

User Details: **Assessor Name:** Peter Mitchell Stroma Number: STRO007945 Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.3.15 Property Address: Unit 6 (GFEND) LEAN New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LX Address: 1. Overall dwelling dimensions Volume(m³) Area(m²) Av. Height(m) Ground floor 96.54 (1a) x (2a) 231.7 (3a) 2.4 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)96.54 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =231.7 (5) total main secondary other m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a) 2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = (8) 0.09 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) (9)O Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)4 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.29 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.22 Infiltration rate modified for monthly wind speed Feb Sep Jan Mar Apr Mav Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$

1.1

1.08

0.95

0.95

0.92

1

1.08

1.12

1.18

1.23

1.27

(22a)m

1.25



Adjusted infilitration rate (allowing for shelter and wind speech) = (21 a) x (21 a) 21	Adjusted infiltra	ation rat	e (allowi	ina for st	nelter an	ıd wind s	:need) –	(21a) v	(22a)m					
Calculate erricktive air charge false for the applicable case	· -		<u> </u>	<u> </u>			i i	`	ì ´	0.24	0.25	0.26	1	
If exhaust air heat pump using Appendix N, (23b) = (23a) × Firry (equation (NS)), otherwise (23b) = (23a) \ flabalanced with heat recovery; difficiency in % allowing for in-use factor (from Table 4h) =			•	rate for t	he appli	cable ca	se		<u> </u>				J	
It balanced with heat recovery. efficiency in % sillowing for in-use factor (from Table 4h) = 0				anadin NL (C	ah) (00.	· \ /-		\) (00-)			0	== ` `
a) if balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) + 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) = (23a)				
24a)m			-	-	_					Ola \	(OOL) [4 (00-)		(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = (24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·						, ``	- ´ ` -	í `	 	` 	- ` ´) ÷ 100]]	(24a)
(24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													J	(= .0)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m							- 	- 	í `	 	- 	0	1	(24b)
The properties of the proper				<u> </u>									J	, ,
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] [24dym	•				•	-				.5 × (23b	o)			
(22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m = 0.54	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.54 0.54 0.54 0.54 0.53 0.53 0.53 0.52 0.52 0.52 0.52 0.53 0.53 0.53 0.53 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)											•	•	•	
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.54 0.54 0.54 0.54 0.53 0.53 0.53 0.52 0.52 0.52 0.52 0.53 0.53 0.53 0.53 0.53 (25) 3. Heat losses and heat loss parameter: ELEMENT	<u> </u>		- ` ´	<u> </u>		`		- `	 		0.50	0.50	1	(244)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	` '									0.53	0.53	0.53	J	(24u)
3. Heat losses and heat loss parameter. ELEMENT Gross Openings area (m²) Openings area (m²) Net Area U-value A X U (W/K) kJ/m²-K kJ/K				- ` 	<u> </u>	ŕ	ŕ `		`	0.53	0.53	0.53	1	(25)
Companies Comp	` '		L	<u> </u>		0.02	0.02	0.02	0.02	0.00	1 0.00	1 0.00	l	(- /
A m²										A 37.11				A 3/1
Windows Type 2 3.5	ELEMENT													
Windows Type 3 8.26	Windows Type	1				7.39	x1.	/[1/(1.2)+	0.04] =	8.46				(27)
Windows Type 4 8.26	Windows Type	2				3.5	x1.	/[1/(1.2)+	0.04] =	4.01				(27)
Windows Type 5	Windows Type	3				8.26	x1.	/[1/(1.2)+	0.04] =	9.46				(27)
Walls 108.14 32.69 75.45 x 0.16 = 12.07 (29) Total area of elements, m² 108.14 (31) Party wall 19.25 x 0 = 0 (32) Party wall 15.26 x 0 = 0 (32) ** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 49.5 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Values Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 6.79 (36) if details of thermal bridging are not known (36) = 0.15 x (31) (31) (31) (32) (33) + (36) = (36) (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = 0.33 x (Windows Type	4				8.26	x1.	/[1/(1.2)+	0.04] =	9.46				(27)
Total area of elements, m² Total area of elements, m² Total fabric heat loss Total fabri	Windows Type	5				5.28	x1	/[1/(1.2)+	0.04] =	6.05				(27)
Party wall $ 19.25 \times 0 = 0 $ (32) Party wall $ 19.25 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (33) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (35) $ 15.26 \times 0 = 0 $ (36) $ 15.26 \times 0 = 0 $ (37) $ 15.26 \times 0 = 0 $ (38) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (35) $ 15.26 \times 0 = 0 $ (36) $ 15.26 \times 0 = 0 $ (37) $ 15.26 \times 0 = 0 $ (38) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (31) $ 15.26 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (33) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (35) $ 15.26 \times 0 = 0 $ (36) $ 15.26 \times 0 = 0 $ (37) $ 15.26 \times 0 = 0 $ (38) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (31) $ 15.26 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (35) $ 15.26 \times 0 = 0 $ (36) $ 15.26 \times 0 = 0 $ (37) $ 15.26 \times 0 = 0 $ (38) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (31) $ 15.26 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (35) $ 15.26 \times 0 = 0 $ (36) $ 15.26 \times 0 = 0 $ (37) $ 15.26 \times 0 = 0 $ (38) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (39) $ 15.26 \times 0 = 0 $ (30) $ 15.26 \times 0 = 0 $ (31) $ 15.26 \times 0 = 0 $ (32) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (34) $ 15.26 \times 0 = 0 $ (35) $ 15.26 \times 0 = 0 $ (36) $ 15.26 \times 0 = 0 $ (37) $ 15.26 \times 0 = 0 $ (38)	Walls	108.	14	32.6	9	75.45	5 X	0.16	i	12.07	<u> </u>			(29)
Party wall 15.26	Total area of el	lements	, m²			108.1	4							(31)
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 49.5 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (6.79 (36)) if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 56.29 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Unique (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.41 40.61 40.83 Heat transfer coefficient, W/K (39)m = (37) + (38)m	Party wall					19.25	5 X	0		0				(32)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 49.5 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 6.79 (36) if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 56.29 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.61 40.83 Heat transfer coefficient, W/K (39)m = (37) + (38)m	Party wall					15.26	3 X	0	= i	0	Ħ i		7 F	(32)
Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 49.5 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (6.79 (36) if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 56.29 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Heat transfer coefficient, W/K (39)m = (37) + (38)m							lated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	n 3.2	
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K								(26)(30) + (32) =				49.5	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 56.29 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.61 40.83 Heat transfer coefficient, W/K (39)m = (37) + (38)m	Heat capacity (Cm = S	(Axk)						((28)	(30) + (3	2) + (32a).	(32e) =	0	(34)
Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 56.29 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.61 40.83 Heat transfer coefficient, W/K (39)m = (37) + (38)m	Thermal mass	parame	ter (TMF	= Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
Thermal bridges : S (L x Y) calculated using Appendix K	· ·				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss					using Ap	pendix l	K						6.79	(36)
Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.61 40.83 Heat transfer coefficient, W/K (39)m = (37) + (38)m	if details of therma	l bridging	,		•	-								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.61 40.83 Heat transfer coefficient, W/K (39)m = (37) + (38)m			alaulataa	المدمم لم							(OE) v (E)		56.29	(37)
(38)m= 41.29 41.17 41.05 40.51 40.41 39.93 39.93 39.84 40.11 40.41 40.61 40.83 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m			i –	· ·		lun	1	L Διια	1		1		1	
Heat transfer coefficient, W/K (39)m = (37) + (38)m			-			 	-	Ť	 	 	 	 	1	(38)
	` ′			L		1	1	L	<u> </u>	<u> </u>	ļ	1	J	` '
ן אווע ן שווע און שווע בייד אווע בייד אווע און אווע אווע	(39)m= 97.58	97.47	97.35	96.8	96.7	96.22	96.22	96.13	96.41	96.7	96.91	97.12	1	

Average = $Sum(39)_{1...12}/12=$

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Heat Ic	ss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
40)m=	1.01	1.01	1.01	1	1	1	1	1	1	1	1	1.01		
م ما ممین ا			.4h /Tab	lo 4o\						Average =	Sum(40) ₁ .	12 /12=	1	(40
Numbe	Jan	Feb	nth (Tab Mar		May	Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
41)m=	31	28	31	Apr 30	Way 31	30	31	Aug 31	30 30	31	30	31		(41
,	01		01											(
4. Wa	ter heat	ing enei	gy requi	rement:								kWh/ye	ear:	
if TF	ed occu A > 13.9 A £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		71		(42
								(25 x N)				.45		(4:
		_			5% if the d ater use, l	_	_	to achieve	a water us	se target o	Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot wate							Table 1c x							
14)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
							·				m(44) ₁₁₂ =		1181.35	(4
nergy o	·				· ·) kWh/mor ı	·	ables 1b, 1			
5)m=	160.59	140.45	144.94	126.36	121.24	104.63	96.95	111.25	112.58	131.2	143.22	155.52		— ,,
instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	= [1548.94	(4
l6)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(4
Vater	storage	loss:									ļ.			
torag	e volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
	-	_			-		litres in	, ,		(Ol ! - /	(47)			
	rise it no storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	nod idmo	ers) ente	er o in (47)			
	_		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(4
•			m Table			`	• ,					0		` (4
•			storage		ear			(48) x (49)) =			0		` (5
•			_	-	oss fact	or is not	known:							\
		•			e 2 (kW	h/litre/da	ıy)					0		(5
	-	•	ee secti	on 4.3										
	e factor i		oie ∠a m Table	2h							-	0		(5 (5
								(47) (54)) (5 0) (EO)		0		·
	(50) or (storage	, KVVII/ye	ear			(47) X (51)) x (52) x (oo) =		0		(5 (5
	. , .	, ,	culated f	or each	month			((56)m = (55) × (41)	m		U		(-
							ı		1					(5
6)m= cylinde	0 er contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendi	x H	(0
7)m=	0	0	0	0	0	0	0	0	0	0	0	0		(5
	ļ													·
		•	inual) fro			59)m – 1	(58) <u>+</u> 36	65 × (41)	m			0		(5
					,	•	. ,	, ,	cylinde	r thermo	stat)			
								J	,	•	,			



Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
·	alculated	for each		(61)m =	(60) ÷ 3	65 × (41))m		1		1	1	
(61)m= 50.96	46.03	50.96	47.58	47.16	43.69	45.15	47.16	47.58	50.96	49.32	50.96]	(61)
Total heat red	uired for	water he	eating ca	alculated	for eac	h month	(62)m :	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		(62)
Solar DHW input									r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix	G)	1		1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	vater hea	ter										_	
(64)m= 211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		,
Output from water heater (annual) ₁₁₂ 212 Heat gains from water heating, $kW/h/month = 0.25 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (50)m]$													
Heat gains from water heating, kWh/month $0.25 ines [0.85 imes (45)m + (61)m] + 0.8 ines [(46)m + (57)m + (59)m]$													
(65)m= 66.14	58.21	60.93	53.91	52.1	45.71	43.52	48.78	49.33	56.36	59.95	64.45		(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	e Table 5	and 5a):									
Metabolic gair	ns (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 162.31	162.31	162.31	162.31	162.31	162.31	162.31	162.31	162.31	162.31	162.31	162.31		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5	•	•	•	•	
(67)m= 55.86	49.61	40.35	30.54	22.83	19.28	20.83	27.07	36.34	46.14	53.85	57.41]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1		o see Ta	ble 5			1	
(68)m= 374.04	- `	368.14	347.32	321.04	296.33	279.83	275.95	285.73	306.55	332.84	357.54	1	(68)
Cooking gains	s (calcula	ated in A	opendix	L. eguat	ion L15	or L15a), also s	ee Table	5			1	
(69)m= 53.94	53.94	53.94	53.94	53.94	53.94	53.94	53.94	53.94	53.94	53.94	53.94]	(69)
Pumps and fa	ns gains	(Table 5	[[a]				l .	1		<u>l</u>		1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. e				ļ				1 -				J	` '
(71)m= -108.2	T .	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	1	(71)
Water heating			100.2	100.2	100.2	100.2	100.2	100.2	100.2	100.2	100.2	J	()
(72)m= 88.89	86.62	81.9	74.87	70.03	63.49	58.5	65.57	68.51	75.76	83.26	86.63	1	(72)
` '	ı		74.07	70.00		I	<u> </u>	+ (69)m +	l	<u> </u>	l]	(, _)
Total interna (73)m= 629.83	-	601.43	563.78	524.94	490.13	470.2	479.62	501.62	539.49	580.99	612.61	1	(73)
(73)m= 629.83 6. Solar gain	1	601.43	303.76	524.94	490.13	470.2	479.02	501.62	559.49	560.99	012.01		(13)
Solar gains are		using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion		
Orientation:		Ü	Area		Flu			g_	о арриоа	FF		Gains	
	Table 6d		m ²			ble 6a		Fable 6b	Т	able 6c		(W)	
Northeast 0.9x	0.77	X	7.3	RQ	x ·	11.28	1 x [0.76	x	0.7		30.74	(75)
Northeast _{0.9x}	0.77	X	8.2		—	11.28]	0.76		0.7	= =	34.36	(75)
Northeast 0.9x			7.3			22.97	」^ <u>└</u> ┃ x	0.76	$\frac{1}{x}$	0.7	-	62.57](75)](75)
Northeast 0.9x	0						╎├		╡╞		=](75)](75)
Northeast 0.9x		×	8.2		-	22.97		0.76	×	0.7	╡ -	69.94	-
1401tileast 0.9X	0.77	Х	7.3	59	X	11.38	X	0.76	x	0.7	=	112.74	(75)



