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DESIGN AND ACCESS STATEMENT 134 Torriano Avenue London NW5 2RY

APPLICATION FOR PLANNING PERMISSION February 2018

Prepared by Binom Architects on behalf of Mark Webber



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#### **1. INTRODUCTION**

This Design and Access Statement has been prepared by Binom Architects on behalf of Mr.Webber, in support of the application for planning permission for a house extension located in 134 Torriano Avenue, NW5 2RY, in Kentish Town, London.

The proposal consists of the alterations to the Ground Floor plan to replace the existing kitchen back extension, and the opening of a new door in the rear facade to access the new terrace from first floor staircase landing level.

The purpose is to improve the living areas in contact with the garden, providing a flexible open plan more suited to a contemporary way of life.

This statement aims to justify the proposal and demonstrate that there will be no detrimental effects on the surrounding area.



134 Torriano Avenue, Location Plan



#### **2. SITE DESCRIPTION**

The local area of Tufnell Park reaches into Dartmouth Park and Kentish Town being predominantly residential having some local streets of small independent shops which are popular and thriving.

Brecknock Road forms the boundary between the original Edwardian properties and the 1950's blocks of flats to the East. These flats are typically set within gardens which set back from the pavement edge and vary in design and quality. Many of the properties within the Edwardian street were designed as single family houses and many have now been divided into flats and bedsits. The area has been, until recently, very run down and untidy with various roof extensions and window replacements. Local streets have lost much of the original regimented and repetitive quality that Edwardian streets would originally have had.



View from the corner between Brecknock Road and Torriano Avenue

134 Torriano Avenue, front elevation.

Mansard roof and back extensions vary considerably throughout the area with some of traditional design and others more modern in style. The area is not within a conservation area. However, the neighbourhood does have an unique character and sense of identity which is endearing. This includes ad-hoc roof treatment, colours and replacement windows.

The corner building beside 134 Torriano Avenue, 99 Brecknock Road, has an additional floor within the roof space built behind the parapet wall, also a new extension at Ground Floor level which is used as roof terrace by the occupiers at first floor level. The adjacent neighbour located at 132 Torriano Avenue has built a back extension at Ground Floor level which provides a balcony at First Floor level, similar in size to our proposal.





134 Torriano Avenue, rear elevation, view from Brecknock Road





134 Torriano Avenue, existing rear elevation



# **3. DESCRIPTION OF THE PROPOSAL: EXTERNAL ALTERATIONS TO GROUND AND FIRST FLOOR LEVELS**

The existing rear extension is of poor quality, it comprises a small kitchen facing the garden. The extension provided this additional functional area to the house but at the same time reduced the amount of natural light creating some dark inner living spaces. It also reduced the connectivity with the rear garden. Also, the lack of insulation in the room, the associated problems of temperature and condensation, and its lack of connectivity with the rest of the house, makes it in an unpleasant space to stay.

The proposed layouts are shown on the Binom Architects PDF drawings accompanying this application for Planning Permission. The scheme aims to provide additional and more functional living spaces at Ground Floor to accommodate the family comfortably, promoting a direct connection with the rear garden. The proposal comprises the following:

#### Ground floor:

- Demolition of existing rear extension
- Erection of a new single storey rear extension which would cover the full width of the existing rear façade.
- New extension will protrude from the existing rear façade 3.86m and will be 3.2m high, therefore the whole proposal will not be visible from street level.
- Partial removal of tiled floor to the existing garden in exchange of a new soft grass area.
- Drainage manhole cover to be relocated to suit the new kitchen layout.
- New glazed façade to the new extension to improve the visual connection between garden-family house.
- High quality contemporary light materials such as timber/painted brick/tiles and glass will be used rather than mimicking those of the existing building. This would also help to separate the perception between the 19th Century town house and the contemporary addition, so each volume enhances the values of the other.

#### First floor:

- New balcony at first floor level.
- Alterations to the existing rear facade: Existing window lintel and sill to WFF 02 (Sash window) will be raised and lowered down to accommodate the new entrance to the balcony. This timber sash window located at the first floor staircase landing level will be replaced by a single glazed door and fixed glazed panel.
- A built-in front planter faced in timber, metal balustrade and timber decking are the main materials for this part of the extension, as well as a new rooflight to introduce as much light as possible to the existing period building.
- Existing drainage and water pipes running across the rear façade at first floor level will be relocated within the new roof to the extension.
- The boundary wall will maintain the current height on both sides
- There is an existing ventilation pipe from 99 Brecknock Road building to the party wall which will need to be re-routed within the new extension build up.

Second floor loft area – rear facade:

• Existing water pipe from roof level will be re-located to the edge of the façade.





134 Torriano Avenue, proposed rear elevation



#### **4. AREA SCHEDULE**

The total existing internal area is 120 sqm/ split in 3 floors. The front garden is approximately 17 sqm and the back garden occupies and area of 39 sqm including the hard paved area between the house and the garden wall.

The proposed extension will add 11 sqm to the existing house at Ground Floor level mainly occupying the stone/ground area between the existing extension side wall facade and the garden wall to 99 Brecknock Road building. The new balcony will have 19sqm to be used also as extension of the existing garden.

The area of the garden where plants grow will be mostly preserved, given that the portion that will be occupied by the extension presents a screed floor covered in gravel and is not currently used.

#### **5. CONCLUSION**

The carefully designed configuration and the choice of external and internal finishes will provide a high quality architectural addition to the existing building, while having no negative impact in the surrounding area.

The proposal presented by Binom Architects has been prepared after careful consideration of the information available on the existing building and our knowledge of the construction typologies, techniques and materials used.

In conclusion we believe that this proposal observes all the relevant Camden Council's policies and will enhance the existing features of this building contributing positively to the Kentish Town historic environment.

## 6. APPENDICES Appendix A: PART L COMPIANCE REPORT



OG Energy Ltd First Floor, 2E Berol House, 25 Ashley Road London, N17 9LJ; og@ogenergy.co.uk

#### MID-TERRACE HOUSE, 134, TORRIANO AVENUE LONDON NW5 2RY

# Part L1B Compliance Checklist -2010 PART L1B BUILDING REGULATIONS-

Paragra	Requirement	Comments	Pass/ Fail
4.1 a (5.3-5.4)	Newly constructed and replacement thermal elements:		
	Area weighted average U-value: Walls: 0.28 W/m <sup>2</sup> K Pitched roof, insulation at rafter level: 0.18 W/m <sup>2</sup> K Pitched roof, insulation at ceiling level: 0.16 W/m <sup>2</sup> K Flat roof: 0.18 W/m <sup>2</sup> K Floor: 0.22 W/m <sup>2</sup> K	<ul> <li>Newly constructed ground floor will achieve U-value of 0.22 W/m<sup>2</sup>K</li> <li>Newly constructed external walls will achieve U-value of 0.28 W/m<sup>2</sup>K</li> <li>Newly constructed flat roof will achieve U-value of 0.18 W/m<sup>2</sup>K</li> <li>Upgraded pitched roof, insulation at ceiling level will achieve U-value of 0.16 W/m<sup>2</sup>K</li> </ul>	Pass
4.1 b (4.19)	Controlled fittings performance (applies to new or replacement fittings): Area weighted average U-value: Window, roof window or rooflight: 1.6 W/m <sup>2</sup> K Glazed doors: 1.8 W/m <sup>2</sup> K Solid doors: 1.8 W/m <sup>2</sup> K	<ul> <li>New windows and rooflights will achieve U-value of 1.6 W/m<sup>2</sup>K or lower</li> <li>New glazed doors will achieve U- value of 1.8 W/m<sup>2</sup>K or lower</li> </ul>	Pass
4.2	Area of windows, roof windows and doors Maximum area of openings in extension: 25% of the extension floor area + area of openings which, as a result of the extension works, no longer exist.	<ul> <li>Area of openings in the extensions: 14.03 m<sup>2</sup></li> <li>Floor area of the proposed extensions: 18.20 m<sup>2</sup></li> <li>Area of existing removed openings: 5.78 m<sup>2</sup></li> <li>Area of openings in notional extension: 10.33 m<sup>2</sup></li> </ul>	Pass (par. 4.6)

