	(64)
Heat gains for	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	+ (6	1)m	1] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	n]	
(65)m= 87.72	77.79	82.81	75.77	75.36	68.94	67.73	72.2	22	71.44	78.49	81.06	86.13]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	e 5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 123.8	1 123.81	123.81	123.81	123.81	123.81	123.81	123	.81	123.81	123.81	123.81	123.81]	(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee -	Table 5				_	
(67)m= 20.07	17.83	14.5	10.98	8.21	6.93	7.49	9.7	3	13.06	16.58	19.35	20.63]	(67)
Appliances of	ains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Ta	ble 5		-	_	
(68)m= 220.9	2 223.21	217.43	205.14	189.61	175.02	165.27	162	.98	168.76	181.06	196.58	211.17]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-	-	_	
(69)m= 35.38	35.38	35.38	35.38	35.38	35.38	35.38	35.3	38	35.38	35.38	35.38	35.38]	(69)
Pumps and t	ans gains	(Table 5	5a)										_	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -99.0	5 -99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.	05	-99.05	-99.05	-99.05	-99.05]	(71)
Water heating	g gains (T	able 5)											_	
(72)m= 117.9	1 115.76	111.3	105.23	101.3	95.75	91.04	97.0	08	99.22	105.5	112.59	115.77]	(72)
Total intern	al gains =				(66	6)m + (67)m	n + (68	8)m +	- (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 422.0	4 419.94	406.37	384.49	362.25	340.84	326.94	332	.93	344.18	366.28	391.66	410.71		(73)
6. Solar gai														
Solar gains ar		Ü					tions 1	to co		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
North coat a a							1 1						. ,	1,
Northeast 0.9		X	8.6		-	11.28	X		0.63	_ ×	0.7	=	29.83	(75)
Northeast 0.9		X	8.6		-	22.97	X		0.63	×	0.7	=	60.72	(75)
Northeast 0.9		X	8.6			41.38	X 1		0.63	×	0.7	=	109.4	(75)
Northeast 0.9		X	8.6			67.96	X		0.63	×	0.7	_ =	179.67](75)
Northeast 0.9	0.77	X	8.6	35	X	91.35	X		0.63	X	0.7	=	241.51	(75)