–		-										_
Northeast _{0.9x}	0.77	X	8.26	X	41.38	Х	0.76	X	0.7	=	126.01	(75)
Northeast _{0.9x}	0.77	X	7.39	X	67.96	X	0.76	X	0.7	=	185.15	(75)
Northeast _{0.9x}	0.77	X	8.26	X	67.96	X	0.76	X	0.7	=	206.94	(75)
Northeast _{0.9x}	0.77	X	7.39	X	91.35	X	0.76	X	0.7	=	248.87	(75)
Northeast _{0.9x}	0.77	X	8.26	X	91.35	X	0.76	X	0.7	=	278.17	(75)
Northeast _{0.9x}	0.77	X	7.39	X	97.38	X	0.76	x	0.7	=	265.33	(75)
Northeast 0.9x	0.77	X	8.26	X	97.38	x	0.76	x	0.7	=	296.56	(75)
Northeast _{0.9x}	0.77	X	7.39	x	91.1	X	0.76	x	0.7	=	248.21	(75)
Northeast _{0.9x}	0.77	X	8.26	X	91.1	X	0.76	x	0.7	=	277.43	(75)
Northeast 0.9x	0.77	X	7.39	X	72.63	x	0.76	x	0.7	=	197.87	(75)
Northeast _{0.9x}	0.77	X	8.26	x	72.63	x	0.76	x	0.7	=	221.17	(75)
Northeast _{0.9x}	0.77	X	7.39	x	50.42	x	0.76	x	0.7	=	137.37	(75)
Northeast _{0.9x}	0.77	X	8.26	x	50.42	x	0.76	x	0.7	=	153.54	(75)
Northeast _{0.9x}	0.77	X	7.39	x	28.07	x	0.76	x	0.7	=	76.47	(75)
Northeast _{0.9x}	0.77	X	8.26	x	28.07	x	0.76	x	0.7	=	85.47	(75)
Northeast _{0.9x}	0.77	X	7.39	x	14.2	х	0.76	x	0.7	=	38.68	(75)
Northeast _{0.9x}	0.77	X	8.26	x	14.2	x	0.76	x	0.7	=	43.23	(75)
Northeast _{0.9x}	0.77	X	7.39	x	9.21	x	0.76	x	0.7	=	25.1	(75)
Northeast _{0.9x}	0.77	X	8.26	x	9.21	x	0.76	x	0.7	=	28.06	(75)
Southeast 0.9x	0.77	X	3.5	X	36.79	x	0.76	x	0.7	=	47.48	(77)
Southeast 0.9x	0.77	X	5.28	X	36.79	x	0.76	x	0.7	=	71.62	(77)
Southeast _{0.9x}	0.77	X	3.5	x	62.67	x	0.76	x	0.7	=	80.87	(77)
Southeast 0.9x	0.77	X	5.28	X	62.67	X	0.76	x	0.7	=	122	(77)
Southeast 0.9x	0.77	X	3.5	X	85.75	X	0.76	x	0.7	=	110.65	(77)
Southeast 0.9x	0.77	X	5.28	X	85.75	x	0.76	x	0.7	=	166.93	(77)
Southeast 0.9x	0.77	X	3.5	X	106.25	X	0.76	x	0.7	=	137.1	(77)
Southeast 0.9x	0.77	X	5.28	X	106.25	x	0.76	x	0.7	=	206.83	(77)
Southeast _{0.9x}	0.77	X	3.5	x	119.01	x	0.76	x	0.7	=	153.57	(77)
Southeast 0.9x	0.77	X	5.28	X	119.01	X	0.76	x	0.7	=	231.67	(77)
Southeast 0.9x	0.77	X	3.5	x	118.15	x	0.76	x	0.7	=	152.46	(77)
Southeast 0.9x	0.77	X	5.28	x	118.15	x	0.76	x	0.7	=	229.99	(77)
Southeast _{0.9x}	0.77	x	3.5	x	113.91	x	0.76	x	0.7	=	146.98	(77)
Southeast 0.9x	0.77	X	5.28	x	113.91	x	0.76	x	0.7	=	221.74	(77)
Southeast 0.9x	0.77	X	3.5	X	104.39	x	0.76	x	0.7	=	134.7	(77)
Southeast 0.9x	0.77	X	5.28	x	104.39	x	0.76	x	0.7	=	203.21	(77)
Southeast 0.9x	0.77	X	3.5	x	92.85	x	0.76	x	0.7	=	119.81	(77)
Southeast 0.9x	0.77	X	5.28	x	92.85	x	0.76	x	0.7	=	180.75	(77)
Southeast 0.9x	0.77	X	3.5	x	69.27	x	0.76	x	0.7	=	89.38	(77)
Southeast 0.9x	0.77	X	5.28	x	69.27	x	0.76	x	0.7	=	134.84	(77)
Southeast 0.9x	0.77	X	3.5	x	44.07	x	0.76	x	0.7	=	56.87	(77)
Southeast 0.9x	0.77	X	5.28	×	44.07	x	0.76	x	0.7	=	85.79	(77)