4.3 (4.24)	Minimum efficiencies and controls of heating and hot water system:		
	<ul> <li>Efficiency of appliances not less then that recommended for its type in the Domestic Heating Compliance Guide</li> </ul>	<ul> <li>Regular condensing boiler Vaillant ecoTEC plus 630 H system A</li> <li>Controls will meet the minimum</li> </ul>	
	(Minimum gas boiler SEDBUK 2009 efficiency 88%, minimum heat pump CoP of 2.2 )	requirements as given in the Domestic Heating Compliance Guide	Pass
	- Controls that meet the minimum requirements as given in the Domestic Heating Compliance Guide		
4.3	Insulation of pipes and ducts		
(4.24 a)	Insulated to standards that are not worse than those set out in the Domestic Heating Compliance Guide	- Fully insulated primary pipework	Pass
4.3	Mechanical cooling		
(4.24 c)	Energy efficiency ratio EER > 2.4	<ul> <li>Proposed building works do not include provision of mechanical cooling</li> </ul>	N/A
4.3	Fixed internal lighting		
(4.24 d)	<ul> <li>Provide fixed energy efficient light fittings that number not less than three per four fixed light fittings.</li> </ul>		
	<ul> <li>Low energy light fittings should have lamps with luminous efficacy greater than 45 lamp lumens per circuit-watt and total output greater than 400 lamp lumens</li> </ul>	- At least 75% of all lights in the new extension will be low energy	Pass
4.3	Fixed external lighting		
(4.24 e)	- Lamp capacity does not exceed 100 W per fitting and the lamp automatically switches off when there is enough daylight and when it is not required	Builder's submission	N/A
	provided		
4.3 (4.30)	Commissioning of controlled services	Builder's submission	N/A
4.15 b (5.5-5.6)	Continuity of insulation and airtightness:		
	<ul> <li>Avoid thermal bridges in insulation caused by gaps, at the joints between elements and edges of elements</li> </ul>	Builder's submission	N/A
	<ul> <li>Reduce unwanted air leakage through the new envelope parts</li> </ul>		
	<ul> <li>Adopt Accredited Construction Details where practical</li> </ul>		

4.6	More design flexibility using SAP2012 Demonstrate that CO2 emissions from all the dwellings in the building as it will become are no greater than if each dwelling had been improved following the guidance set out in paragraphs 4.1 to 4.3	CO2 emissions from building built to the standards set out in paragraphs 4.1 to 4.3 (notional house): 5,956.10 kgCO <sub>2</sub> / year CO2 emissions from building as proposed : 4,562.75 kgCO <sub>2</sub> / year (Supporting SAP worksheets attached)	Pass
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Glos

Ondrej Gajdos OG Energy Ltd



				User D	etails:						
Assessor Name:	Ondrej Ga	jdos			Strom	a Num	ber:		STRO	006629	
Software Name:	Stroma FS	AP 201	2		Softwa	are Vei	rsion:		Versic	on: 1.0.4.10	
			Р	roperty .	Address	: 134, To	orriano A	venue			
Address :	134, Torriar	no Avenu	ue, LON	DON, N	W5 2RY						
1. Overall dwelling dimer	nsions:										
Cround floor				Area	a(m²)	(4 )	Av. Hei	ight(m)		Volume(m <sup>3</sup> )	
					58.1	(1a) x	2.	.75	(2a) =	159.77	(3a)
First floor				:	38.8	(1b) x	3.	.05	(2b) =	118.34	(3b)
Second floor				;	38.8	(1c) x	2.	.75	(2c) =	106.7	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e	)+(1r	ו) 1	35.7	(4)					
Dwelling volume						(3a)+(3b	)+(3c)+(3d	)+(3e)+	.(3n) =	384.81	(5)
2. Ventilation rate:					a tha an		totol				
	heating	\$	econdar	У	otner	_	total			m <sup>3</sup> per nour	
Number of chimneys	0	+	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	] + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	าร						3	x ′	10 =	30	(7a)
Number of passive vents						Ē	0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					Γ	0	x 4	40 =	0	(7c)
											-
						_			Air ch	langes per no	ur ¬
Infiltration due to chimney	rs, flues and f	ans = (6 r in intende	a)+(6b)+(7	'a)+(7b)+(	7c) =	pontinuo fr	30	(16)	÷ (5) =	0.08	(8)
Number of storevs in th	e dwelling (ns	s)	a, procee	<i>a io (17), i</i>	olinei wise (	;onunue Ir	0111 (9) 10 (	10)		0	
Additional infiltration	e arrening (in	-)						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel o	r timber t	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are pro	esent, use the va	lue corres	ponding to	o the great	er wall are	a (after					_
If suspended wooden fl	gs); if equal user oor. enter 0.2	: (unseal	ed) or 0	.1 (seale	ed). else	enter 0				0	<b>]</b> (12)
If no draught lobby, ent	er 0.05, else (	enter 0		(	-,,					0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	15	(17)
If based on air permeabili	ty value, then	(18) = [(1	7) ÷ 20]+(8	8), otherwi	ise (18) = (	(16)				0.83	(18)
Air permeability value applies	s if a pressurisati	on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered	d				(20) = 1	[0 075 v (1	10)1			3	(19)
Sheller lactor	na chaltar fac	tor			$(20) = 1^{-2}$ (21) = (19)	[0.073 × (1	[3]] –			0.78	
Infiltration rate incorporati	ng sheller tac				(21) = (18	,				0.64	(21)
	Mar Anr	May	, lun	.lul	Aug	Sen	Oct	Nov	Dec	]	
Monthly average wind on	and from Tabl		Jun		I nug			1100		I	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
			0.0							l	

Wind F	actor (22	2a)m =	(22)m ÷ ·	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	tion rat	e (allowir	ng for sł	nelter an	nd wind s	peed) =	(21a) x	(22a)m					
	0.82	0.8	0.79	0.71	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75		
Calcula	ate effect	tive air	change r	ate for t	he appli	cable ca	se	•		8				- (00-)
li me	echanicai		ILION. Using Anne	ndiv N (2	23h) - (23;	a) v Emv (e	auation (I		rwise (23t	u) – (23a)				0 (23a)
lf hala	anced with	heat reco	werv: effici	ency in %	allowing f	for in-use f	actor (fron	n Table 4h	) –	) = (20a)				0 (230)
a) If	balancer	l moch	anical vo	ntilation	with he	at recove	any (M)/l		y = (2)	2h)m ⊥ ('	23b) v [	1 _ (23c)	· 1001	0 (230)
(24a)m=				0				0				1 - (230)	- 100]	(24a)
b) If	balanced	1 mech	anical ve	ntilation	without	heat rec	overv (N	///) (24h	$1 = (2^{\circ})$	2h)m + (;	23h)	-		· · · ·
(24b)m=	0	0		0	0	0	0	0	0	0	0	0		(24b)
c) If	whole ho	use ex	tract ven	tilation of	r positiv	/e input v	/entilatio	n from c	utside					
i	if (22b)m	< 0.5 ×	(23b), tł	nen (24	c) = (23k	b); other	wise (24	c) = (22b	o) m + 0	.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural v	entilatio	on or who	ble hous	se positi	ve input	ventilatio	on from I	oft					
(0.1.1)	if (22b)m	= 1, th	en (24d)r	n = (22)	b)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]	0.70	0.70		(244)
(24a)m=	0.83	0.82	0.81	0.75	0.74	0.69	0.69	0.68	0.71	0.74	0.76	0.78		(240)
Effec	ctive air c	change	rate - en	0 75	) or (24)	$\frac{1}{1}$ or (24)	c) or (24		(25)	0.74	0.76	0.70		(25)
(25)111=	0.83	0.02	0.01	0.75	0.74	0.69	0.69	0.00	0.71	0.74	0.76	0.76		(23)
3. He	at losses	and he	eat loss p	aramet	er:									
ELEN	IENT	Gros area	ss (m²)	Openin m	igs 1 <sup>2</sup>	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/ł	≺)	k-value kJ/m²∙ł	e ≺	A X k kJ/K
Doors						1.83	x	3	=	5.49				(26)
Windov	ws Type	1				0.39	x1	/[1/( 4.8 )+	0.04] =	1.57				(27)
Windov	ws Type	2				2.44	x1	/[1/( 4.8 )+	0.04] =	9.83				(27)
Windov	ws Type	3				1.36	x1	/[1/( 4.8 )+	0.04] =	5.48				(27)
Windov	ws Type	4				1.36	x1	/[1/( 4.8 )+	0.04] =	5.48				(27)
Windov	ws Type	5				2	x1	/[1/( 4.8 )+	0.04] =	8.05				(27)
Windov	ws Type	6				1.75	x1	/[1/( 4.8 )+	0.04] =	7.05				(27)
Windov	ws Type	7				6.44	x1	/[1/( 1.8 )+	0.04] =	10.81				(27)
Windov	ws Type	8				1.93	x1	/[1/( 1.8 )+	0.04] =	3.24				(27)
Windov	ws Type	9				2.13		/[1/( 4.8 )+	0.04] =	8.58				(27)
Windov	ws Type	10				1.56	x1	/[1/( 4.8 )+	0.04] =	6.28				(27)
Windov	ws Type	11				0.28		/[1/( 4.8 )+	0.04] =	1.13	_			(27)
Rooflig														
	ghts					1.95	x1	/[1/(1.6) +	0.04] =	3.12				(27b)
Floor T	ghts ⊺ype 1					1.95 39.9	x1 x	/[1/(1.6) +	0.04] =	3.12 14.364				(27b) (28)
Floor T Floor T	ghts Fype 1 Fype 2					1.95 39.9 18.2	x1 x	/[1/(1.6) + 0.36	0.04] =	3.12 14.364 4.004				(27b) (28) (28)
Floor T Floor T Walls <sup>-</sup>	ghts Fype 1 Fype 2 Type1	73.2	23	22.3	4	1.95 39.9 18.2 50.89	x1 x x x x	/[1/(1.6) + 0.36 0.22 2.1	0.04] =	3.12 14.364 4.004 106.87				(27b) (28) (28) (28) (29)