								,			_				
Northeast _{0.9x}	0.77	X	8.6	5	X	9	7.38	X		0.63	X	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X		91.1	X		0.63	X	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	7	2.63	X		0.63	X	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	5	0.42	X		0.63	X	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X	2	8.07	X		0.63	X	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	X	8.6	5	X		14.2	X		0.63	X	0.7	=	37.53	(75)
Northeast 0.9x	0.77	X	8.6	5	X		9.21	X		0.63	X	0.7	=	24.36	(75)
Southwest _{0.9x}	0.77	X	2.0	3	X	3	6.79]		0.63	X	0.7	=	22.77	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	6	2.67]		0.63	X	0.7	=	38.79	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	8	5.75]		0.63	X	0.7	=	53.07	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	1	06.25]		0.63	X	0.7	=	65.76	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	1	19.01]		0.63	X	0.7	=	73.65	(79)
Southwest _{0.9x}	0.77	Х	2.0	3	X	1	18.15]		0.63	X	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	Х	2.0	3	X	1	13.91]		0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	x	2.0	3	X	1	04.39	j		0.63	X	0.7		64.6	(79)
Southwest _{0.9x}	0.77	x	2.0	3	X	9	2.85	Ī		0.63	x	0.7		57.46	(79)
Southwest _{0.9x}	0.77	x	2.0	3	X	6	9.27	Ī		0.63	x	0.7	_ =	42.87	(79)
Southwest _{0.9x}	0.77	x	2.0	3	X	4	4.07	j		0.63	X	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	x	2.0	3	X	3	1.49	Ī		0.63	x	0.7	_ =	19.49	(79)
Northwest _{0.9x}	0.77	x	4.0	5	X	1	1.28	X		0.63	X	0.7		13.97	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	2	2.97	X		0.63	X	0.7	=	28.43	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	4	1.38	X		0.63	x	0.7	_ =	51.22	(81)
Northwest _{0.9x}	0.77	X	4.0	5	X	6	7.96	X		0.63	х	0.7	_	84.11	(81)
Northwest _{0.9x}	0.77	X	4.0	5	X	9	1.35	X		0.63	x	0.7	_ =	113.06	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	9	7.38	X		0.63	x	0.7		120.54	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	,	91.1	X		0.63	x	0.7	_ =	112.76	(81)
Northwest _{0.9x}	0.77	X	4.0	5	X	7	2.63	X		0.63	x	0.7	_ =	89.89	(81)
Northwest 0.9x	0.77	x	4.0	5	X	5	0.42	X		0.63	x	0.7		62.41	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	2	8.07	X		0.63	x	0.7	_ =	34.74	(81)
Northwest 0.9x	0.77	X	4.0	5	X		14.2	X		0.63	x	0.7	_ =	17.57	(81)
Northwest _{0.9x}	0.77	x	4.0	5	X	,	9.21	X		0.63	x	0.7		11.4	(81)
_															
Solar gains in	watts, ca	alculated	for eacl	n mont	h_			(83)m	n = S	um(74)m .	(82)m			_	
(83)m= 66.57	127.93	213.68	329.53	428.22		51.13	424.11	346	5.51	253.18	151.8	82.38	55.25		(83)
Total gains – ir	nternal a		(84)m =	(73)m	+ (83)m	, watts						1	_	
(84)m= 488.61	547.88	620.06	714.02	790.47	7	91.97	751.05	679	.44	597.36	518.09	474.04	465.97		(84)
7. Mean inter	nal temp	erature	(heating	seaso	n)										
Temperature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisation fac	tor for g	ains for I	iving are	ea, h1,r	n (s	ee Ta	ble 9a)							_	
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec	_	
(86)m= 1	1	0.99	0.96	0.86		0.67	0.51	0.5	58	0.85	0.98	1	1	J	(86)
Mean internal	temper	ature in	living are	ea T1 (follo	w ste	ps 3 to 7	7 in T	able	e 9c)				_	
(87)m= 19.79	19.93	20.18	20.54	20.83	2	20.96	20.99	20.	99	20.88	20.51	20.1	19.78		(87)