Southeast 0.9x	0.77	x	3.5	5	x	31.49	x	0.76	X	0.7	=	40.63	(77)
Southeast 0.9x	0.77	x	5.28	8	x	31.49	x	0.76	X	0.7	=	61.29	(77)
Southwest _{0.9x}	0.77	X	8.26	6	x	36.79] [0.76	X	0.7	=	112.05	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	62.67] [0.76	X	0.7	=	190.86	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	85.75] [0.76	x	0.7	=	261.14	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	106.25] [0.76	X	0.7	=	323.56	(79)
Southwest _{0.9x}	0.77	x	8.26	6	x	119.01] [0.76	X	0.7	=	362.42	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	118.15] [0.76	x	0.7	=	359.8	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	113.91] [0.76	x	0.7	=	346.88	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	104.39] [0.76	x	0.7	=	317.9	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	92.85] [0.76	x	0.7	=	282.76	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	69.27] [0.76	x	0.7	=	210.94	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	44.07] [0.76	x	0.7	=	134.21	(79)
Southwest _{0.9x}	0.77	X	8.26	6	x	31.49] [0.76	x	0.7	=	95.89	(79)
Solar gains ir	watts, ca	alculated	for each	month			(83)m	= Sum(74)m .	.(82)m			-	
(83)m= 296.25		777.46	1059.59	1274.7	1304.		1074	.85 874.23	597.1	358.77	250.98		(83)
Total gains –	internal a	nd solar	(84)m =	(73)m ·	+ (83)	m , watts				_		7	
(84)m= 926.08	1151.44	1378.89	1623.37	1799.64	1794.	27 1711.43	1554	.47 1375.85	1136.5	8 939.76	863.59]	(84)
7. Mean inte	ernal temp	erature ((heating	season)								
Temperature	e during h	eating p	eriods in	the livi	ng are	a from Tal	ole 9,	Th1 (°C)				21	(85)
							,	` '					
Utilisation fa	ctor for ga	ains for li	ving are	a, h1,m	(see	Table 9a)	•	,					
Utilisation fa	ctor for ga	ains for li Mar	ving are	a, h1,m May	(see	<u> </u>	Αυ		Oct	Nov	Dec]	
	т <u> </u>				Г` .	n Jul		ıg Sep	Oct	Nov 0.96	Dec 0.99]	(86)
(86)m=	Feb 0.95	Mar 0.86	Apr 0.69	May 0.49	Ju 0.34	n Jul 0.25	Au 0.28	Ig Sep 3 0.48		_			(86)
Jan	Feb 0.95 al temper	Mar 0.86	Apr 0.69	May 0.49	Ju 0.34	n Jul 0.25	Au 0.28	sig Sep 3 0.48 able 9c)		_]	(86)
(86)m= 0.98 Mean intern (87)m= 20.28	Feb 0.95 al tempera 20.52	0.86 ature in l	Apr 0.69 iving are 20.94	May 0.49 ea T1 (fo 20.99	0.34 Ollow :	n Jul 0.25 steps 3 to 7 21	Au 0.28 7 in Ta 21	sig Sep 0.48 able 9c) 20.99	0.79	0.96	0.99		` ,
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature	Feb 0.95 al tempera 20.52	0.86 ature in l	Apr 0.69 iving are 20.94	May 0.49 ea T1 (fo 20.99	0.34 Ollow :	n Jul 0.25 steps 3 to 7 21 ng from Ta	Au 0.28 7 in Ta 21	g Sep 0.48 able 9c) 20.99 , Th2 (°C)	0.79	0.96	0.99]	` ,
(86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07	Feb 0.95 al tempera 20.52 e during h 20.08	Mar 0.86 ature in l 20.77 eating po	Apr 0.69 iving are 20.94 eriods in 20.08	May 0.49 ea T1 (fo 20.99 rest of 20.08	Ju 0.34 collow s 21 dwell 20.0	1 Jul 0.25 steps 3 to 7 21 ng from Ta 9 20.09	Au 0.287 in Ta 21 able 9 20.0	g Sep 0.48 able 9c) 20.99 , Th2 (°C)	20.9	0.96	0.99		(87)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa	Feb 0.95 al tempera 20.52 e during h 20.08	Mar 0.86 ature in I 20.77 eating pe 20.08 ains for r	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw	May 0.49 ea T1 (for 20.99 rest of 20.08 velling,	Ju 0.34 ollow: 21 dwell 20.0 h2,m	n Jul 0.25 steps 3 to 7 21 ng from Ta 9 20.09 (see Table	Au 0.28 7 in Ta 21 able 9 20.0 9a)	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08	20.9	0.96 20.55 20.08	0.99 20.22 20.08		(87)
Jan (86)m= 0.98	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93	Mar 0.86 ature in I 20.77 eating pe 20.08 ains for r 0.83	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45	Ju 0.34 ollow : 21 dwell 20.0 h2,m 0.29	n Jul 0.25 steps 3 to 7 21 sing from Ta 9 20.09 (see Table 0 0.2	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.23	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08	0.79 20.9 20.08	0.96	0.99		(87)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera	Mar 0.86 ature in I 20.77 eating pore search for r 0.83 ature in t	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of	May 0.49 ea T1 (for 20.99 rest of 20.08 welling, 0.45 of dwelli	Ju 0.34 collow: 21 dwell 20.0 h2,m 0.29	n Jul 0.25 steps 3 to 7 21 ng from Ta 9 20.09 (see Table 0 0.2	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.23	g Sep 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table	0.79 20.9 20.08 0.75 e 9c)	0.96 20.55 20.08	0.99 20.22 20.08 0.98		(87) (88) (89)
Jan (86)m= 0.98	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera	Mar 0.86 ature in I 20.77 eating pe 20.08 ains for r 0.83	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45	Ju 0.34 ollow : 21 dwell 20.0 h2,m 0.29	n Jul 0.25 steps 3 to 7 21 ng from Ta 9 20.09 (see Table 0 0.2	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.23	g Sep 3 0.48 able 9c) 20.99 20.08 3 0.42 to 7 in Table 99 20.08	0.79 20.9 20.08 0.75 e 9c) 19.98	0.96 20.55 20.08 0.94	0.99 20.22 20.08 0.98		(87) (88) (89) (90)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera	Mar 0.86 ature in I 20.77 eating pore search for r 0.83 ature in t	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of	May 0.49 ea T1 (for 20.99 rest of 20.08 welling, 0.45 of dwelli	Ju 0.34 collow: 21 dwell 20.0 h2,m 0.29	n Jul 0.25 steps 3 to 7 21 ng from Ta 9 20.09 (see Table 0 0.2	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.23	g Sep 3 0.48 able 9c) 20.99 20.08 3 0.42 to 7 in Table 99 20.08	0.79 20.9 20.08 0.75 e 9c) 19.98	0.96 20.55 20.08	0.99 20.22 20.08 0.98	0.52	(87) (88) (89)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48	Mar 0.86 ature in l 20.77 eating per 20.08 ains for r 0.83 ature in t 19.82	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelling	Ju 0.34 ollow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0	1 Jul 0.25 steps 3 to 7 21 sing from Ta 9 20.09 (see Table 0 0.2 2 (follow steps 20.09)	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.28 eps 3 20.0	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08	0.79 20.9 20.08 0.75 e 9c) 19.98	0.96 20.55 20.08 0.94	0.99 20.22 20.08 0.98	0.52	(87) (88) (89) (90)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation far (89)m= 0.98 Mean intern (90)m= 19.15	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera	Mar 0.86 ature in l 20.77 eating per 20.08 ains for r 0.83 ature in t 19.82	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelling	Ju 0.34 ollow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0	n Jul 0.25 steps 3 to 7 21 ng from Ta 9 20.09 (see Table 0 0.2 2 (follow ste 9 20.09	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.28 eps 3 20.0	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) × T2	0.79 20.9 20.08 0.75 e 9c) 19.98	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4	0.99 20.22 20.08 0.98	0.52	(87) (88) (89) (90)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern (90)m= 19.15 Mean intern (92)m= 19.73 Apply adjust	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to the	Mar 0.86 ature in l 20.77 eating per 20.08 ains for r 0.83 ature in t 19.82 ature (for 20.31)	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of 20.02 r the who	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelling 20.07	Ju 0.34 collow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5 ature	Jul 0.25 steps 3 to 7 21 ng from Ta 20.09 (see Table 0.2 (follow steps 20.09 = fLA × T1 6 20.56 from Table 1.25 from Table 1.2	9a) 0.23 9a) 0.23 0.25	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 ffLA) × T2 66 20.55	0.79 20.9 20.08 0.75 9 9c) 19.98 LA = Liv	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06	0.99 20.22 20.08 0.98 19.06	0.52	(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.98	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to th 20.02	Mar 0.86 ature in l 20.77 eating per 20.08 ains for r 0.83 ature in t 19.82 ature (for 20.31 ne mean 20.31	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of 20.02 r the who	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelling 20.07	Ju 0.34 ollow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5	Jul 0.25 steps 3 to 7 21 ng from Ta 20.09 (see Table 0.2 (follow steps 20.09 = fLA × T1 6 20.56 from Table 1.25 from Table 1.2	9a) 0.23 9a) 0.23 0.25	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) × T2 6 20.55 where approximates	0.79 20.9 20.08 0.75 9 9c) 19.98 LA = Liv	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06	0.99 20.22 20.08 0.98 19.06	0.52	(87) (88) (89) (90) (91)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern (90)m= 19.15 Mean intern (92)m= 19.73 Apply adjust (93)m= 19.73 8. Space he	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to th 20.02 ating requ	Mar 0.86 ature in I 20.77 eating pore search of the se	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest c 20.02 r the who 20.5 internal 20.5	May 0.49 ea T1 (for 20.99 rest of 20.08 welling, 0.45 of dwelli 20.07 ole dwe 20.55 temper 20.55	Ju 0.34 collow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5 ature 20.5	Jul 0.25	Au 0.28 7 in Table 9 20.0 9a) 0.28 eps 3 20.0 + (1 - 20.5) 2 4e, v	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) × T2 6 20.55 where appro-	0.79 20.9 20.08 0.75 e 9c) 19.98 LA = Liv 20.45 priate 20.45	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06	0.99 20.22 20.08 0.98 19.06 19.66		(87) (88) (89) (90) (91) (92)
Jan	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to th 20.02 ating reques	Mar 0.86 ature in l 20.77 eating por 20.08 ains for r 0.83 ature in t 19.82 ature (for 20.31 ne mean 20.31 virement ernal ten	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of 20.02 r the who 20.5 internal 20.5	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelli 20.07 ole dwe 20.55 temper 20.55	Ju 0.34 collow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5 ature 20.5	Jul 0.25	Au 0.28 7 in Table 9 20.0 9a) 0.28 eps 3 20.0 + (1 - 20.5) 2 4e, v	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) × T2 6 20.55 where appro-	0.79 20.9 20.08 0.75 e 9c) 19.98 LA = Liv 20.45 priate 20.45	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06	0.99 20.22 20.08 0.98 19.06 19.66		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern (90)m= 19.15 Mean intern (92)m= 19.73 Apply adjust (93)m= 19.73 8. Space he Set Ti to the the utilisation	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to th 20.02 ating reques mean interperation factor for	Mar 0.86 ature in l 20.77 eating pr 20.08 ains for r 0.83 ature in t 19.82 ature (for 20.31 ne mean 20.31 uirement ernal ten or gains to	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of 20.02 r the who 20.5 internal 20.5	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelli 20.07 ole dwe 20.55 temper 20.55 e obtain ble 9a	Ju 0.34 ollow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5 ature 20.5	Jul 0.25	Au 0.28 7 in Ta able 9 20.0 9a) 0.23 20.0 + (1 - 20.5 4 4e, v 20.5	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) x T2 6 20.55 where approx 6 20.55	0.79 20.9 20.08 0.75 e 9c) 19.98 LA = Liv 20.45 priate 20.45	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06 20.06	0.99 20.22 20.08 0.98 19.06 19.66 19.66 d re-calc		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern (90)m= 19.15 Mean intern (92)m= 19.73 Apply adjust (93)m= 19.73 8. Space he Set Ti to the the utilisatio Jan	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to th 20.02 ating reques Feb	Mar 0.86 ature in I 20.77 eating per 20.08 ains for r 0.83 ature in t 19.82 ature (for 20.31 ne mean 20.31 uirement ernal ten or gains to Mar	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of 20.02 r the who 20.5 internal 20.5 Apr Apr	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelli 20.07 ole dwe 20.55 temper 20.55	Ju 0.34 collow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5 ature 20.5	Jul 0.25	Au 0.28 7 in Table 9 20.0 9a) 0.28 eps 3 20.0 + (1 - 20.5) 2 4e, v	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) x T2 6 20.55 where approx 6 20.55	0.79 20.9 20.08 0.75 e 9c) 19.98 LA = Liv 20.45 priate 20.45	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06 20.06	0.99 20.22 20.08 0.98 19.06 19.66		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.98 Mean intern (87)m= 20.28 Temperature (88)m= 20.07 Utilisation fa (89)m= 0.98 Mean intern (90)m= 19.15 Mean intern (92)m= 19.73 Apply adjust (93)m= 19.73 8. Space he Set Ti to the the utilisation	Feb 0.95 al tempera 20.52 e during h 20.08 actor for ga 0.93 al tempera 19.48 al tempera 20.02 tment to th 20.02 ating reques Feb	Mar 0.86 ature in I 20.77 eating per 20.08 ains for r 0.83 ature in t 19.82 ature (for 20.31 ne mean 20.31 uirement ernal ten or gains to Mar	Apr 0.69 iving are 20.94 eriods in 20.08 est of dw 0.64 he rest of 20.02 r the who 20.5 internal 20.5 Apr Apr	May 0.49 ea T1 (for 20.99 rest of 20.08 velling, 0.45 of dwelli 20.07 ole dwe 20.55 temper 20.55 e obtain ble 9a	Ju 0.34 ollow: 21 dwell 20.0 h2,m 0.29 ing T2 20.0 lling) 20.5 ature 20.5	Jul 0.25	Au 0.28 7 in Ta able 9 20.0 9a) 0.23 20.0 + (1 - 20.5 4 4e, v 20.5	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08 3 0.42 to 7 in Table 9 20.08 f -fLA) x T2 6 20.55 where approx 6 20.55 e 9b, so that	0.79 20.9 20.08 0.75 e 9c) 19.98 LA = Liv 20.45 priate 20.45	0.96 20.55 20.08 0.94 19.54 ring area ÷ (4) 20.06 20.06	0.99 20.22 20.08 0.98 19.06 19.66 19.66 d re-calc		(87) (88) (89) (90) (91) (92)



Useful gains, hmG	<u> </u>	r ` ` 	r	T	ı	Г	ī	Г	I			(0-)
` ′	39 1154.57		848.62	572.57	380.75	399.58	618.13	869.78	885.28	846.6		(95)
Monthly average e		i 	r	1	40.0	10.4		100	7.4			(96)
` '	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(90)
Heat loss rate for r (97)m= 1505.81 1473	1	1122.58	855.54	573.19	380.81	399.72	622.03	952.7	1255.88	1501.59		(97)
Space heating req		<u> </u>	<u> </u>	<u> </u>	<u> </u>					1301.33		(0.)
(98)m= 449.67 269.	-	34.4	5.14	0	0	0	0	61.69	266.83	487.31		
` '		<u> </u>	<u> </u>	!	<u> </u>	ITota	l per year	(kWh/year	r) = Sum(9	8) _{15.912} =	1715.77	(98)
Space heating req	uirement ir	n kWh/m²	²/year							, , , , , , , , , , , , , , , , , , ,	17.77	(99)
9a. Energy requiren				vstems i	ncludina	micro-C	CHP)			L		
Space heating:				,			,					
Fraction of space I	eat from s	econdar	y/supple	ementary	system						0	(201)
Fraction of space I	eat from r	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total he	ating from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =		Ì	1	(204)
Efficiency of main	space hea	ting syste	em 1								90.4	(206)
Efficiency of secon	dary/supp	lementar	y heatin	g systen	າ, %					Ī	0	(208)
Jan Fe	o Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating req	uirement (calculate	d above)								
449.67 269.	4 141.2	34.4	5.14	0	0	0	0	61.69	266.83	487.31		
(211) m = {[(98)m x	204)] } x	100 ÷ (20	06)									(211)
497.42 298.	6 156.19	38.05	5.69	0	0	0	0	68.24	295.16	539.06		_
						Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	į=	1897.98	(211)
Space heating fue	•	• •	month									
$= \{[(98)m \times (201)]\}$		1					I .		<u> </u>			
(215)m= 0 0	0	0	0	0	0	0 	0	0	0	0		7,,,,,
						Tota	ıı (Kvvn/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating	/	ام امدانید	h aa.\									
Output from water h		173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		
Efficiency of water h					<u> </u>						80.3	(216)
(217)m= 86.9 85.9		81.81	80.57	80.3	80.3	80.3	80.3	82.64	85.87	87.14		(217)
Fuel for water heati	ng, kWh/m	onth	Į.	!	Į.	Į.	!	Į.	!	<u> </u>		
(219)m = (64)m x		T							·			
(219)m= 243.43 216	232.54	212.61	209.02	184.71	176.96	197.27	199.45	220.44	224.21	236.96		_
						Tota	al = Sum(2			l	2554.5	(219)
Annual totals Space heating fuel	isad mair	evetom	1					k\	Wh/year		kWh/yeai	,
		i Systeiii	1								1897.98	╡
Water heating fuel u	sed										2554.5	
Electricity for pumps												
central heating pur		l electric	keep-ho	t								



boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =		75	(231)
Electricity for lighting				394.57	(232)
10a. Fuel costs - individual heating systems:					
	Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	66.05	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	88.9	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) sep Energy for lighting	arately as applicable and ap	oply fuel price acc	ording to x 0.01 =	Table 12a 52.04	(250)
Additional standing charges (Table 12)		·		120	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	0	(252)
Appendix Q items: repeat lines (253) and (254) a	s needed				」 ` ′
	77) + (250)(254) =			336.88	(255)
11a. SAP rating - individual heating systems					
Energy cost deflator (Table 12)				0.42	(256)
Energy cost factor (ECF) [(255) x (2	$[56)] \div [(4) + 45.0] =$			1	(257)
SAP rating (Section 12)				86.05	(258)
12a. CO2 emissions – Individual heating system	ns including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	409.96	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	551.77	(264)
Space and water heating	(261) + (262) + (263) + (264) =	:		961.74	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	204.78	(268)
Energy saving/generation technologies Total CO2, kg/year	SU	ım of (265)(271) =		1205.44	(272)
CO2 emissions per m²	(2	72) ÷ (4) =		12.49	(273)
El rating (section 14)				89	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Chase heating (main system 1)	(211) v	i -	_	1	Lance

(211) x

1.22

Space heating (main system 1)

2315.53

(261)



Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3116.49	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5432.03	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1211.32	(268)
Energy saving/generation technologies 'Total Primary Energy	sum	of (265)(271) =		6873.6	(272)
Primary energy kWh/m²/year	(272)) ÷ (4) =		71.2	(273)



User Details: **Assessor Name:** Peter Mitchell Stroma Number: STRO007945 Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.3.15 Property Address: Unit 6 (GFEND) LEAN New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LX Address: 1. Overall dwelling dimensions Volume(m³) Area(m²) Av. Height(m) Ground floor 96.54 (1a) x (2a) 231.7 (3a) 2.4 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)96.54 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =231.7 (5) total main secondary other m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a) 2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = (8) 0.09 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) (9)O Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)4 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.29 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.22 Infiltration rate modified for monthly wind speed Feb Sep Jan Mar Apr Mav Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$