Roof 7	Гуре1	38.8	В	0		38.8	x	2.3	=	89.24				(30)
Roof 7	Гуре2	1.7	,	0		1.7	x	2.3	=	3.91				(30)
Roof 1	ГуреЗ	17.6	6	1.95	5	15.65	5 X	0.18	= =	2.82	Ē		╕	(30)
Total a	rea of el	ements	, m²			202.6	8							(31)
* for win	dows and i	roof winde	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragrapł	1 3.2	
** includ	le the areas	s on both	sides of in	ternal wal	ls and par	titions			()					
Fabric	heat loss	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				320.41	(33)
Heat c	apacity C	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass <sub>l</sub>	parame	ter (TMF	? = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For desi can be u	gn assessi ised instea	ments wh d of a det	ere the de tailed calcu	tails of the ılation.	construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Te	able 1f		
Therm	al bridge	s : S (L	x Y) cale	culated u	using Ap	pendix ł	<						30.4	(36)
if details	of thermal	bridging	are not kn	own (36) =	= 0.15 x (3	1)								_
Total fa	abric hea	it loss							(33) +	(36) =			350.81	(37)
Ventila	tion heat	t loss ca	alculated	monthly	y	1	i		(38)m	= 0.33 × (	25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m=	105.99	104.34	102.73	95.13	93.71	87.09	87.09	85.86	89.64	93.71	96.58	99.59	J	(38)
Heat tr	ansfer co	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	456.8	455.15	453.53	445.94	444.51	437.9	437.9	436.67	440.45	444.51	447.39	450.4		
		notor (L	ע וחור	m21/					(40)~	Average =	Sum(39) <sub>1.</sub>	12 /12=	445.93	(39)
			ημΡ), VV/	2.20	2.20	2.22	2.22	2.22	(40)m	= (39)m <del>.</del>	(4)	2 22	1	
(40)11=	3.37	3.30	5.54	3.29	3.20	3.23	3.23	3.22	5.20	3.20 Average -	5.5 Sum(40)	3.32 	3 20	(40)
Numbe	er of days	s in mor	nth (Tabl	e 1a)						Average =	Sum(40)1.	12 / 12=	5.29	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heati	na ener	rav reaui	rement:								kWh/v	ear:	
			37										-	
Assum		Dancy, I	N + 1 76 v	[1 - ovn	(_0 0003		-130	)2)]⊥0 <i>(</i>	1013 v (	TEA _13	2.	91	J	(42)
if TF	A £ 13.9	, N = 1	+ 1.70 X	[i - evb	(-0.0002	, , , , , , , , , , , , , , , , , , ,	A - 10.9	/2/] + 0.0	) / 10/0	11 A - 13.	3)			
Annua	l average	e hot wa	ater usag	je in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		103	3.27	]	(43)
Reduce	the annual e that 125 l	average itres per i	hot water person per	usage by : dav (all w	5% if the a ater use. I	lwelling is hot and co	designed : Id)	to achieve	a water us	se target o	f			
			Man	αα <i>)</i> (α ι				<b>A</b>	0.00	0.4	Nau	Dee	1	
Hot wate	Jan ar usage in	Feb litres per	Mar day for ea	Apr https://www.apr	May Vd m = fa	Jun	JUI Table 1c x	(43)	Sep	Oct	Nov	Dec	J	
(44)		100.47	405.24	101.01	07.00	02.05	02.05		101.01	105.24	100.47	112.6	1	
(44)m=	113.6	109.47	105.34	101.21	97.08	92.95	92.95	97.08	101.21	105.34	109.47	113.6	1020.0	
Energy o	content of I	not water	used - cale	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x [	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )	) kWh/mor	otal = Su	ables 1b, 1	₌ c, 1d)	1239.3	(44)
(45)m=	168.47	147.34	152.05	132.56	127.19	109.76	101.71	116.71	118.1	137.64	150.24	163.15	1	
									L	I Total = Su	m(45)1 12 =		1624.91	(45)
lf instant	taneous wa	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)		( / 112 -			` ´
(46)m=	25.27	22.1	22.81	19.88	19.08	16.46	15.26	17.51	17.72	20.65	22.54	24.47		(46)
Water	storage I	OSS:			<u> </u>		I	<b>!</b>	I	I				
Storag	e volume	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		170		(47)

If common of the second	munity h vise if no storage	eating a stored loss:	nd no ta hot wate	ank in dw er (this in	velling, e ncludes i	nter 110 nstantan	litres in neous co	(47) ombi boil	ers) ente	er '0' in (	47)			(40)
Tompo	anulaci	actor fro	m Tabla	255 1acii			vuay).					0		(40)
Enorm	v loot fro			ZD LVMb/w	oor			$(19) \times (10)$	\ _			0		(49)
b) If m	/ lost iro	m water urer's de	eclared of	, kvvn/ye cvlinder l	ear loss fact	or is not	known:	(40) X (49)	) =		1	70		(50)
Hot wa	ater stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	iy)				0.	02		(51)
If com	munity h	leating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a	Oh							0.	89		(52)
Tempe	erature f	actor fro	m Table	2D				· · · · · · · · · · · · · · · · · ·			0.	54		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	56		(54)
Watar	(50) OF (		oulated :	for oach	month			((56)m - (	55) v ( <b>/</b> 1)	<b>m</b>	1.	56		(55)
valer						40.04	40.4	((50))) = (	55) x (41)		40.04	40.4	I	(50)
(56)m=	48.4	43.72	48.4	46.84	48.4	46.84	48.4 H11)1 ÷ (5)	48.4	46.84	48.4	46.84	48.4 m Append	iv H	(56)
			u solal sio	iage, (57)i	n = (50)m	x [(30) – ()	[[[]] ÷ (3		7)iii = (30) I					()
(57)m=	48.4	43.72	48.4	46.84	48.4	46.84	48.4	48.4	46.84	48.4	46.84	48.4		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar (moo	Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 x (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)m = 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)													
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	l for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	240.13	212.07	223.71	201.91	198.86	179.11	173.37	188.37	187.46	209.3	219.6	234.82		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			-			-		-	-		
(64)m=	240.13	212.07	223.71	201.91	198.86	179.11	173.37	188.37	187.46	209.3	219.6	234.82		_
								Outp	out from w	ater heate	r (annual)₁	12	2468.72	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	« [(46)m	+ (57)m	+ (59)m	]	
(65)m=	113.35	100.78	107.89	99.56	99.62	91.98	91.15	96.14	94.75	103.1	105.44	111.58		(65)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5	-	-	-		
(67)m=	84.82	75.34	61.27	46.39	34.67	29.27	31.63	41.11	55.18	70.07	81.78	87.18		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5			I	
 (68)m=	454.43	459.14	447.26	421.96	390.03	360.02	339.97	335.25	347.13	372.43	404.37	434.38		(68)
Cookin			L todin A	nnondiv		lion   15	or   150)		L Da Tabla	5			I	