Taman a		ما يم مياس بام		مان مام نس		مال مالم	. f	bla O T	۱۵ (۵C)					
· -	- 1						from Ta	i	· · ·	20	20	10.00		(88)
` ′ L	19.98	19.98	19.98	20	20	20.01	20.01	20.01	20.01	20	20	19.99	,	(66)
Utilisati (89)m=	ion fac	0.99	0.98	nest of di 0.94	welling, 0.81	h2,m (se 0.58	ee Table	9a) _{0.46}	0.78	0.97	0.99	1		(89)
						<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	0.99	'		(00)
	nternal	18.57	18.94	the rest	of dwelli	19.99	20.01	20.01	7 in Tabl	19.43	18.83	18.35		(90)
(90)111=	10.37	10.07	10.94	19.40	19.03	19.99	20.01	20.01		fLA = Livin			0.34	(91)
											g aroa . (-	-, -	0.34	(91)
	1						LA × T1		·					(00)
` ′	18.86	19.04	19.37	19.82	20.17	20.32	20.35	20.34	20.24	19.8	19.26	18.84	ı	(92)
	18.86	19.04	19.37	19.82	20.17	20.32	20.35	20.34	20.24	19.8	19.26	18.84		(93)
			uirement		20.17	20.32	20.33	20.34	20.24	19.0	19.20	10.04		(33)
•		·			re ohtair	ned at et	en 11 of	Tahla 0l	h so tha	ıt Ti m-(76)m an	d re-calc	ulate	
			or gains	•		ica at st	СРТТОГ	Table 5	o, 30 tria	it 11,111—(r Ojiii aii	a re care	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat	ion fac	tor for g	ains, hm	:				-						
(94)m=	1	0.99	0.98	0.94	0.82	0.61	0.43	0.5	0.8	0.96	0.99	1		(94)
			W = (94)	<u> </u>								ı	1	
` '	486.71	543.82	608.35	669.39	646.23	484.09	326.04	340.1	475.28	499.28	470.39	464.54		(95)
_			rnal tem	·			ı	<u> </u>	ı	ı	I		1	(0.0)
(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	l	(96)
_							- ` 	-``	– (96)m		4000.04	4045 40		(07)
` '		1281.88			752.49	501.76	328.44	344.93	541.25	816.92	1086.31	1315.43	I	(97)
	623.12	495.98	412.69	218.66	79.06	0	$\ln = 0.02$	24 X [(97])m – (95 0	236.33	443.46	633.06		
(90)111=	023.12	493.90	412.03	210.00	79.00			<u> </u>	l per year		!	!	3142.35	(98)
Casas	bootin	~ roauir	amant in	Is\A/lb/m2	2hroor			1010	ii pei yeai	(KVVIII) your) = Gam(S	0)15,912		=
· .			ement in										38.93	(99)
			nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space Fraction		•	at from se	acondan	u/eunnle	mentary	system						0	(201)
						inental y	•	(202) = 1 -	_ (201) _					= '
			nt from m	•	` ,			` '	` '	(000)]			1	(202)
			ng from i	•				(204) = (2	02) x [1 –	(203)] =			1	(204)
	•	•	ace heat										93.5	(206)
Efficier	ncy of s	econda	ry/supple	ementar	y heatin	g systen	า, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
· -			ement (c			<u> </u>							1	
	623.12	495.98	412.69	218.66	79.06	0	0	0	0	236.33	443.46	633.06		
(211)m :	= {[(98]	m x (20	4)] } x 1	00 ÷ (20)6)									(211)
_ (666.44	530.46	441.38	233.86	84.55	0	0	0	0	252.76	474.29	677.07		
								Tota	ıl (kWh/yea	ar) =Sum(2	211),15,1012	F	3360.81	(211)
Cnasa		a fuel (e	econdar	v) k\//h/	month									
•	heating	`		• , .										
= {[(98 <u>)</u> r	n x (20	1)] } x 1	00 ÷ (20	8)		I ^	I ^			_	_			
•		`		• , .	0	0	0	0 Tota	0 I (kWh/yea	0 ar) =Sum(2	0	0	0	(215)

Water heating Output from water heater (calculated above)								
	43.94 138.19	151.7	151.46	170.55	180.4	193.53		
Efficiency of water heater	· · · · · · · · · · · · · · · · · · ·						79.8	(216
(217)m= 87.66 87.44 86.91 85.57 83.03	79.8 79.8	79.8	79.8	85.68	87.12	87.75		(217
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
` ' ` ' ` ' ' ' ' ' '	80.37 173.17	190.1	189.79	199.05	207.07	220.56		
	-	Tota	I = Sum(2	19a) ₁₁₂ =			2383.67	(219
Annual totals				k\	Wh/yeaı	•	kWh/year	- -
Space heating fuel used, main system 1							3360.81	╛
Water heating fuel used							2383.67]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231
Electricity for lighting							354.49	(232
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	725.93	(261
Space heating (secondary)	(215) x			0.5	19	=	0	(263
Water heating	(219) x			0.2	16	=	514.87	(264
Space and water heating	(261) + (262)	+ (263) + (264) =				1240.81	(265
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267
Electricity for lighting	(232) x			0.5	19	=	183.98	(268
Total CO2, kg/year			sum o	of (265)(2	271) =		1463.71	_ (272

TER =

(273)

18.14