1.1

1.08

0.95

0.95

0.92

1

1.08

1.12

1.18

1.23

1.27

(22a)m

1.25



Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.28	0.28	0.27	0.24	0.24	0.21	0.21	0.21	0.22	0.24	0.25	0.26		
Calculate effec		-	rate for t	he appli	cable ca	se	l.	l.	l			Г	
If mechanica			andiv NL (O	ah) (aa	.\ 	auatian (N	JEV otho	muiaa (22h	\ (220\			0	(23a)
If exhaust air he		0 11		, ,	, ,	. ,	,, .	,) = (23a)			0	(23b)
If balanced with		•	•	J		`		,	.	001 \ .	, (22)	0	(23c)
a) If balance		anical ve			i	ery (MVI	TR) (24a	$\frac{a}{1} = \frac{22}{0}$	2b)m + (23b) × [· ·	÷ 100] I	(24a)
(24a)m= 0	0		0	0	0						0		(24a)
b) If balance	o mecna 0			without	neat red	- 	- ´ ` -	´`	- ´ `			1	(24b)
(24b)m= 0	-	0	0			0	0	0	0	0	0		(240)
c) If whole ho if (22b)m					•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v					•				0.51				
if (22b)m (24d)m= 0.54	0.54	en (24a) _{0.54}	m = (22)		0.52	4a)m = 0.52	0.5 + [(2	2b)m² x 0.52	-	0.53	0.52	1	(24d)
` ′				0.53					0.53	0.53	0.53		(24u)
Effective air o	0.54	0.54	o.53) or (24) 0.53	0) or (24)	c) or (24 0.52	a) in box	0.52	0.53	0.53	0.53	1	(25)
(25)m= 0.54	0.54	0.54	0.55	0.55	0.52	0.52	0.52	0.52	0.55	0.55	0.55		(23)
3. Heat losses	and he	eat loss p	paramete	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		A X k kJ/K
Windows Type	1				7.39	x1.	/[1/(1.2)+	0.04] =	8.46				(27)
Windows Type	2				3.5	x1.	/[1/(1.2)+	0.04] =	4.01				(27)
Windows Type	3				8.26	x1.	/[1/(1.2)+	0.04] =	9.46				(27)
Windows Type	4				8.26	x1,	/[1/(1.2)+	0.04] =	9.46	=			(27)
Windows Type	5				5.28	x1.	/[1/(1.2)+	0.04] =	6.05				(27)
Walls	108.	14	32.69	9	75.45	x	0.16	= [12.07	=			(29)
Total area of el					108.1	=		'					(31)
Party wall					19.25	5 x	0	=	0			$\neg \vdash$	(32)
Party wall					15.26	x	0	=	0	=			(32)
* for windows and I					alue calcul		formula 1	/[(1/U-valu	ie)+0.04] a	ıs given in	paragraph	3.2	
** include the areas				is and pan	uuoris		(26)(30)) + (32) =				49.5	(33)
Heat capacity (•	0)				, , , , ,		(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass		•	P = Cm -	- TFA) ir	n k.J/m²K			***	tive Value	, , ,	(020)	250	(35)
For design assessi	•	`		,			ecisely the				able 1f	230	(00)
can be used instea											ı		
Thermal bridge					-	<						6.79	(36)
if details of thermal Total fabric hea		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			56.29	(37)
Ventilation hea	t loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 41.29	41.17	41.05	40.51	40.41	39.93	39.93	39.84	40.11	40.41	40.61	40.83		(38)
Heat transfer co	oefficier	nt, W/K					-	(39)m	= (37) + (37)	 38)m	-	•	
(39)m= 97.58	97.47	97.35	96.8	96.7	96.22	96.22	96.13	96.41	96.7	96.91	97.12	<u> </u>	

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Average = $Sum(39)_{1...12}/12=$

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Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.01	1.01	1.01	1	1	1	1	1	1	1	1	1.01		
								,	Average =	Sum(40) ₁ .	12 /12=	1	(40)
Number of day Jan	s in mo	nth (Tabl Mar		May	Jun	Jul	Λιια	Son	Oct	Nov	Dec		
(41)m= 31	28	31	Apr 30	31	30	31	Aug 31	Sep 30	31	30	31		(41)
(41)1112 31	20	31	30	31	30	31	31	30	J 31	30	31		(+1)
4. Water heat	ina ene	rav regui	rement:								kWh/ye	ar.	
4. Water fleat	ing ene	igy requi	rement.								KVVII/ye	ai.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		71		(42)
Annual averag Reduce the annua not more that 125	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.45		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								Сор		1.101			
(44)m= 108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
Energy content of	hat water	unad aak	audatad m	anthly 1	100 × Vd *	n v nm v [Tm / 2600			m(44) ₁₁₂ =	L	1181.35	(44)
Energy content of													
(45)m= 160.59	140.45	144.94	126.36	121.24	104.63	96.95	111.25	112.58	131.2 Total = Su	143.22 m(45) ₁₁₂ =	155.52	1548.94	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – ou	111(43)112 -	- L	1340.94	()
(46)m= 24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(46)
Water storage		مالد ما د مالد		-11	/\// IDC	-1							
Storage volum If community h	` '		•			•		arrie ves	Sei		0		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage			•					,	·				
a) If manufact	urer's d	eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)) =			0		(50)
b) If manufactHot water stora			-								0		(51)
If community h	•			_ (.,	-57					<u> </u>		(-1)
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 (, ,	,					((50)	==\			0		(55)
Water storage	loss cal	culated f	or each	month		T	((56)m = (55) × (41):	m 	1	1		
(56)m= 0 If cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendi	x H	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	3					-		0		(58)
Primary circuit	loss cal	culated f	or each	month (•	. ,	, ,						
(modified by		rom Tabl		here is s		i		cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)



Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (11)m					
(61)m= 50.96 46.03 50.96	47.58 47.16	43.69 45.1	-i	47.58 50.96	49.32	50.96		(61)
Total heat required for water he	eating calculated	for each mor	th (62) m = 0).85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.55 186.48 195.9	173.94 168.4	148.32 142.	1 158.41 1	160.16 182.16	192.53	206.48		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quar	ntity) (enter '0' if	no solar contribut	tion to wate	r heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, see	Appendix G)					
(63)m= 0 0 0	0 0	0 0	0	0 0	0	0		(63)
Output from water heater								
(64)m= 211.55 186.48 195.9	173.94 168.4	148.32 142.	I 158.41 1	160.16 182.16	192.53	206.48		_
			Output	t from water heate	r (annual)1	12	2126.43	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (45)m + (61)m]	+ 0.8 x [(46)m	+ (57)m	+ (59)m]	
(65)m= 66.14 58.21 60.93	53.91 52.1	45.71 43.5	2 48.78	49.33 56.36	59.95	64.45		(65)
include (57)m in calculation of	of (65)m only if o	ylinder is in th	e dwelling or	r hot water is f	rom com	munity h	eating	
5. Internal gains (see Table 5	and 5a):							
Metabolic gains (Table 5), Wat	ts							
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep Oct	Nov	Dec		
(66)m= 135.26 135.26 135.26	135.26 135.26	135.26 135.2	6 135.26 1	135.26 135.26	135.26	135.26		(66)
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or L9a)	, also see Ta	able 5	-			
(67)m= 22.34 19.84 16.14	12.22 9.13	7.71 8.33	10.83	14.54 18.46	21.54	22.96		(67)
Appliances gains (calculated in	Appendix L, eq	uation L13 or	_13a), also s	see Table 5				
(68)m= 250.61 253.21 246.66	232.71 215.09	198.54 187.4	9 184.89 1	191.44 205.39	223	239.55		(68)
Cooking gains (calculated in A	ppendix L, equa	tion L15 or L1	5a), also see	Table 5	•			
(69)m= 36.53 36.53 36.53	36.53 36.53	36.53 36.5	36.53	36.53 36.53	36.53	36.53		(69)
Pumps and fans gains (Table 5	5a)			•				
(70)m= 3 3 3	3 3	3 3	3	3 3	3	3		(70)
Losses e.g. evaporation (negation	tive values) (Tab	ole 5)		•				
(71)m= -108.2 -108.2 -108.2	-108.2 -108.2	-108.2 -108.	2 -108.2 -	-108.2 -108.2	-108.2	-108.2		(71)
Water heating gains (Table 5)	•			•				
(72)m= 88.89 86.62 81.9	74.87 70.03	63.49 58.5	65.57	68.51 75.76	83.26	86.63		(72)
Total internal gains =	•	(66)m + (6°	7)m + (68)m + (6	69)m + (70)m + (7	71)m + (72)ı	m		
(73)m= 428.42 426.25 411.27	386.37 360.84	336.32 320.8	9 327.86 3	341.06 366.18	394.38	415.72		(73)
6. Solar gains:								
Solar gains are calculated using solar	r flux from Table 6a	and associated e	quations to conv	vert to the applical	ole orientati	on.		
Orientation: Access Factor	Area	Flux		9_	FF		Gains	
Table 6d	m²	Table 6a	lat 	ble 6b T ————	able 6c		(W)	_
Northeast 0.9x 0.77 x	7.39	x 11.28	x (0.76 ×	0.7	=	30.74	(75)
Northeast 0.9x 0.77 x	8.26	X 11.28	x (0.76 ×	0.7	=	34.36	(75)
Northeast 0.9x 0.77 x	7.39	x 22.97	x (0.76 ×	0.7	=	62.57	(75)
Northeast _{0.9x} 0.77 x	8.26	x 22.97	x (0.76 ×	0.7	=	69.94	(75)
Northeast 0.9x 0.77 x	7.39	x 41.38	x (0.76 x	0.7	=	112.74	(75)



Northeast _{0.9x}	0.77	X	8.26	X	41.38	x	0.76	x	0.7	=	126.01	(75)
Northeast _{0.9x}	0.77	X	7.39	x	67.96	x	0.76	x	0.7	=	185.15	(75)
Northeast _{0.9x}	0.77	X	8.26	X	67.96	x	0.76	x	0.7	=	206.94	(75)
Northeast _{0.9x}	0.77	X	7.39	X	91.35	x	0.76	x	0.7	=	248.87	(75)
Northeast _{0.9x}	0.77	X	8.26	X	91.35	x	0.76	x	0.7	=	278.17	(75)
Northeast _{0.9x}	0.77	X	7.39	X	97.38	x	0.76	x	0.7	=	265.33	(75)
Northeast 0.9x	0.77	X	8.26	X	97.38	X	0.76	X	0.7] =	296.56	(75)
Northeast _{0.9x}	0.77	X	7.39	X	91.1	x	0.76	x	0.7] =	248.21	(75)
Northeast _{0.9x}	0.77	X	8.26	X	91.1	x	0.76	x	0.7	=	277.43	(75)
Northeast 0.9x	0.77	X	7.39	X	72.63	X	0.76	X	0.7	=	197.87	(75)
Northeast _{0.9x}	0.77	X	8.26	X	72.63	x	0.76	x	0.7	=	221.17	(75)
Northeast _{0.9x}	0.77	X	7.39	X	50.42	X	0.76	X	0.7	=	137.37	(75)
Northeast _{0.9x}	0.77	X	8.26	X	50.42	x	0.76	x	0.7	=	153.54	(75)
Northeast _{0.9x}	0.77	X	7.39	X	28.07	x	0.76	x	0.7	=	76.47	(75)
Northeast _{0.9x}	0.77	X	8.26	X	28.07	x	0.76	x	0.7	=	85.47	(75)
Northeast _{0.9x}	0.77	X	7.39	x	14.2	x	0.76	x	0.7	=	38.68	(75)
Northeast _{0.9x}	0.77	X	8.26	X	14.2	x	0.76	x	0.7	=	43.23	(75)
Northeast _{0.9x}	0.77	X	7.39	X	9.21	x	0.76	x	0.7	=	25.1	(75)
Northeast _{0.9x}	0.77	X	8.26	X	9.21	x	0.76	x	0.7] =	28.06	(75)
Southeast 0.9x	0.77	X	3.5	X	36.79	X	0.76	x	0.7] =	47.48	(77)
Southeast 0.9x	0.77	X	5.28	X	36.79	x	0.76	x	0.7	=	71.62	(77)
Southeast _{0.9x}	0.77	X	3.5	x	62.67	x	0.76	x	0.7	=	80.87	(77)
Southeast _{0.9x}	0.77	X	5.28	X	62.67	x	0.76	x	0.7	=	122	(77)
Southeast 0.9x	0.77	X	3.5	X	85.75	x	0.76	x	0.7	=	110.65	(77)
Southeast 0.9x	0.77	X	5.28	X	85.75	X	0.76	x	0.7] =	166.93	(77)
Southeast 0.9x	0.77	X	3.5	X	106.25	X	0.76	x	0.7] =	137.1	(77)
Southeast 0.9x	0.77	X	5.28	X	106.25	X	0.76	x	0.7] =	206.83	(77)
Southeast 0.9x	0.77	X	3.5	X	119.01	X	0.76	x	0.7] =	153.57	(77)
Southeast 0.9x	0.77	X	5.28	X	119.01	X	0.76	X	0.7	=	231.67	(77)
Southeast 0.9x	0.77	X	3.5	X	118.15	X	0.76	X	0.7	=	152.46	(77)
Southeast 0.9x	0.77	X	5.28	X	118.15	X	0.76	X	0.7	=	229.99	(77)
Southeast 0.9x	0.77	X	3.5	X	113.91	X	0.76	X	0.7	=	146.98	(77)
Southeast 0.9x	0.77	X	5.28	X	113.91	X	0.76	x	0.7] =	221.74	(77)
Southeast 0.9x	0.77	X	3.5	X	104.39	x	0.76	x	0.7	=	134.7	(77)
Southeast 0.9x	0.77	X	5.28	X	104.39	x	0.76	x	0.7	=	203.21	(77)
Southeast _{0.9x}	0.77	x	3.5	×	92.85	x	0.76	x	0.7	=	119.81	(77)
Southeast 0.9x	0.77	x	5.28	x	92.85	x	0.76	x	0.7	=	180.75	(77)
Southeast 0.9x	0.77	x	3.5	×	69.27	x	0.76	x	0.7	=	89.38	(77)
Southeast _{0.9x}	0.77	X	5.28	×	69.27	x	0.76	x	0.7	=	134.84	(77)
Southeast _{0.9x}	0.77	X	3.5	x	44.07	x	0.76	x	0.7	=	56.87	(77)
Southeast _{0.9x}	0.77	X	5.28	×	44.07	x	0.76	x	0.7	=	85.79	(77)
_				_		_						