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.36	55.36	55.36	55.36	55.36	5	5.36	55.36	55.	36	55.36	55.3	55.36	55.	36		(69)
Pumps	Pumps and fans gains (Table 5a)																
(70)m=	10	10	10	10	10	Τ	10	10	1	0	10	10	10	1	0		(70)
Losses	s e.g. e	vaporatio	n (nega	tive valu	ies) (Ta	ble	5)						-	•			
(71)m=	-116.34	-116.34	-116.34	-116.34	-116.34	-1	16.34	-116.34	-116	.34	-116.34	-116.3	-116.34	-116	6.34		(71)
Water	heating	gains (T	able 5)	•													
(72)m=	152.35	149.96	145.01	138.28	133.9	1:	27.75	122.51	129	.22	131.6	138.5	7 146.44	149	.97		(72)
Total i	nterna	gains =		-			(66)	m + (67)m	n + (68	3)m +	(69)m + (	70)m +	(71)m + (72	)m			
(73)m=	815.13	807.98	777.07	730.15	682.13	6	40.56	617.64	629	.11	657.45	704.	6 756.11	795	.06		(73)
6. Sol	ar gain	s:															
Solar g	ains are	calculated u	using sola	ar flux from	Table 6a	a and	assoc	iated equa	tions	to con	overt to the	e appli	cable orienta	tion.			
Orienta	ation:	Access F Table 6d	actor	Area m²	l		Flu Tal	x ole 6a		Ta	g_ able 6b		FF Table 6c			Gains (W)	
North	0.9x	0.77	x	1.	36	x	1	0.63	x		0.85	x	0.7		=	5.96	(74)
North	0.9x	0.77	×	1.3	36	x	2	0.32	×		0.85	x	0.7		=	11.4	(74)
North	0.9x	0.77	x	1.	36	x	3	4.53	×		0.85	x	0.7		=	19.36	(74)
North	0.9x	0.77	x	1.	36	x	5	5.46	×		0.85	x	0.7		=	31.1	(74)
North	0.9x	0.77	x	1.	36	x	7	4.72	×		0.85	x	0.7		=	41.9	(74)
North	0.9x	0.77	x	1.3	36	x	7	9.99	×		0.85	x	0.7		=	44.85	(74)
North	0.9x	0.77	x	1.3	36	x	7	4.68	×		0.85	x	0.7		=	41.88	(74)
North	0.9x	0.77	x	1.	36	x	5	9.25	x		0.85	x	0.7		=	33.22	(74)
North	0.9x	0.77	x	1.	36	x	4	1.52	x		0.85	x	0.7		=	23.28	(74)
North	0.9x	0.77	x	1.3	36	x	2	4.19	×		0.85	x	0.7		=	13.56	(74)
North	0.9x	0.77	x	1.:	36	x	1	3.12	x		0.85	x	0.7		=	7.36	(74)
North	0.9x	0.77	x	1.:	36	x		8.86	×		0.85	x	0.7		=	4.97	(74)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	44	x	3	6.79	x		0.63	x	0.7		=	72.42	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.	93	x	3	6.79	x		0.63	x	0.7		=	21.7	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	2.	13	x	3	6.79	x		0.85	x	0.7		=	32.32	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.	56	x	3	6.79	×		0.85	x	0.7		=	47.33	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	0.1	28	x	3	6.79	×		0.85	x	0.7		=	4.25	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	44	x	6	2.67	×		0.63	x	0.7		=	123.35	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.5	93	x	6	2.67	×		0.63	x	0.7		=	36.97	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	2.	13	x	6	2.67	x		0.85	x	0.7		=	55.04	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.	56	X	6	2.67	x		0.85	x	0.7		=	80.63	(77)
Southea	ast <mark>0.9</mark> x	0.77	x	0.:	28	X	6	2.67	×		0.85	x	0.7		=	7.24	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.4	44	X	8	5.75	x		0.63	x	0.7		=	168.77	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	1.5	93	x	8	5.75	×		0.63	x	0.7		=	50.58	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	2.	13	x	8	5.75	×		0.85	×	0.7		=	75.31	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	1.	56	x	8	5.75	×		0.85	x	0.7		=	110.32	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	0.	28	x	8	5.75	×		0.85	x	0.7		=	9.9	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	44	x	1	06.25	x		0.63	×	0.7		=	209.12	(77)

Southoost on		1		1		1				1		
Southeast 0.9x	0.77	×	1.93	X	106.25	X	0.63	X	0.7	=	62.67	_( <i>′′</i> )
Southeast 0.9x	0.77	×	2.13	×	106.25	X	0.85	X	0.7	=	93.32	(77)
Southeast 0.9x	0.77	x	1.56	x	106.25	x	0.85	x	0.7	=	136.69	(77)
Southeast 0.9x	0.77	x	0.28	x	106.25	x	0.85	x	0.7	=	12.27	(77)
Southeast 0.9x	0.77	x	6.44	x	119.01	x	0.63	x	0.7	=	234.23	(77)
Southeast 0.9x	0.77	x	1.93	x	119.01	x	0.63	x	0.7	=	70.2	(77)
Southeast 0.9x	0.77	x	2.13	x	119.01	x	0.85	x	0.7	=	104.52	(77)
Southeast 0.9x	0.77	x	1.56	x	119.01	x	0.85	x	0.7	] =	153.11	(77)
Southeast 0.9x	0.77	x	0.28	x	119.01	x	0.85	x	0.7	] =	13.74	(77)
Southeast 0.9x	0.77	x	6.44	x	118.15	x	0.63	x	0.7	=	232.54	(77)
Southeast 0.9x	0.77	x	1.93	x	118.15	x	0.63	x	0.7	] =	69.69	(77)
Southeast 0.9x	0.77	x	2.13	x	118.15	x	0.85	x	0.7	] =	103.77	(77)
Southeast 0.9x	0.77	x	1.56	x	118.15	x	0.85	x	0.7	] =	152	(77)
Southeast 0.9x	0.77	x	0.28	x	118.15	x	0.85	x	0.7	=	13.64	(77)
Southeast 0.9x	0.77	x	6.44	x	113.91	x	0.63	x	0.7	=	224.19	(77)
Southeast 0.9x	0.77	x	1.93	x	113.91	x	0.63	x	0.7	] =	67.19	(77)
Southeast 0.9x	0.77	x	2.13	x	113.91	x	0.85	x	0.7	] =	100.04	(77)
Southeast 0.9x	0.77	x	1.56	x	113.91	x	0.85	x	0.7	] =	146.54	(77)
Southeast 0.9x	0.77	x	0.28	x	113.91	x	0.85	x	0.7	] =	13.15	(77)
Southeast 0.9x	0.77	x	6.44	x	104.39	x	0.63	x	0.7	] =	205.46	(77)
Southeast 0.9x	0.77	x	1.93	x	104.39	x	0.63	x	0.7	=	61.57	(77)
Southeast 0.9x	0.77	x	2.13	x	104.39	x	0.85	x	0.7	] =	91.68	(77)
Southeast 0.9x	0.77	x	1.56	x	104.39	x	0.85	x	0.7	] =	134.3	(77)
Southeast 0.9x	0.77	x	0.28	x	104.39	x	0.85	x	0.7	] =	12.05	(77)
Southeast 0.9x	0.77	x	6.44	x	92.85	x	0.63	x	0.7	] =	182.75	(77)
Southeast 0.9x	0.77	x	1.93	x	92.85	x	0.63	x	0.7	] =	54.77	(77)
Southeast 0.9x	0.77	x	2.13	x	92.85	x	0.85	x	0.7	] =	81.55	(77)
Southeast 0.9x	0.77	x	1.56	x	92.85	x	0.85	x	0.7	] =	119.45	(77)
Southeast 0.9x	0.77	x	0.28	x	92.85	x	0.85	x	0.7	] =	10.72	(77)
Southeast 0.9x	0.77	x	6.44	x	69.27	x	0.63	x	0.7	] =	136.33	(77)
Southeast 0.9x	0.77	x	1.93	x	69.27	x	0.63	x	0.7	] =	40.86	(77)
Southeast 0.9x	0.77	x	2.13	x	69.27	x	0.85	x	0.7	] =	60.84	(77)
Southeast 0.9x	0.77	x	1.56	×	69.27	×	0.85	x	0.7	] =	89.11	(77)
Southeast 0.9x	0.77	x	0.28	x	69.27	x	0.85	x	0.7	] =	8	(77)
Southeast 0.9x	0.77	x	6.44	x	44.07	x	0.63	x	0.7	] =	86.74	(77)
Southeast 0.9x	0.77	x	1.93	x	44.07	x	0.63	x	0.7	] =	25.99	(77)
Southeast 0.9x	0.77	x	2.13	×	44.07	x	0.85	x	0.7	] =	38.71	(77)
Southeast 0.9x	0.77	x	1.56	×	44.07	x	0.85	x	0.7	] =	56.7	(77)
Southeast 0.9x	0.77	x	0.28	×	44.07	x	0.85	x	0.7	] =	5.09	(77)
Southeast 0.9x	0.77	x	6.44	×	31.49	x	0.63	x	0.7	] =	61.97	(77)
Southeast 0.9x	0.77	x	1.93	×	31.49	x	0.63	x	0.7	=	18.57	(77)
-												