Souther	ast _{0.9x}	0.77	Х	3	.5	X	3	1.49	x	0.76		x	0.7			40.63	(77)
Southea	ast _{0.9x}	0.77	х	5.	28	X	3	1.49	x	0.76		x	0.7			61.29	(77)
Southw	est _{0.9x}	0.77	х	8.	26	X	3	6.79		0.76		x	0.7			112.05	(79)
Southw	est _{0.9x}	0.77	Х	8.	26	X	6:	2.67		0.76		x	0.7			190.86	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	8	5.75		0.76		x	0.7			261.14	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	10	06.25		0.76		x	0.7			323.56	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	11	19.01		0.76		x	0.7			362.42	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	11	18.15		0.76		x	0.7			359.8	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	11	13.91		0.76		x	0.7			346.88	(79)
Southw	est _{0.9x}	0.77	Х	8.	26	X	10	04.39		0.76		x	0.7			317.9	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	9:	2.85		0.76		x	0.7			282.76	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	6	9.27		0.76		x	0.7			210.94	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	4	4.07	[0.76		x	0.7			134.21	(79)
Southw	est _{0.9x}	0.77	х	8.	26	X	3	1.49		0.76		x	0.7			95.89	(79)
Solar g	ains in	watts, ca	alculate	d for eac	h month	1			(83)m	= Sum(74)m	n(82	2)m			_		
(83)m=	296.25	526.24	777.46	1059.59			304.13	1241.24	1074	.85 874.23	59	97.1	358.77	250.98	3		(83)
		nternal a		`	` ´ 	Ť									_		(5.4)
(84)m=	724.67	952.49	1188.73	1445.96	1635.54	16	340.45	1562.13	1402	2.7 1215.2	9 96	3.28	753.15	666.7			(84)
7. Me	an inter	nal temp	erature	(heatin	g seasor	า)											
	erature	during h	eating	periods i	n the livi	ina a	area f	rom Tah	Jo O	Th4 (°C)						21	(85)
Temp	orataro	aamig n	loating			9	a.ou .	IUIII I au	л е э,	IIII (C)					L	Z 1	(00)
•		tor for g				•			ле э, ——	iii (C)					_ _		
•		_				า (se			Aı	<u> </u>	. (Oct	Nov	Dec		21	(00)
•	ation fac	tor for g	ains for	living ar	ea, h1,n	n (se	ee Ta	ble 9a)		ıg Sep	+	Oct	Nov 0.98	Dec	 ; 		(86)
Utilisa (86)m=	Jan 0.99	tor for g	ains for Mar	living ar Apr 0.75	ea, h1,n May 0.54	n (se	ee Ta Jun 0.37	ble 9a) Jul 0.27	Αι 0.3	ıg Sep 1 0.54	+		+			21	
Utilisa (86)m=	Jan 0.99	Feb	ains for Mar	living ar Apr 0.75	ea, h1,n May 0.54	n (se	ee Ta Jun 0.37	ble 9a) Jul 0.27	Αι 0.3	ug Sep 1 0.54 able 9c)	0		+		<u></u>	21	
Utilisa (86)m= Mean (87)m=	Jan 0.99 interna	Feb 0.97 I temper	ains for Mar 0.91 ature in	Apr 0.75 living at 20.91	ea, h1,n May 0.54 rea T1 (f	ollo	ee Ta Jun 0.37 w step 21	ble 9a) Jul 0.27 ps 3 to 7 21	0.3 ' in T	ug Sep 1 0.54 able 9c)	20).87	0.98	1	<u></u>	21	(86)
Utilisa (86)m= Mean (87)m=	Jan 0.99 interna	Feb 0.97 I temper	ains for Mar 0.91 ature in	Apr 0.75 living at 20.91	ea, h1,n May 0.54 rea T1 (f	n (se	ee Ta Jun 0.37 w step 21	ble 9a) Jul 0.27 ps 3 to 7 21	0.3 ' in T	ug Sep 1 0.54 able 9c) 20.99 , Th2 (°C)	20).87	0.98	1		21	(86)
Utilisa (86)m= Mean (87)m= Temp (88)m=	Jan 0.99 interna 20.09 erature 20.07	Feb 0.97 I temper 20.36 during h	ains for Mar 0.91 ature in 20.67 eating 20.08	Apr 0.75 living at 20.91 periods i 20.08	ea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08	ollor dw	Jun 0.37 w step 21 relling 20.09	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09	0.3 ' in T 21 ble 9	ug Sep 1 0.54 able 9c) 20.99 7, Th2 (°C)	20	0.83	0.98	20.03		21	(86)
Utilisa (86)m= Mean (87)m= Temp (88)m=	Jan 0.99 interna 20.09 erature 20.07	Feb 0.97 I temper 20.36 during h	ains for Mar 0.91 ature in 20.67 eating 20.08	Apr 0.75 living at 20.91 periods i 20.08	ea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08	ollor dw h2,	Jun 0.37 w step 21 relling 20.09	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09	0.3 ' in T 21 ble 9	Ig Sep 1 0.54 able 9c) 20.99 7, Th2 (°C) 19 20.08	20	0.83	0.98	20.03		21	(86)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 0.99 interna 20.09 erature 20.07 ation fac	retor for garage Feb 0.97 I temper 20.36 during h 20.08 etor for garage 0.97	ains for Mar 0.91 ature in 20.67 eating 20.08 ains for 0.89	Apr 0.75 living at 20.91 ceriods i 20.08 rest of c	ea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08 dwelling, 0.49	n (se	Jun 0.37 w step 21 relling 0.09 m (se 0.32	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09 re Table 0.21	Au 0.3 ' in T 21 ble 9 20.0 9a)	Ig Sep 1 0.54 able 9c) 20.99 7, Th2 (°C) 19 20.08	20	0.83	20.39	20.03		21	(86) (87) (88)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	Jan 0.99 interna 20.09 erature 20.07 ation fac 0.99 interna	retor for garage Feb 0.97 I temper 20.36 during h 20.08 ctor for garage 0.97 I temper 1	ains for Mar 0.91 ature in 20.67 eating 20.08 ains for 0.89 ature in	Apr 0.75 living at 20.91 periods i 20.08 rest of c 0.71 the rest	ea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08 dwelling, 0.49	ollo dw 2 h2,	yelling m (se 0.32 m (se 0.32	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09 re Table 0.21 bllow ste	Au 0.3 7 in T 21 8ble 9 20.0 9a) 0.2	Ig Sep 1 0.54 able 9c) 20.99 7, Th2 (°C) 9 20.08 5 0.47 to 7 in Tal	20 20 0 ble 9	0.83 0.08 0.83	20.39 20.08 0.98	20.03		21	(86) (87) (88) (89)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 0.99 interna 20.09 erature 20.07 ation fac	retor for garage Feb 0.97 I temper 20.36 during h 20.08 etor for garage 0.97	ains for Mar 0.91 ature in 20.67 eating 20.08 ains for 0.89	Apr 0.75 living at 20.91 ceriods i 20.08 rest of c	ea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08 dwelling, 0.49	ollo dw 2 h2,	Jun 0.37 w step 21 relling 0.09 m (se 0.32	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09 re Table 0.21	Au 0.3 ' in T 21 ble 9 20.0 9a)	Ig Sep 1 0.54 able 9c) 20.99 7, Th2 (°C) 9 20.08 5 0.47 to 7 in Tal	20 20 0 ble 9	0.87 0.83 0.08 0.08 0.08 0.08	20.39	20.03 20.08 0.99			(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	interna 20.09 erature 20.07 ation factors 0.99 interna 18.87	retor for garage Feb 0.97 I temper 20.36 during h 20.08 etor for garage 0.97 I temper 19.26	ains for Mar 0.91 ature in 20.67 eating 20.08 ains for 0.89 ature in 19.69	Apr 0.75 living at 20.91 ceriods i 20.08 rest of co 0.71 the rest 19.99	ea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08 dwelling, 0.49 c of dwell 20.07	ollo h2,	ee Ta Jun 0.37 w step 21 relling 0.09 m (se 0.32 T2 (fo	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09 re Table 0.21 bllow ste 20.09	Au 0.3 7 in T 21 8ble 9 20.0 9a) 0.2 8ps 3 20.0	Ig Sep 1 0.54 able 9c) 20.99 7, Th2 (°C) 9 20.08 5 0.47 to 7 in Tal 9 20.08	0 20 0 0 ble 9 19 fLA =	0.87 0.83 0.08 0.08 0.08 0.08	20.39 20.08 0.98	20.03 20.08 0.99		0.52	(86) (87) (88) (89)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	interna 20.09 erature 20.07 ation fac 0.99 interna 18.87	retor for garage Feb 0.97 I temper 20.36 during h 20.08 etor for garage 0.97 I temper 19.26	ains for Mar 0.91 ature in 20.67 eating 20.08 ains for 0.89 ature in 19.69	Apr 0.75 living at 20.91 ceriods i 20.08 rest of 0.71 the rest 19.99 or the wi	mea, h1,n May 0.54 rea T1 (f 20.99 n rest of 20.08 dwelling, 0.49 of dwell 20.07	ollo dw 2 h2,	ee Ta Jun 0.37 w ster 21 relling 0.09 m (se 0.32 T2 (fc 0.09 g) = fL	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.09 re Table 0.21 bllow ste 20.09 A × T1	Au 0.3 in T 21 ble 9 20.0 9a) 0.2 ps 3 20.0 + (1 -	Ig Sep 1 0.54 able 9c) 20.99 7, Th2 (°C) 19 20.08 5 0.47 to 7 in Tal 19 20.08	0 20 0 0 ble 9 15 fLA = 2	0.83 0.08 0.08 0.08 0.83 0.09 9.91 Livi	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4	20.03 20.08 0.99 18.79			(86) (87) (88) (89) (90) (91)
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Use five gains, mrGm W = (94)m x (84)m (96)m (96)m 1961 1968 1968 1964.57 844.29 1972.16 199.71 199.84 199.87 194.64 1810.29 734.3 662.46 (98)	95 ms
Monthly average external temperature from Table 8 (86)ms	Monthly average external temperature from Table 8 (96)m= 4.3
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Heat loss rate for mean intermal temperature, Lm , W = ((39)m × ((93)m - (96)m) (97)m	Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m =
Sprace heating requirements - Individual heating systems including micro-CHP	(97)me
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m Fig. 698.74 359.76 202.7 52.96 8.03 0 0 0 0 100.94 362.43 607.84 369.78 369.76 369.78 369.76 369.78 369.76 369.78 369.76 369.78 369.76 369.78 369.	Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 569.74 359.76 202.7 52.96 8.03 0 0 0 0 100.94 362.43 607.84 Total per year (kWh/year) = Sum(98)s 2 = 2264.4 (98) Space heating requirement in kWh/m²/year 23.46 (99) 9a. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system
Separal Separa	Space heating requirement in kWh/m²/year Space heating requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system O (201)
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Seg. 74 359.76 202.7 52.96 8.03 0 0 0 100.94 362.43 607.84	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
(211) m = {[[(98) m x (204)]] } x 100 ÷ (206)	$ (211) \mathbf{m} = \{ [(98) \mathbf{m} \times (204)] \} \times 100 \div (206) $ $ (211) \mathbf{m} = \{ [(98) \mathbf{m} \times (204)] \} \times 100 \div (206) $ $ (212) \mathbf{m} = \{ (211) \mathbf{m} = (211) \mathbf{m} \times (204) \} \times 100 \div (206) $ $ (213) \mathbf{m} = (211) \mathbf{m} \times (204) \} \times 100 \div (206) $ $ (214) \mathbf{m} = (211) \mathbf{m} \times (204) \} \times 100 \div (206) $ $ (215) \mathbf{m} \times (204) \times (204) \times (206) $ $ (216) \mathbf{m} \times (204) \times (206) \times (206) $ $ (217) \mathbf{m} \times (204) \times (206) \times (206) $ $ (218) \mathbf{m} \times (204) \times (206) \times (206) $ $ (219) \mathbf{m} \times (204) \times (206) \times (206) $ $ (219) \mathbf{m} \times (204) \times (206) \times (206) $ $ (219) \mathbf{m} \times (204) \times (206) \times (206) $ $ (219) \mathbf{m} \times (204) \times (206) \times (206) $ $ (219) \mathbf{m} \times (204) \times (206) \times (206) $ $ (219) \mathbf{m} \times (206) \times (206) \times (206) \times (206) $ $ (219) \mathbf{m} \times (206) \times (206) \times (206) $ $ (219) \mathbf{m} \times (206) \times (206) \times (206) \times ($
Space heating fuel (secondary), kWh/month	630.25 397.96 224.22 58.58 8.88 0 0 0 0 1111.66 400.92 672.38
Total (kWh/year) = Sum(211),	
Space heating fuel (secondary), kWh/month = {[[(98)m x (201)] } x 100 ÷ (208)	
= {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Total (kWh/year) = Sum(211) _{15,1012} = 2504.86 (211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space heating fuel (secondary), kWh/month
Total (kWh/year) = Sum(215) _{15,1012} 0 (215) Water heating Output from water heater (calculated above) 211.55 186.48 195.9 173.94 168.4 148.32 142.1 158.41 160.16 182.16 192.53 206.48 Efficiency of water heater 80.3 (216) (217)m= 87.42 86.68 85.14 82.45 80.71 80.3 80.3 80.3 83.63 86.62 87.61 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₂ = 2541.01 (219) Annual totals kWh/year Space heating fuel used, main system 1 Water heating fuel used 2541.01	$= \{[(98)m \times (201)]\} \times 100 \div (208)$
Water heating Output from water heater (calculated above) 211.55 186.48 195.9 173.94 168.4 148.32 142.1 158.41 160.16 182.16 192.53 206.48 Efficiency of water heater 80.3 (216) (217)m= 87.42 86.68 85.14 82.45 80.71 80.3 80.3 80.3 83.63 86.62 87.61 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₂ = EWh/year Annual totals kWh/year Space heating fuel used, main system 1 2541.01 (219) Water heating fuel used 2541.01	
Output from water heater (calculated above) 211.55 186.48 195.9 173.94 168.4 148.32 142.1 158.41 160.16 182.16 192.53 206.48 Efficiency of water heater (217)m= 87.42 86.68 85.14 82.45 80.71 80.3 80.3 80.3 80.3 80.3 80.3 80.62 87.61 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₁₂ = 2541.01 (219) Annual totals Space heating fuel used, main system 1 Water heating fuel used Water heating fuel used	Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)
211.55	
Efficiency of water heater 80.3 (216) (217)m= 87.42 86.68 85.14 82.45 80.71 80.3 80.3 80.3 80.3 80.3 83.63 86.62 87.61 (217) Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₁₂ = 2541.01 (219) Annual totals Space heating fuel used, main system 1 Water heating fuel used	
(217)m= 87.42 86.68 85.14 82.45 80.71 80.3 80.3 80.3 80.3 83.63 86.62 87.61 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₂ = 2541.01 (219) Annual totals Space heating fuel used, main system 1 Water heating fuel used Water heating fuel used	
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₁₂ = 2541.01 (219) Annual totals Space heating fuel used, main system 1 Water heating fuel used	
(219)m = (64)m x 100 ÷ (217)m (219)m = 241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7 Total = Sum(219a) ₁₁₂ = 2541.01 (219) Annual totals Space heating fuel used, main system 1 2504.86 2541.01	
241.99 215.14 230.09 210.96 208.65 184.71 176.96 197.27 199.45 217.81 222.27 235.7	9.
Annual totals Space heating fuel used, main system 1 Water heating fuel used kWh/year 2504.86 2541.01	
Annual totals Space heating fuel used, main system 1 Water heating fuel used kWh/year 2504.86 2541.01	Total = Sum(219a) ₁₁₂ = 2541.01 (219)
Space heating fuel used, main system 1 Water heating fuel used 2504.86 2541.01	
Electricity for pumps, fans and electric keep-hot	Water heating fuel used 2541.01
	Electricity for pumps, fans and electric keep-hot
central heating nump:	central heating pump: 30 (230c)