Southeast 0.9x	0.77	x	2.13	x	31.49	x	0.85	x	0.7	=	27.65	7(77)
Southeast 0.9x	0.77	] x	1.56	x	31.49	x	0.85	x	0.7	=	40.51	](77)
Southeast 0.9x	0.77	x	0.28	x	31.49	x	0.85	x	0.7	i =	3.64	] <sub>(77)</sub>
West 0.9x	0.77	x	1.36	x	19.64	x	0.85	x	0.7	1 =	11.01	_ ](80)
West 0.9x	0.77	x	1.36	x	38.42	×	0.85	x	0.7	i =	21.55	] (80)
West 0.9x	0.77	x	1.36	x	63.27	x	0.85	x	0.7	=	35.48	] (80)
West 0.9x	0.77	x	1.36	x	92.28	×	0.85	x	0.7	<b>i</b> =	51.75	(80)
West 0.9x	0.77	x	1.36	x	113.09	×	0.85	x	0.7	<b>i</b> =	63.42	(80)
West 0.9x	0.77	x	1.36	x	115.77	x	0.85	x	0.7	=	64.92	(80)
West 0.9x	0.77	x	1.36	×	110.22	×	0.85	x	0.7	] =	61.81	(80)
West 0.9x	0.77	x	1.36	x	94.68	x	0.85	x	0.7	] =	53.09	(80)
West 0.9x	0.77	x	1.36	x	73.59	x	0.85	x	0.7	=	41.27	(80)
West 0.9x	0.77	x	1.36	x	45.59	x	0.85	x	0.7	=	25.57	(80)
West 0.9x	0.77	x	1.36	x	24.49	x	0.85	x	0.7	=	13.73	(80)
West 0.9x	0.77	x	1.36	x	16.15	x	0.85	x	0.7	=	9.06	(80)
Northwest 0.9x	0.77	x	0.39	x	11.28	x	0.85	x	0.7	=	1.81	(81)
Northwest 0.9x	0.77	x	2.44	x	11.28	x	0.85	x	0.7	=	11.35	(81)
Northwest 0.9x	0.77	x	2	x	11.28	x	0.85	x	0.7	=	18.61	(81)
Northwest 0.9x	0.77	x	1.75	x	11.28	x	0.85	x	0.7	=	16.28	(81)
Northwest 0.9x	0.77	x	0.39	x	22.97	x	0.85	x	0.7	=	3.69	(81)
Northwest 0.9x	0.77	x	2.44	x	22.97	x	0.85	x	0.7	=	23.11	(81)
Northwest 0.9x	0.77	x	2	x	22.97	x	0.85	x	0.7	] =	37.88	(81)
Northwest 0.9x	0.77	x	1.75	x	22.97	x	0.85	x	0.7	=	33.14	(81)
Northwest 0.9x	0.77	x	0.39	x	41.38	x	0.85	x	0.7	=	6.65	(81)
Northwest 0.9x	0.77	x	2.44	x	41.38	x	0.85	x	0.7	] =	41.63	(81)
Northwest 0.9x	0.77	x	2	x	41.38	x	0.85	x	0.7	] =	68.25	(81)
Northwest 0.9x	0.77	x	1.75	x	41.38	x	0.85	x	0.7	] =	59.72	(81)
Northwest 0.9x	0.77	x	0.39	x	67.96	x	0.85	x	0.7	] =	10.93	(81)
Northwest 0.9x	0.77	x	2.44	x	67.96	x	0.85	x	0.7	] =	68.37	(81)
Northwest 0.9x	0.77	x	2	x	67.96	x	0.85	x	0.7	=	112.08	(81)
Northwest 0.9x	0.77	x	1.75	x	67.96	x	0.85	x	0.7	=	98.07	(81)
Northwest 0.9x	0.77	x	0.39	x	91.35	x	0.85	x	0.7	] =	14.69	(81)
Northwest 0.9x	0.77	x	2.44	x	91.35	x	0.85	x	0.7	] =	91.9	(81)
Northwest 0.9x	0.77	x	2	x	91.35	x	0.85	x	0.7	=	150.66	(81)
Northwest 0.9x	0.77	x	1.75	x	91.35	x	0.85	x	0.7	] =	131.83	(81)
Northwest 0.9x	0.77	x	0.39	x	97.38	x	0.85	x	0.7	=	15.66	(81)
Northwest 0.9x	0.77	x	2.44	x	97.38	x	0.85	x	0.7	=	97.98	(81)
Northwest 0.9x	0.77	x	2	x	97.38	x	0.85	x	0.7	=	160.62	(81)
Northwest 0.9x	0.77	x	1.75	×	97.38	<b>x</b>	0.85	x	0.7	] =	140.54	(81)
Northwest 0.9x	0.77	x	0.39	×	91.1	×	0.85	x	0.7	=	14.65	(81)
Northwest 0.9x	0.77	x	2.44	×	91.1	×	0.85	x	0.7	=	91.66	(81)

Northwest 0.9x	0.77	x	2	×	91.1	×	0.85	x	0.7	=	150.26	(81)
Northwest 0.9x	0.77	x	1.75	×	91.1	X	0.85	×	0.7	= [	131.47	(81)
Northwest 0.9x	0.77	x	0.39	×	72.63	×	0.85	x	0.7	= =	11.68	(81)
Northwest 0.9x	0.77	x	2.44	×	72.63	x	0.85	×	0.7	= =	73.07	(81)
Northwest 0.9x	0.77	x	2	×	72.63	×	0.85	x	0.7	= [	119.79	(81)
Northwest 0.9x	0.77	x	1.75	×	72.63	x	0.85	x	0.7	= =	104.81	(81)
Northwest 0.9x	0.77	x	0.39	x	50.42	x	0.85	x	0.7	=	8.11	(81)
Northwest 0.9x	0.77	x	2.44	x	50.42	x	0.85	×	0.7	=	50.73	(81)
Northwest 0.9x	0.77	x	2	x	50.42	x	0.85	x	0.7	=	83.16	(81)
Northwest 0.9x	0.77	x	1.75	x	50.42	x	0.85	x	0.7	=	72.77	(81)
Northwest 0.9x	0.77	x	0.39	x	28.07	x	0.85	×	0.7	=	4.51	(81)
Northwest 0.9x	0.77	x	2.44	x	28.07	x	0.85	x	0.7	=	28.24	(81)
Northwest 0.9x	0.77	x	2	×	28.07	x	0.85	×	0.7	=	46.29	(81)
Northwest 0.9x	0.77	x	1.75	x	28.07	x	0.85	x	0.7	=	40.51	(81)
Northwest 0.9x	0.77	x	0.39	x	14.2	x	0.85	x	0.7	=	2.28	(81)
Northwest 0.9x	0.77	x	2.44	x	14.2	x	0.85	x	0.7	=	14.28	(81)
Northwest 0.9x	0.77	x	2	x	14.2	x	0.85	x	0.7	=	23.42	(81)
Northwest 0.9x	0.77	x	1.75	x	14.2	x	0.85	x	0.7	=	20.49	(81)
Northwest 0.9x	0.77	x	0.39	x	9.21	x	0.85	x	0.7	=	1.48	(81)
Northwest 0.9x	0.77	x	2.44	x	9.21	x	0.85	x	0.7	=	9.27	(81)
Northwest 0.9x	0.77	x	2	x	9.21	x	0.85	x	0.7	=	15.2	(81)
Northwest 0.9x	0.77	x	1.75	x	9.21	x	0.85	x	0.7	=	13.3	(81)
Rooflights 0.9x	1	x	1.95	x	26	x	0.63	x	0.7	=	20.12	(82)
Rooflights 0.9x	1	x	1.95	x	54	x	0.63	x	0.7	=	41.79	(82)
Rooflights 0.9x	1	x	1.95	x	96	x	0.63	x	0.7	=	74.3	(82)
Rooflights 0.9x	1	x	1.95	x	150	x	0.63	x	0.7	=	116.09	(82)
Rooflights 0.9x	1	x	1.95	x	192	x	0.63	x	0.7	=	148.6	(82)
Rooflights 0.9x	1	x	1.95	x	200	x	0.63	x	0.7	=	154.79	(82)
Rooflights 0.9x	1	x	1.95	x	189	x	0.63	x	0.7	=	146.28	(82)
Rooflights 0.9x	1	x	1.95	x	157	x	0.63	x	0.7	=	121.51	(82)
Rooflights 0.9x	1	x	1.95	x	115	x	0.63	x	0.7	=	89	(82)
Rooflights 0.9x	1	x	1.95	x	66	x	0.63	x	0.7	=	51.08	(82)
Rooflights 0.9x	1	x	1.95	x	33	x	0.63	x	0.7	=	25.54	(82)
Rooflights 0.9x	1	x	1.95	x	21	×	0.63	x	0.7	=	16.25	(82)
Solar gains in	watts, calcula	ated	for each mon	th	1251 1400 40	(83)m	1 = Sum(74)m.	(82)m		224.07		(92)
Total gains $-i$	14/5./9 /20 nternal and e	.∠ŏ olar	(84)m = (73)m	°   ́ ∩ + ()	83)m watte	1022	2.24 817.55	544.8	320.32	221.87		(03)
(84)m= 1078 3	1283 76 140	7 35	1732 61 1000 0	3 19	391 56 1806 75	165	35 1475	1249 /	9 1076 44	1016 03	1	(84)
	1200.70 1491		1702.01 1300.8	<u>, , , , , , , , , , , , , , , , , , , </u>	1000.75			1273.4		1010.30		(01)
7. Mean inter	nal temperat	ure (	heating seaso	on)	oroo from T-I					ſ		
remperature	ouring neatil	ig pe	erious in the li	ving	area from Tal	bie 9	ini (°C)				21	(85)
Utilisation fac	tor for gains	tor li	ving area, h1,	m (s	ee Table 9a)							

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Jan

Feb

(86)m=	0.99	0.99	0.98	0.96	0.91	0.83	0.73	0.77	0.9	0.97	0.99	0.99		(86)
Mean	interna	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	17.77	18.01	18.47	19.14	19.8	20.38	20.7	20.63	, 20.14	19.3	18.44	17.75		(87)
Temp	erature	durina h	eating p	eriods ir	n rest of	u dwellina	from Ta	uble 9. Ti	h2 (°C)					
(88)m=	18.58	18.58	18.59	18.61	18.62	18.64	18.64	18.64	18.63	18.62	18.61	18.6		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.97	0.93	0.85	0.68	0.45	0.51	0.81	0.95	0.98	0.99		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	15.89	16.13	16.59	17.26	17.89	18.4	18.6	18.58	18.23	17.43	16.57	15.88		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.37	(91)
Mean	interna	temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			-		
(92)m=	16.58	16.82	17.28	17.95	18.6	19.13	19.37	19.34	, 18.93	18.12	17.26	16.57		(92)
Apply	adjustn	nent to th	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	16.58	16.82	17.28	17.95	18.6	19.13	19.37	19.34	18.93	18.12	17.26	16.57		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	nean int	ernal ter	mperatur	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
1.14:12	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilise		tor for g		0.02	0.85	0.72	0.56	0.62	0.82	0.04	0.08	0.00		(94)
(94)III=		0.90 hmGm	10.90	1)m x (8)	1)m	0.75	0.50	0.02	0.02	0.94	0.96	0.99		(34)
(95)m=	1060.9	1251.81	1434.5	1596	1617 49	1372 66	1010 23	1015.8	1215 14	1174 04	1050.5	1002 74		(95)
Month	ly aver		rnal tem	perature	from T	able 8	1010.20	101010	1210.11		1000.0	1002.11		()
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an intern	al tempe	erature.	Lm.W=	=[(39)m :	x [(93)m	– (96)m	1				
(97)m=	5609.42	5426.1	4891.33	4036.05	3065.12	1984.66	1212.85	1281.69	2129.13	3341.98	4545.01	5570.81		(97)
Space	e heatin	a require	ement fo	r each m	nonth, k	I Nh/mont	h = 0.02	24 x [(97	)m – (95	)m] x (4′	1)m			
(98)m=	3384.1	2805.13	2571.88	1756.84	1077.04	0	0	0	0	1612.95	, 2516.05	3398.65		
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	19122.62	(98)
Space	e heatin	a require	ement in	kWh/m <sup>2</sup>	/vear							ļ	140.92	 (99)
	, noutin	groquire	to lod			untorno i	n alı ı alina a	uniere C	רווי			l		
9a. En	ergy rec	uiremer	its – Indi	ividual n	eating s	ystems i	nciuaing	micro-C	, HP)					
Fracti	on of sp	ig: ace hea	t from s	econdar	y/supple	mentary	system					[	0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	encv of r	nain spa	ace heat	ina svste	em 1								84	(206)
Efficie	ency of s	seconda	rv/suppl	ementar	v heatin	a system	ר %						0	 (208)
Linoie		Fab	Mar	Amr	Max		1, 70	A	Can	Oct	Nov	Dee		
Space	Jan		iviai		d above	Jun	Jui	Aug	Sep	Uci	INOV	Dec	киллуеа	ar
Opace	3384.1	2805.13	2571.88	1756.84	1077.04	0	0	0	0	1612.95	2516.05	3398.65		
(211)~	_ ([/00	)m v (20			)6)				-					(211)
رد ۲۱/۱۱	4028 68	3339 44	-+/] } X   3061 77	2091 47	1282 19	0	0	0	0	1920 18	2995 29	4046 01		(211)
		5550.77			02.10	Ĺ	L	L Tota	L I (kWh/yea	L = Sum(2)	211)	=	22765 02	(211)
									· · · · ·	· · · · ·	+ 15,1012		22100.02	<u> </u>