boiler with a fan-assisted flue

Total electricity for the above, kWh/year

Electricity for lighting

45

(230e)

75

(231)

394.57

(232)

Electricity for lighting			394.57 (232)							
12a. CO2 emissions – Individual heating systems including micro-CHP										
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year							
Space heating (main system 1)	(211) x	0.216	541.05 (261)							
Space heating (secondary)	(215) x	0.519 =	0 (263)							
Water heating	(219) x	0.216	548.86 (264)							
Space and water heating	(261) + (262) + (263) + (264) =		1089.91 (265)							
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)							
Electricity for lighting	(232) x	0.519 =	204.78 (268)							
Energy saving/generation technologies Total CO2, kg/year	sum	o of (265)(271) =	1333.61 (272)							
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	13.81 (273)							
El rating (section 14)			87 (274)							



User Details: **Assessor Name:** Peter Mitchell Stroma Number: STRO007945 Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.3.15 Property Address: Unit 6 (GFEND) LEAN New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LX Address: 1. Overall dwelling dimensions Volume(m³) Area(m²) Av. Height(m) Ground floor 96.54 (1a) x (2a) 231.7 (3a) 2.4 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)96.54 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =231.7 (5) total main secondary other m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a) 3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = (8) 0.13 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) (9)O Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.38 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.29 Infiltration rate modified for monthly wind speed Feb Sep Jan Mar Apr Mav Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$

1.1

1.08

0.95

0.95

0.92

1

1.08

1.12

1.18

1.23

1.27

(22a)m

1.25



Adjusted infiltra	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.37	0.37	0.36	0.32	0.32	0.28	0.28	0.27	0.29	0.32	0.33	0.35		
Calculate effec		•	rate for t	he appli	cable ca	se		l	l			Г	
If mechanica			andiv NL (O	ah) (aa	s) Em. /	aguatian (l	VIEVV otho	muiaa (22h	\ (220\			0	(23a)
If exhaust air he		0 11		, ,	, ,	. ,	,, .	,) = (23a)			0	(23b)
		•	•	J		`		,	21.) (001.) [(00)	0	(23c)
a) If balance	o mecn	anicai ve	ntilation	with nea	at recove	ery (MV)	TR) (248	$\frac{1}{1} = \frac{2}{2}$	2b)m + (. 0	23b) x [*	1 – (23c) 0	† 100j 	(24a)
b) If balance		, i									U		(244)
(24b)m= 0		o 0	nillation 0	without 0	0	overy (r	0	0	0	230)	0]	(24b)
					<u> </u>						0		(210)
c) If whole h if (22b)n					•				.5 × (23b))			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	<u> </u>			l	
if (22b)n				•	•				0.5]			_	
(24d)m= 0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
3. Heat losse	s and he	eat loss r	paramet	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	AXk
	area	(m^2)	'n		A ,r	m²	W/m2	!K	(W/I	<)	kJ/m²-l	K	kJ/K
Windows Type	1				5.46	χ1.	/[1/(1.4)+	0.04] =	7.24				(27)
Windows Type	2				2.58	x1.	/[1/(1.4)+	0.04] =	3.42				(27)
Windows Type	3				6.1	x1.	/[1/(1.4)+	0.04] =	8.09				(27)
Windows Type	4				6.1	x1	/[1/(1.4)+	0.04] =	8.09				(27)
Windows Type	5				3.9	x1.	/[1/(1.4)+	0.04] =	5.17				(27)
Walls	108.	14	24.1	4	84	X	0.18	=	15.12			$\neg \vdash$	(29)
Total area of e	lements	, m²			108.1	4							(31)
Party wall					19.25	5 x	0	=	0				(32)
Party wall					15.26	3 x	0	=	0	=		i i	(32)
* for windows and	roof wind	ows, use e	ffective wi	ndow U-va				L /[(1/U-valu		⊥ ∟ ns given in	paragraph	 1 3.2	
** include the area	as on both	sides of in	iternal wal	ls and pan	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				47.12	(33)
Heat capacity		,						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	•	`		,					tive Value			250	(35)
For design assess can be used instead				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge				usina Ac	pendix I	K						3.52	(36)
if details of therma					-							0.02	(33)
Total fabric he	at loss							(33) +	(36) =			50.65	(37)
Ventilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 43.61	43.4	43.19	42.23	42.05	41.21	41.21	41.06	41.54	42.05	42.41	42.8		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 94.25	94.04	93.84	92.88	92.7	91.86	91.86	91.7	92.18	92.7	93.06	93.44		

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Average = $Sum(39)_{1...12}/12=$

92.8β_{age 2 0}(39)



leat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
10)m=	0.98	0.97	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.96	0.96	0.97		
م ما ممد دا	£ . l			la 4a\					,	Average =	Sum(40) ₁	12 /12=	0.96	(40
lumbe	Jan	Feb	nth (Tab Mar	· ·	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m=	31	28	31	Apr 30	Way 31	30	31	Aug 31	30 30	31	30	31		(41
*1)111=	31	20								J 1] 30	31		(
4 Wa	ter heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
		_												
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		71		(42
Reduce	the annua	al average	hot water	usage by		lwelling is	designed t	(25 x N) to achieve		se target o		.45		(43
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot wate					Vd,m = fa				ОСР		1407	D00		
14)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
							_				m(44) ₁₁₂ =		1181.35	(44
nergy o					· ·) kWh/mor	· ·	ables 1b, 1	· ,		
l5)m=	160.59	140.45	144.94	126.36	121.24	104.63	96.95	111.25	112.58	131.2	143.22	155.52		٦,,
instan	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1548.94	(4
16)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(4
Vater	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
	•	_			elling, e			, ,		(0) ! (· 4 ¬ \			
	rise it no storage		not wate	er (this ir	iciuaes i	nstantar	ieous co	mbi boil	ers) ente	er o in ((47)			
	_		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(4
empe	rature fa	actor fro	m Table	2b		•	• •					0		(4
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(5
•				-	oss fact									
		•			e 2 (kW	h/litre/da	ıy)					0		(5
	-	from Ta	ee secti ble 2a	011 4.3								0		(5:
			m Table	2b								0		(5:
•			storage		ear			(47) x (51)) x (52) x (53) =		0		` (5
		(54) in (5	-	,				, , , ,		,		0		(5
/ater	storage	loss cal	culated f	for each	month			((56)m = (55) × (41):	m				
56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(5
	-							-		_		m Append	ix H	•
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(5
	v circuit	lose (an	nual) fro	m Table	3	!	!		!	!		0		(5
		•				59)m = ((58) ÷ 36	65 × (41)	m			-		(3
					,	•	. ,	ng and a		r thermo	stat)			
9)m=	0	0	0	0	0	0	0	0	0	0	0	0		(5



Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$									
(61)m= 50.96 46.03 50.96	47.58 47.16	43.69 45.15	47.16 47.58	50.96 49.32	50.96		(61)		
Total heat required for water he	<u> </u>	<u> </u>	ļ ļ	<u> </u>		(50)m ± (61)m	(-1)		
(62)m= 211.55 186.48 195.9	173.94 168.4	148.32 142.1	158.41 160.16	182.16 192.53	206.48	(39)111 + (61)111	(62)		
Solar DHW input calculated using Appe							(02)		
(add additional lines if FGHRS				i contribution to water	or ricating)				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0	0 0	0 0	0 0	0		(63)		
Output from water heater	I	l I	l	l					
(64)m= 211.55 186.48 195.9	173.94 168.4	148.32 142.1	158.41 160.16	182.16 192.53	206.48				
· · · <u> </u>	I	l l	Output from w	L Later heater (annual)₁	112	2126.43	(64)		
Heat gains from water heating,	kWh/month 0.25	5 ´ [0.85 × (45)m	ı + (61)m] + 0.8 x	x [(46)m + (57)m	+ (59)m	1	-		
(65)m= 66.14 58.21 60.93	53.91 52.1	45.71 43.52	48.78 49.33	56.36 59.95	64.45	•	(65)		
include (57)m in calculation of	of (65)m only if c	vlinder is in the	dwelling or hot w	rater is from com	ımunitv he	eating			
5. Internal gains (see Table 5	· · ·	,	3			J			
Metabolic gains (Table 5), Watt	,								
Jan Feb Mar	Apr May	Jun Jul	Aug Sep	Oct Nov	Dec				
(66)m= 135.26 135.26 135.26	135.26 135.26	135.26 135.26	135.26 135.26	135.26 135.26	135.26		(66)		
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or L9a), a	llso see Table 5						
(67)m= 22.34 19.84 16.14	12.22 9.13	7.71 8.33	10.83 14.54	18.46 21.54	22.96		(67)		
Appliances gains (calculated in	Appendix L, eq	uation L13 or L1	3a), also see Ta	ble 5					
(68)m= 250.61 253.21 246.66	232.71 215.09	198.54 187.49	184.89 191.44	205.39 223	239.55		(68)		
Cooking gains (calculated in Ap	ppendix L, equat	tion L15 or L15a), also see Table	5					
(69)m= 36.53 36.53 36.53	36.53 36.53	36.53 36.53	36.53 36.53	36.53 36.53	36.53		(69)		
Pumps and fans gains (Table 5	ia)	•	•						
(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)		
Losses e.g. evaporation (negat	ive values) (Tab	le 5)	•	· · · · · ·					
(71)m= -108.2 -108.2 -108.2	-108.2 -108.2	-108.2 -108.2	-108.2 -108.2	-108.2 -108.2	-108.2		(71)		
Water heating gains (Table 5)									
(72)m= 88.89 86.62 81.9	74.87 70.03	63.49 58.5	65.57 68.51	75.76 83.26	86.63		(72)		
Total internal gains =	•	(66)m + (67)m	n + (68)m + (69)m +	(70)m + (71)m + (72))m				
(73)m= 428.42 426.25 411.27	386.37 360.84	336.32 320.89	327.86 341.06	366.18 394.38	415.72		(73)		
6. Solar gains:									
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.									
Orientation: Access Factor	Area	Flux	g_ 	FF		Gains			
Table 6d	m²	Table 6a	Table 6b	Table 6c		(W)	-		
Northeast 0.9x 0.77 x	5.46	x 11.28	x 0.63	x 0.7	= [18.83	(75)		
Northeast 0.9x 0.77 x	6.1	x 11.28	x 0.63	× 0.7	= [21.03	(75)		
Northeast 0.9x 0.77 x	5.46	x 22.97	× 0.63	X 0.7	= [38.32	(75)		
Northeast 0.9x 0.77 x	6.1	x 22.97	× 0.63	x 0.7	= [42.82	(75)		
Northeast 0.9x 0.77 x	5.46	x 41.38	x 0.63	X 0.7	= [69.05	(75)		



Northeast 0 av													
Northeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	41.38	X	0.63	X	0.7	=	77.14	(75)
Northeast 0.8	Northeast _{0.9x}	0.77	X	5.46	x	67.96	x	0.63	x	0.7] =	113.39	(75)
Northeast 0.9k	Northeast _{0.9x}	0.77	X	6.1	X	67.96	X	0.63	x	0.7] =	126.69	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	5.46	X	91.35	X	0.63	x	0.7] =	152.42	(75)
Northeast 0,9x	Northeast _{0.9x}	0.77	X	6.1	X	91.35	x	0.63	x	0.7	=	170.29	(75)
Northeast 0,9x	Northeast _{0.9x}	0.77	X	5.46	X	97.38	x	0.63	x	0.7	=	162.5	(75)
Northeast 0,9%	Northeast 0.9x	0.77	X	6.1	X	97.38	X	0.63	x	0.7] =	181.55	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	5.46	X	91.1	x	0.63	x	0.7] =	152.02	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	91.1	X	0.63	X	0.7	=	169.83	(75)
Northeast 0.9x	Northeast 0.9x	0.77	X	5.46	X	72.63	X	0.63	X	0.7	=	121.19	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	72.63	X	0.63	X	0.7	=	135.39	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	5.46	X	50.42	X	0.63	X	0.7	=	84.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	50.42	X	0.63	X	0.7	=	94	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	5.46	X	28.07	X	0.63	X	0.7	=	46.83	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	28.07	X	0.63	X	0.7	=	52.32	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	5.46	X	14.2	X	0.63	x	0.7] =	23.69	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	14.2	X	0.63	X	0.7	=	26.47	(75)
Southeast 0.9x	Northeast _{0.9x}	0.77	X	5.46	X	9.21	X	0.63	X	0.7	=	15.38	(75)
Southeast 0.9x	Northeast _{0.9x}	0.77	X	6.1	X	9.21	X	0.63	X	0.7	=	17.18	(75)
Southeast 0.9x	Southeast _{0.9x}	0.77	X	2.58	X	36.79	X	0.63	X	0.7	=	29.01	(77)
Southeast 0.9x	Southeast _{0.9x}	0.77	X	3.9	X	36.79	X	0.63	X	0.7	=	43.85	(77)
Southeast 0.9x	Southeast 0.9x	0.77	X	2.58	X	62.67	X	0.63	X	0.7	=	49.42	(77)
Southeast 0.9x 0.77 x 3.9 x 85.75 x 0.63 x 0.7 = 102.21 (77) Southeast 0.9x 0.77 x 2.58 x 106.25 x 0.63 x 0.7 = 83.78 (77) Southeast 0.9x 0.77 x 2.58 x 119.01 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 2.58 x 119.01 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 141.85 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7	Southeast _{0.9x}	0.77	X	3.9	X	62.67	x	0.63	X	0.7	=	74.7	(77)
Southeast 0.9x 0.77 x 2.58 x 106.25 x 0.63 x 0.7 = 83.78 (77) Southeast 0.9x 0.77 x 3.9 x 106.25 x 0.63 x 0.7 = 126.64 (77) Southeast 0.9x 0.77 x 2.58 x 119.01 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 2.58 x 119.01 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 93.16 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 140.82 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7	Southeast _{0.9x}	0.77	X	2.58	X	85.75	X	0.63	x	0.7	=	67.61	(77)
Southeast 0.9x 0.77 x 3.9 x 106.25 x 0.63 x 0.7 = 126.64 (77) Southeast 0.9x 0.77 x 2.58 x 119.01 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 3.9 x 119.01 x 0.63 x 0.7 = 141.85 (77) Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 93.16 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 140.82 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7	Southeast _{0.9x}	0.77	X	3.9	X	85.75	x	0.63	x	0.7	=	102.21	(77)
Southeast 0.9x 0.77 x 2.58 x 119.01 x 0.63 x 0.7 = 93.84 (77) Southeast 0.9x 0.77 x 3.9 x 119.01 x 0.63 x 0.7 = 141.85 (77) Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 93.16 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 140.82 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7	<u> </u>	0.77	X	2.58	X	106.25	X	0.63	x	0.7] =	83.78	(77)
Southeast 0.9x 0.77 x 3.9 x 119.01 x 0.63 x 0.7 = 141.85 (77) Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 93.16 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7	Southeast _{0.9x}	0.77	X	3.9	X	106.25	X	0.63	X	0.7	=	126.64	(77)
Southeast 0.9x 0.77 x 2.58 x 118.15 x 0.63 x 0.7 = 93.16 (77) Southeast 0.9x 0.77 x 3.9 x 118.15 x 0.63 x 0.7 = 140.82 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 3.9 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 124.42 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7	Southeast _{0.9x}	0.77	X	2.58	X	119.01	x	0.63	X	0.7	=	93.84	(77)
Southeast 0.9x 0.77 x 3.9 x 118.15 x 0.63 x 0.7 = 140.82 (77) Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 3.9 x 113.91 x 0.63 x 0.7 = 135.77 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 124.42 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7	<u> </u>	0.77	X	3.9	X	119.01	X	0.63	X	0.7] =	141.85	(77)
Southeast 0.9x 0.77 x 2.58 x 113.91 x 0.63 x 0.7 = 89.82 (77) Southeast 0.9x 0.77 x 3.9 x 113.91 x 0.63 x 0.7 = 135.77 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 3.9 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 124.42 (77) Southeast 0.9x 0.77 x 3.9 x 92.85 x 0.63 x 0.7 = 110.67 (77) Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7	<u> </u>	0.77	X	2.58	X	118.15	X	0.63	X	0.7	=	93.16	(77)
Southeast 0.9x 0.77 x 3.9 x 113.91 x 0.63 x 0.7 = 135.77 (77) Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 3.9 x 104.39 x 0.63 x 0.7 = 124.42 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 110.67 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7	<u> </u>	0.77	X	3.9	X	118.15	X	0.63	X	0.7] =	140.82	(77)
Southeast 0.9x 0.77 x 2.58 x 104.39 x 0.63 x 0.7 = 82.31 (77) Southeast 0.9x 0.77 x 3.9 x 104.39 x 0.63 x 0.7 = 124.42 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 73.21 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7 = 82.56 (77) Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7 = 34.75 (77)	Southeast _{0.9x}	0.77	X	2.58	X	113.91	X	0.63	X	0.7] =	89.82	(77)
Southeast 0.9x 0.77 x 3.9 x 104.39 x 0.63 x 0.7 = 124.42 (77) Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 73.21 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7 = 82.56 (77)	Southeast 0.9x	0.77	X	3.9	X	113.91	X	0.63	X	0.7	=	135.77	(77)
Southeast 0.9x 0.77 x 2.58 x 92.85 x 0.63 x 0.7 = 73.21 (77) Southeast 0.9x 0.77 x 3.9 x 92.85 x 0.63 x 0.7 = 110.67 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7 = 82.56 (77) Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7 = 34.75 (77)	Southeast _{0.9x}	0.77	X	2.58	X	104.39	X	0.63	X	0.7] =	82.31	(77)
Southeast 0.9x 0.77 x 3.9 x 92.85 x 0.63 x 0.7 = 110.67 (77) Southeast 0.9x 0.77 x 2.58 x 69.27 x 0.63 x 0.7 = 54.62 (77) Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7 = 82.56 (77) Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7 = 34.75 (77)	Southeast _{0.9x}	0.77	x	3.9	×	104.39	x	0.63	x	0.7] =	124.42	(77)
Southeast 0.9x	<u>L</u>	0.77	X	2.58	x	92.85	x	0.63	x	0.7	=	73.21	(77)
Southeast 0.9x 0.77 x 3.9 x 69.27 x 0.63 x 0.7 = 82.56 (77) Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7 = 34.75 (77)	<u> </u>	0.77	X	3.9	×	92.85	x	0.63	x	0.7] =	110.67	(77)
Southeast 0.9x 0.77 x 2.58 x 44.07 x 0.63 x 0.7 = 34.75 (77)	<u> </u>	0.77	X	2.58	X	69.27	X	0.63	x	0.7] =	54.62	(77)
	<u> </u>	0.77	X	3.9	X	69.27	x	0.63	x	0.7] =	82.56	(77)
Southeast $0.9x$ 0.77 x 3.9 x 44.07 x 0.63 x 0.7 = 52.53 (77)	<u>L</u>	0.77	X	2.58	x	44.07	X	0.63	x	0.7] =	34.75	(77)
	Southeast 0.9x	0.77	X	3.9	x	44.07	×	0.63	X	0.7	=	52.53	(77)