Space heating fuel (secondary), kWh/month

= {[(98)m x	(201)] } x 1	00 ÷ (20	)8)										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	al (kWh/yea	ar) =Sum(2	215) <sub>15,101</sub>	2=	0	(215)
Water heat	ting	( ( l .											
	1 water nea 13 212.07	223.71	201.91	198.86	179.11	173.37	188.37	187.46	209.3	219.6	234.82	]	
Efficiency c	of water hea	ater										74	(216)
(217)m= 83.2	25 83.21	83.1	82.85	82.27	74	74	74	74	82.72	83.1	83.27		(217)
Fuel for wa (219)m = (	ter heating 64)m x 10	, kWh/m 0 ÷ (217)	onth )m									-	
(219)m= 288	.43 254.87	269.2	243.72	241.72	242.04	234.29	254.56	253.32	253.04	264.26	281.99		_
							Tota	al = Sum(2)	19a) <sub>112</sub> =			3081.43	(219)
Annual tot	<b>als</b> ting fuel use	ed main	system	1					k	Wh/yea	r	<b>kWh/year</b>	٦ T
Water heat	ing fuel use	d	oyotom	•								2091 42	1
		one and	alactria	kaan ha	+							5001.45	
central he	ating pump	ans anu :	electric	кеер-по	L						120	1	(230c)
Total electr	icity for the	above, I	kWh/yea	r			sum	of (230a).	(230g) =	:		120	(231)
Electricity for	or lighting											599.2	(232)
10a. Fuel	costs - indi	vidual he	eating sy	stems:									
					Fu kW	<b>el</b> /h/year			<b>Fuel P</b> (Table	<b>Price</b> 12)		<b>Fuel Cost</b> £/year	
Space heat	ing - main	system 1	1		<b>Fu</b> kW (211	<b>el</b> /h/year 1) x			Fuel P (Table	Price 12) 18	x 0.01 =	Fuel Cost £/year	(240)
Space heat	iing - main iing - main	system 1 system 2	1 2		Fu kW (211 (213	<b>el</b> /h/year 1) x 3) x			Fuel P (Table	Price 12) <sup>18</sup>	x 0.01 = x 0.01 =	Fuel Cost £/year	](240) ](241)
Space heat Space heat Space heat	ting - main ting - main ting - secor	system 1 system 2 ndary	1 2		Fu kW (211 (213 (215	el /h/year 1) x 3) x 5) x			<b>Fuel P</b> (Table 3.4	Price 12) 18	x 0.01 = x 0.01 = x 0.01 =	<b>Fuel Cost</b> £/year 792.22 0	)(240) )(241) )(242)
Space heat Space heat Space heat Water heat	ting - main ting - main ting - secor ing cost (ot	system 1 system 2 ndary her fuel)	1 2		Fu kW (211 (213 (215 (215	el /h/year 1) x 3) x 5) x			Fuel P (Table 3.4 0 13. 3.4	Price 12) 18 19 18	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 792.22 0 0 107.23	)(240) )(241) )(242) )(247)
Space heat Space heat Space heat Water heat Pumps, fan	ting - main ting - main ting - secor ing cost (ot is and elect	system 1 system 2 ndary her fuel) tric keep	l 2 -hot		Fu kW (211 (213 (215 (215) (234	el /h/year 1) x 3) x 5) x 9) 1)			Fuel P (Table 3.4 0 13. 3.4 13.	Price 12) 18 19 19 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 792.22 0 0 107.23 15.83	)(240) )(241) )(242) )(247) )(249)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting	system 1 system 2 idary her fuel) tric keep ach of (2	l <u>2</u> -hot 30a) to (	230g) se	Fu kW (211 (212 (215 (215 (237 eparately) (237	el /h/year 1) x 3) x 5) x 9) 1) / as app	licable a	nd apply	Fuel P (Table 3.4 0 13. 3.4 13. 7 fuel pri	Price 12) 18 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ r \ 0.01 = \\ \hline \begin{array}{l} x \ 0.01 = \\ x \ 0.01 = \\ \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a	)(240) )(241) )(242) )(247) )(249)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting	system 1 system 2 idary her fuel) cric keep ach of (2	l 2 -hot 30a) to (	230g) se	Fu kW (211 (213 (215 (215 (231 eparately (232	el /h/year 1) x 3) x 5) x 9) 1) / as app 2)	licable a	nd apply	Fuel P         (Table         3.4         0         13.         13.         r fuel prii         13.	Price 12) 18 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 0 107.23 15.83 Table 12a 79.03	)(240) )(241) )(242) )(247) )(249) )(250)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting standing ch	system 1 system 2 ndary her fuel) cric keep ach of (2 arges (T	l 2 -hot 30a) to ( able 12)	230g) se	Fu kW (211 (213 (215 (215 (237 eparately (237	el /h/year 1) x 3) x 5) x 9) 1) / as app 2)	licable a	nd apply	Fuel P         (Table         3.4         0         13.         3.4         13.         r fuel pri         13.	Price 12) 18 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 0 107.23 15.83 Table 12a 79.03 120	)(240) )(241) )(242) )(247) )(249) )(250) )(250) )(251)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s Appendix G	ting - main ting - main ting - secor ing cost (ot s and elect tariff, list ea lighting standing ch a items: rep ergy cost	system 1 system 2 idary her fuel) aric keep ach of (2 arges (T reat lines	1 -hot 30a) to ( able 12) 5 (253) ai	230g) se nd (254) (245)(	Fu kW (211 (213 (215 (215 (232 eparately (232 as need 247) + (25	el /h/year 1) x 3) x 5) x 9) 1) / as app 2) ded 50)(254)	licable a	nd apply	Fuel P         (Table         3.4         0         13.         13.         r fuel pri         13.	Price 12) 18 19 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a 79.03 120	)(240) )(241) )(242) )(247) )(247) )(249) )(250) )(251)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s Appendix C Total ener 11a. SAP	ting - main ting - main ting - secor ing cost (ot as and elect tariff, list ea lighting standing ch a items: rep ergy cost rating - ind	system 1 system 2 idary her fuel) aric keep ach of (2 arges (T eeat lines	l -hot 30a) to ( able 12) s (253) ai eating sy	230g) se nd (254) (245)( /stems	Fu kW (211 (212 (212 (212 (232 eparately (232 as need (247) + (25	el /h/year 1) x 3) x 5) x 9) 1) / as app 2) ded 50)(254)	licable a	nd apply	Fuel P         (Table         3.4         0         13.         13.         r fuel pri         13.	Price 12) 18 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a 79.03 120 1114.32	)(240) )(241) )(242) )(247) )(249) )(250) ](251) )(255)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s Appendix C Total energing 11a. SAP	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting standing ch a items: rep ergy cost rating - ind t deflator ( <sup>7</sup>	system 1 system 2 idary her fuel) cric keep ach of (2 arges (T eat lines ividual h	1 -hot 30a) to ( 7able 12) 5 (253) ai eating sy	230g) se nd (254) (245)( /stems	Fu kW (211 (212 (212 (212 (232 eparately (232 as need (247) + (25	el /h/year 1) x 3) x 5) x 9) 1) / as app 2) ded 50)(254)	licable a	nd apply	Fuel P         (Table         3.4         0         13.         13.         r fuel pri         13.	Price 12) 18 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a 79.03 120 1114.32	)(240) )(241) )(242) )(247) )(247) )(249) )(250) )(251) )(255)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s Appendix C Total energy I1a. SAP Energy cos Energy cos	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting standing ch a items: rep ergy cost rating - ind t deflator ( <sup>–</sup> t factor (EC	system 1 system 2 idary her fuel) cric keep ach of (2 arges (T eat lines ividual h fable 12 CF)	l -hot 30a) to ( able 12) (253) an eating sy	230g) se nd (254) (245)( /stems [(255) x	Fu kW (211 (213 (215 (215 (232 eparately (232 as need (247) + (25 (256)] ÷ [(	el /h/year 1) x 3) x 5) x 9) 1) 7 as app ded 50)(254) 4) + 45.0]	licable a	nd apply	Fuel P         (Table         3.4         0         13.         13.         r fuel prii         13.	Price 12) 18 19 19 18 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a 79.03 120 1114.32 0.42 2.59	(240) (241) (242) (247) (249) (250) (250) (251) (255)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s Appendix G Total energy Ina. SAP Energy cos Energy cos SAP rating	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting standing ch a items: rep ergy cost rating - ind t deflator ( <sup>–</sup> t factor (EC I <b>(Section</b>	system 1 system 2 idary her fuel) cric keep ach of (2 arges (T eat lines ividual h Fable 12 CF) <b>12)</b>	l 2 -hot 30a) to ( 7able 12) 5 (253) al eating sy	230g) se nd (254) (245)( /stems [(255) x	Fu kW (211 (213 (215 (215 (232 eparately (232 as need (247) + (25 (256)] ÷ [(	el /h/year 1) x 3) x 5) x 9) 1) / as app 2) ded 50)(254) 4) + 45.0]	licable a	nd apply	Fuel P         (Table         3.4         0         13.         3.4         13.         r fuel prii         13.	Price 12) 18 19 19 18 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a 79.03 120 1114.32 0.42 2.59 63.87	](240) ](241) ](242) ](247) ](249) ](250) ](250) ](255) ](255) ](256) ](257) ](258)
Space heat Space heat Space heat Water heat Pumps, fan (if off-peak Energy for Additional s Appendix C Total energy Energy cos Energy cos SAP rating 12a. CO2	ting - main ting - main ting - secor ing cost (ot is and elect tariff, list ea lighting standing ch itarns: rep ergy cost rating - ind t deflator ( <sup>7</sup> t factor (EC <b>(Section</b> -	system 1 system 2 idary her fuel) cric keep ach of (2 arges (T eat lines ividual h Fable 12 CF) <b>12)</b> – Individ	I 2 -hot 30a) to ( 7able 12) 6 (253) an eating sy ) ual heati	230g) se nd (254) (245)( /stems [(255) x	Fu kW (211 (213 (215 (215 (232 (232 as need (232 (232 (232 (232) (	el /h/year 1) x 3) x 5) x 9) 1) / as app 2) ded 50)(254) (4) + 45.0]	licable a = = cro-CHF	nd apply	Fuel P         (Table         3.4         0         13.         3.4         13.         r fuel pri         13.	Price 12) 18 19 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ rding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 792.22 0 107.23 15.83 Table 12a 79.03 120 1114.32 0.42 2.59 63.87	](240) ](241) ](242) ](247) ](249) ](250) ](250) ](255) ](255) ](256) ](257) ](258)

Emission factor kg CO2/kWh Emissions kg CO2/year

Space heating (main system 1)	(211) x	0.216	=	4917.25	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	665.59	(264)
Space and water heating	(261) + (262) + (263) + (264)	1) =		5582.84	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	62.28	(267)
Electricity for lighting	(232) x	0.519	=	310.99	(268)
Total CO2, kg/year		sum of (265)(271) =		5956.1	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		43.89	(273)
El rating (section 14)				56	(274)
13a Primary Energy					
rou. I finary Energy					
Tou. Finnary Enorgy	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	<b>Energy</b> kWh/year (211) x	Primary factor	=	P. Energy kWh/year 27773.33	(261)
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x	Primary factor 1.22 3.07	=	<b>P. Energy</b> kWh/year 27773.33	(261) (263)
Space heating (main system 1) Space heating (secondary) Energy for water heating	Energy kWh/year (211) x (215) x (219) x	Primary factor 1.22 3.07 1.22	= =	P. Energy kWh/year 27773.33 0 3759.35	)(261) )(263) )(264)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	Primary factor 1.22 3.07 1.22	-	P. Energy kWh/year 27773.33 0 3759.35 31532.68	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x	Primary factor 1.22 3.07 1.22	-	P. Energy kWh/year 27773.33 0 3759.35 31532.68 368.4	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	Primary factor 1.22 3.07 1.22 4) = 3.07 0	-	P. Energy kWh/year 27773.33 0 3759.35 31532.68 368.4 1839.55	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting 'Total Primary Energy	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	Primary factor 1.22 3.07 1.22 4) = 3.07 0 sum of (265)(271) =	-	P. Energy kWh/year 27773.33 0 3759.35 31532.68 368.4 1839.55 33740.63	(261) (263) (264) (265) (267) (268) (272)