Southeast 0.9x	0.77	X	2.5	8	X	3	1.49	X	0.63	X	0.7	=	24.83	(77)
Southeast 0.9x	0.77	×	3.9	9	X	3	1.49	X	0.63	X	0.7	=	37.53	(77)
Southwest _{0.9x}	0.77	X	6.1	1	X	36	6.79		0.63	X	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	6.1	1	X	62	2.67		0.63	X	0.7	=	116.84	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	8	5.75		0.63	X	0.7	=	159.86	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	10	06.25		0.63	X	0.7	=	198.08	(79)
Southwest _{0.9x}	0.77	X	6.1	1	X	11	9.01		0.63	X	0.7	=	221.86	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	11	8.15		0.63	X	0.7	=	220.26	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	11	3.91		0.63	X	0.7	=	212.35	(79)
Southwest _{0.9x}	0.77	X	6.1	1	X	10)4.39		0.63	X	0.7	=	194.61	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	92	2.85		0.63	X	0.7	=	173.1	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	69	9.27		0.63	X	0.7	=	129.13	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	44	4.07		0.63	X	0.7	=	82.16	(79)
Southwest _{0.9x}	0.77	X	6.1	1	x	3	1.49		0.63	X	0.7	=	58.7	(79)
Solar gains in	watts, ca	lculated	for each	n month	1			(83)m	= Sum(74)m	(82)m	•	•	_	
(83)m= 181.32	322.09	475.87	648.58	780.26	1	98.29	759.79	657.	92 535.11	365.4	7 219.59	153.61		(83)
Total gains – i	г т		` 	. ,	·							г	7	
(84)m= 609.74	748.34	887.14	1034.95	1141.1	11	34.61	1080.68	985.	78 876.17	731.6	5 613.97	569.33		(84)
7. Mean inter	nal tempe	erature ((heating	seasor	n)									
Temperature	during he	eating pe	eriods in	the livi	ng a	area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
									` ,					
Utilisation fac	tor for ga	ins for li	ving are	a, h1,m	n (se	ee Tal	ble 9a)							
Utilisation fac	tor for ga	ains for li Mar	ving are	ea, h1,m May	ΤÌ	ee Tal Jun	ble 9a) Jul	Αι		Oc	Nov	Dec]	
	r Ť	T			Ĺ	. 1		Αι 0.4	ıg Sep	Oct		Dec 1]	(86)
Jan	Feb 0.99	Mar 0.97	Apr 0.89	May 0.71	(Jun 0.51	Jul 0.37	0.4	ug Sep 3 0.69	 				(86)
(86)m= Jan	Feb 0.99	Mar 0.97	Apr 0.89	May 0.71	ollo	Jun 0.51	Jul 0.37	0.4	ug Sep 3 0.69 able 9c)	 	0.99]	(86)
(86)m= 1 Mean interna (87)m= 20.03	Feb 0.99 l tempera 20.22	Mar 0.97 ature in li 20.5	Apr 0.89 iving are 20.79	May 0.71 ea T1 (fo 20.95	ollo 2	Jun 0.51 w ster	Jul 0.37 os 3 to 7 21	0.4 ' in T 21	ug Sep 3 0.69 able 9c) 20.97	0.94	0.99	1		` ,
(86)m= 1 Mean interna	Feb 0.99 l tempera 20.22	Mar 0.97 ature in li 20.5	Apr 0.89 iving are 20.79	May 0.71 ea T1 (fo 20.95	ollo 2 dw	Jun 0.51 w ster	Jul 0.37 os 3 to 7 21	0.4 ' in T 21	ug Sep 3 0.69 able 9c) 20.97 , Th2 (°C)	0.94	0.99	1]	` ,
Jan	Feb 0.99 I tempera 20.22 during he 20.1	Mar 0.97 ature in li 20.5 eating pe	Apr 0.89 iving are 20.79 eriods in	May 0.71 ea T1 (for 20.95 or rest of 20.12	ollo 2 dw	Jun 0.51 w step 0.99 relling 0.12	Jul 0.37 os 3 to 7 21 from Ta 20.12	0.4 7 in T 21 able 9	ug Sep 3 0.69 able 9c) 20.97 , Th2 (°C)	20.72	0.99	19.99		(87)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation fac	Feb 0.99 I tempera 20.22 during he 20.1	Mar 0.97 ature in li 20.5 eating pe	Apr 0.89 iving are 20.79 eriods in	May 0.71 ea T1 (for 20.95 or rest of 20.12	ollo 2 dw 2 h2,	Jun 0.51 w step 0.99 relling 0.12	Jul 0.37 os 3 to 7 21 from Ta 20.12	0.4 7 in T 21 able 9	ug Sep 3 0.69 able 9c) 20.97 7, Th2 (°C) 13 20.12	20.72	0.99	19.99		(87)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation factors (89)m= 1	Feb 0.99 I tempera 20.22 during he 20.1 etor for ga 0.99	Mar 0.97 ature in li 20.5 eating pe 20.11 ains for re 0.96	Apr 0.89 iving are 20.79 eriods in 20.12 est of do 0.86	May 0.71 ea T1 (for 20.95 or rest of 20.12 welling, 0.66	ollo dw 2 h2,	Jun (5e 0.45	Jul 0.37 os 3 to 7 21 from Ta 20.12 e Table 0.3	0.4 ' in T 21 ble 9 20. ' 9a) 0.3	able 9c) 20.97 7, Th2 (°C) 20.12	0.94 20.72 20.12	0.99	19.99		(87)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean interna	Feb 0.99 I tempera 20.22 during he 20.1 ctor for ga 0.99 I tempera	Mar 0.97 ature in li 20.5 eating pe 20.11 ains for re 0.96 ature in t	Apr 0.89 iving are 20.79 eriods in 20.12 est of dv 0.86 he rest of	May 0.71 ea T1 (for 20.95 n rest of 20.12 welling, 0.66 of dwell	ollo 2 dw 2 h2,	Jun (50.99 relling 20.12 m (se 0.45 T2 (fc	Jul 0.37 DS 3 to 7 21 from Ta 20.12 e Table 0.3 Dllow ste	0.4 7 in T 21 able 9 20.7 9a) 0.3	ug Sep 3 0.69 able 9c) 20.97 7, Th2 (°C) 13 20.12 5 0.62 to 7 in Tab	0.94 20.72 20.12 0.92 le 9c)	0.99 2 20.31 2 20.11 0.99	1 19.99 20.11		(87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation factors (89)m= 1	Feb 0.99 I tempera 20.22 during he 20.1 etor for ga 0.99	Mar 0.97 ature in li 20.5 eating pe 20.11 ains for re 0.96	Apr 0.89 iving are 20.79 eriods in 20.12 est of do 0.86	May 0.71 ea T1 (for 20.95 or rest of 20.12 welling, 0.66	ollo 2 dw 2 h2,	Jun (5e 0.45	Jul 0.37 os 3 to 7 21 from Ta 20.12 e Table 0.3	0.4 ' in T 21 ble 9 20. ' 9a) 0.3	ag Sep 3 0.69 able 9c) 20.97 7, Th2 (°C) 13 20.12 5 0.62 to 7 in Tab	0.94 20.72 20.12 0.92 le 9c) 19.81	0.99 2 20.31 2 20.11 0.99	1 19.99 20.11 1 18.76		(87) (88) (89) (90)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean interna	Feb 0.99 I tempera 20.22 during he 20.1 ctor for ga 0.99 I tempera	Mar 0.97 ature in li 20.5 eating pe 20.11 ains for re 0.96 ature in t	Apr 0.89 iving are 20.79 eriods in 20.12 est of dv 0.86 he rest of	May 0.71 ea T1 (for 20.95 n rest of 20.12 welling, 0.66 of dwell	ollo 2 dw 2 h2,	Jun (50.99 relling 20.12 m (se 0.45 T2 (fc	Jul 0.37 DS 3 to 7 21 from Ta 20.12 e Table 0.3 Dllow ste	0.4 7 in T 21 able 9 20.7 9a) 0.3	ag Sep 3 0.69 able 9c) 20.97 7, Th2 (°C) 13 20.12 5 0.62 to 7 in Tab	0.94 20.72 20.12 0.92 le 9c) 19.81	0.99 2 20.31 2 20.11 0.99	1 19.99 20.11 1 18.76	0.52	(87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation fac (89)m= 1 Mean interna (90)m= 18.81 Mean interna	Feb 0.99 I tempera 20.22 during he 20.1 ctor for ga 0.99 I tempera 19.09	Mar 0.97 ature in li 20.5 eating pe 20.11 ains for re 0.96 ature in t 19.48	Apr 0.89 iving are 20.79 eriods in 20.12 est of dv 0.86 he rest of 19.89	May 0.71 ea T1 (for 20.95) n rest of 20.12 welling, 0.66 of dwell 20.07	dw 2 h2, (Jun 0.51 w step 0.99 relling 0.12 m (se 0.45 T2 (fc 0.12	Jul 0.37 ps 3 to 7 21 from Ta 20.12 e Table 0.3 pllow ste 20.12 A × T1	0.4 7 in T 21 able 9 20.7 9a) 0.3 pps 3 20.7	Ig Sep 3 0.69 able 9c) 20.97 7, Th2 (°C) 13 20.12 5 0.62 to 7 in Tab 12 20.1 - fLA) × T2	0.94 20.72 20.12 0.92 le 9c) 19.81 fLA = Li	0.99 2 20.31 2 20.11 3 0.99 4 19.22 4 ving area ÷ (-	1 19.99 20.11 1 18.76 4) =	0.52	(87) (88) (89) (90) (91)
Jan (86)m= 1 Mean interna (87)m= 20.03 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean interna (90)m= 18.81 Mean interna (92)m= 19.44	Feb 0.99 I tempera 20.22 during he 20.1 ctor for ga 0.99 I tempera 19.09	Mar 0.97 ature in li 20.5 eating pe 20.11 ains for re 0.96 ature in t 19.48 ature (for	Apr 0.89 iving are 20.79 eriods in 20.12 est of dv 0.86 he rest of 19.89	May 0.71 ea T1 (for 20.95 or rest of 20.12 welling, 0.66 of dwell 20.07	dw 2 h2, ing 2	Jun 0.51 w step 0.99 relling 0.12 m (se 0.45 T2 (fc 0.12 g) = fL 0.57 m m m m m m m m m	Jul 0.37 DS 3 to 7 21 from Ta 20.12 e Table 0.3 Dllow ste 20.12 A × T1 20.58	0.4 7 in T 21 able 9 20.7 9a) 0.3 eps 3 20.7 + (1 - 20.5	Ig Sep 3 0.69 able 9c) 20.97 7, Th2 (°C) 13 20.12 5 0.62 to 7 in Tab 12 20.1 fLA) × T2 58 20.55	0.94 20.72 20.12 0.92 le 9c) 19.81 fLA = Li	0.99 2 20.31 2 20.11 3 0.99 4 19.22 4 ving area ÷ (1 19.99 20.11 1 18.76	0.52	(87) (88) (89) (90)
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			(0	1) (0										
1		ĭ	· `	4)m x (84	·	l								(05)
(95)m=	607.08	738.37	849.69	894.86	780.96	544.49	364.77	382.01	573.17	676.88	607.26	567.6		(95)
(96)m=	4.3	age exte	6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
									(96)m		7.1	4.2		(50)
(97)m=	1426.7			1063.71		548.5	365.19	382.91	594.43	897.38	1180 49	1419.75		(97)
		<u> </u>						l)m – (95			1110.70		(- /
(98)m=	609.8	437.51	310.61	121.58	27.7	0	0	0	0	164.05	412.73	634		
` ′		<u> </u>		<u> </u>		ļ		Tota	l per year	(kWh/year		8) _{15,912} =	2717.99	(98)
Snace	hoatin	a roquir	amont in	k\\/h/m2	2/voor					` ,	,	, [20.45	(99)
·		•		kWh/m²								Ĺ	28.15	(99)
		•	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heatir	_	nt from so	econdar	v/sunnle	mentary	system					Γ	0	(201)
				nain syst		incinary	-	(202) = 1 -	- (201) =			<u>[</u>	1	(202)
				•	` '				, ,	(202)] -		Į		╡`
			Ü	main sys				(204) = (2	02) x [1 –	(203)] =		ļ	1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1							Ţ	93.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (c	alculate	d above)								
	609.8	437.51	310.61	121.58	27.7	0	0	0	0	164.05	412.73	634		
(211)m	ı = {[(98)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	652.89	468.43	332.56	130.17	29.66	0	0	0	0	175.64	441.9	678.8		
								Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2910.05	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							_		
= {[(98))m x (20)1)] } x 1	00 ÷ (20	8)	•									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	= [0	(215)
	heating	_												
Output				ulated al		140.00	440.4	450.44	400.40	400.40	400.50	200.40		
C#inion	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		7(246)
ı	_	ater hea		04.47	04.50	1 00 0	00.0	00.0	00.0	04.70	00.00	07.00	80.3	(216)
(217)m=	87.56	87.13	86.21	84.17	81.59	80.3	80.3	80.3	80.3	84.79	86.92	87.69		(217)
		heating, m x 100												
(219)m=		214.04	227.24	206.65	206.41	184.71	176.96	197.27	199.45	214.84	221.5	235.47		
								Tota	I = Sum(2	19a) ₁₁₂ =			2526.14	(219)
Annua	l totals									k۱	Wh/year		kWh/yea	' r
Space	heating	fuel use	ed, main	system	1						-		2910.05	
\Motor												-		=
vvaleri	heating	fuel use	d										2526.14	
	•			electric	keep-ho	t							2526.14	
	•			electric	keep-ho	t							2526.14	



(273)

14.69

boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	75 (231)
Electricity for lighting			394.57 (232)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	628.57 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	545.65 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1174.22 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	204.78 (268)
Total CO2, kg/year	sum	of (265)(271) =	1417.92 (272)

TER =