				User D	etails:						
Assessor Name:	Ondrej Ga	jdos			Strom	a Num	ber:		STRO	006629	
User Details:Assessor Name:Stroma FSAP 2012Stroma Number:STR0006623Software Version:Version: 1.0.Property Address. 134, Torriano AvenueAddress:134, Torriano Avenue, LONDON, NW5 2RY1.Overall dwelling dimensions:Area(m?)Av. Height(m)VoluGround floorArea(m?)Av. Height(m)VoluSecond floor38.8(10)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)135.7(2c) = 10Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)135.7(2c) = 10Number of chimneysmainsecondary heatingothertotalm³ prNumber of chimneys0× 40 =Number of open flues0× 40 =Number of flueless gas fires0× 40 =Air changesNumber of flueless gas fires0× 40 =Air changesInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =× 40 =Air changesInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(						on: 1.0.4.10					
			Р	roperty .	Address	: 134, To	orriano A	venue			
User Details:Assessor Name:Ondrej GajdosStroma Rvamber:STRO006629Version:10.4.10Property Address:134, Torriano AvenueAddress:134, Torriano Avenue, LONDON NWS 2RY1. Overall dwelling dimensions:Volume(m?)Area(m?)Av. Height(m)Volume(m?)Ground floorCrospent (16)Volume(m?)Ground floorColspan="2">Colspan="2">Colspan= 100.77Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)135.77Colspan= 2.75Colspan=											
1. Overall dwelling dimer	nsions:										
User Details:Assessor Name:Ondrej GajdosStroma RNamber: Stroma RSAP 2012Stroma RNamber: Stroma RSAP 2012Stroma RNamber: Version: Version: 1.0.4.10Recently Address: 134, Torriano Avenue, LONDON MVS 2RYArea(m?)Av. Height(m) StatVolume(m?) 198.77(a)Area(m?)Av. Height(m) StatVolume(m?) 198.77Ground floorArea(m?) 198.7Av. Height(m) 20.2Volume(m?) 198.77Ground floorArea(m?) 198.77Av. Height(m) 198.77Volume(m?) 198.77Ground floorArea(m?) 198.77Av. Height(m) 20.2Volume(m?) 198.77Ground floorArea(m?) 198.77Av. Height(m) 20.2Volume(m?) 198.77Ground floorSat 198.77(a) 198.77Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 186.7Area(m?) 186.7Av. Height(m) 20.2Volume(m?) 198.77Number of chimneys meating no area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 186.7Area Total 188.7Mather of 188.7Mather of 188.7Store 188.7Number of chimneys number of chimneys number of chimneys number of sintended, proceed to (77), otherwise continue from (9) to (76) Number of storeys in the dwelling (ns) Additional infiltration 16 bet types of wall area (after ddecking area of opening).Group and area (38) (9)Group and area (38) (9)Infiltration 16 of th											
User Details:Assessor Name:Ondrej GajdosStroma FSAP 2012Stroma Number:STR0006629Version:Version:1.0.4.10Property Address: 134, Torriano AvenueAddress :134, Torriano Avenue, LONDON, NV5 2RY1. Overall dwelling dimensions:Volume(m <sup>2</sup> )Ground floorSoftware Version:Volume(m <sup>2</sup> )First floorSoftware Name:Volume(m <sup>2</sup> )Software Version:Volume(m <sup>2</sup> )Ground floorColspan="2">Volume(m <sup>2</sup> )First floorSoftware Version:Volume(m <sup>2</sup> )Ground floor2. 275Volume(m <sup>2</sup> )Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)135.77(a)Software Version:volume(m <sup>2</sup> )Volume(m <sup>2</sup> )volume(m <sup>2</sup> )On a state to the state matrix of the state					(3a)						
User Details:Assessor Name:Ondrej GajdosStroma FSAP 2012Stroma Number:STR0006629Version: 1.0.4.10Property Address: 134, Torriano AvenueAddress :134, Torriano Avenue, LONDON, NWS ZRY1. Overall dwelling dimensions:Area(m <sup>2</sup> )Av. Height(m)Volume(rGround floorSoftware Version:Volume(rGround floorAv. Height(m)Volume(rColspan="2">Second floorSaftware Version:Volume(r)Ground floorAv. Height(m)Volume(r)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)totalMumber of chirnneysmain secondary heatingtotalmain secondary heatingNumber of chirnneysmain secondary heatingtotalmain secondary heatingNumber of chirnneysmain secondary heatingtotalMumber of chirnneysMumber of secondary heatingNumber of span=flow wol					118.34	(3b)					
Second floor				;	38.8	(1c) x	2.	.75	(2c) =	106.7	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e	)+(1r	ו) 1	35.7	(4)					
Dwelling volume						(3a)+(3b	)+(3c)+(3d	)+(3e)+	.(3n) =	384.81	(5)
2. Ventilation rate:					a tha an		totol				
	heating	\$	econdar	У	otner	_	total			m <sup>3</sup> per nour	
Number of chimneys	0	+	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	] + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	าร						3	x ′	10 =	30	(7a)
Number of passive vents						Ē	0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					Γ	0	x 4	40 =	0	(7c)
											-
						_			Air ch	langes per no	ur ¬
Infiltration due to chimney	rs, flues and f	ans = (6 r in intende	a)+(6b)+(7	'a)+(7b)+(	7c) =	pontinuo fr	30	(16)	÷ (5) =	0.08	(8)
Number of storevs in th	e dwelling (ns	s)	a, procee	<i>a io (17), i</i>	olinei wise (	;onunue Ir	0111 (9) 10 (	10)		0	
Additional infiltration	e arrening (in	-)						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel o	r timber t	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are pro	esent, use the va	lue corres	ponding to	o the great	er wall are	a (after					_
If suspended wooden fl	gs); if equal user oor. enter 0.2	: (unseal	ed) or 0	.1 (seale	ed). else	enter 0				0	<b>]</b> (12)
If no draught lobby, ent	er 0.05, else (	enter 0		(	-,,					0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	15	(17)
If based on air permeabili	ty value, then	(18) = [(1	7) ÷ 20]+(8	8), otherwi	ise (18) = (	(16)				0.83	(18)
Air permeability value applies	s if a pressurisati	on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered	d				(20) = 1	[0 075 v (1	10)1			3	(19)
Sheller lactor	na chaltar fac	tor			$(20) = 1^{-2}$ (21) = (19)	[0.073 × (1	[3]] –			0.78	
Infiltration rate incorporati	ng sheller tac				(21) = (18	,				0.64	(21)
	Mar Anr	May	, lun	.lul	Aug	Sen	Oct	Nov	Dec	]	
Monthly average wind on	and from Tabl		Jun		I nug			1100		I	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
			0.0							l	

Wind F	actor (22	2a)m =	(22)m ÷ ·	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	tion rat	e (allowir	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.82	0.8	0.79	0.71	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75		
Calcula	ate effect	tive air	change r	ate for t	he appli	cable ca	se	•		-				
li me	aust air bea		ILION. Using Anne	ndiv N (2	(23a) – (23a	a) v Emv (e	auation (1		wise (23h	) - (23a)				0 (23a)
lf hala	anced with I	heat reco	werv: effici	ency in %	allowing f	or in-use f	actor (fron	n Table 4h	) –	<i>)</i> = (200)				0 (230)
a) If	balancec	1 mach	anical vo	ntilation	with he	at recove	any (MV/		y = (2)	2h)m ⊥ ('	23h) v [·	1 _ (23c)	· 1001	0 (230)
(24a)m=				0				0	0 $11 = (2)$		23D) X [	1 - (230)	- 100]	(24a)
b) If	balancec	1 mech	anical ve	ntilation	without	heat rec	coverv (N	///) (24b	m = (2)	1 2b)m + (;	23h)	-		· · · · ·
(24b)m=	0	0		0	0	0	0	0	0	0	0	0		(24b)
c) If	whole ho	ouse ex	tract ven	tilation of	r positiv	i ve input v	ı ventilatio	on from c	utside					
i	if (22b)m	< 0.5 ×	(23b), tł	nen (24	c) = (23k	); other	wise (24	c) = (22b	o) m + 0	.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural v	entilatio	on or who	ble hous	se positiv	ve input	ventilatio	on from I	oft	o <b>-1</b>			-	
(0.1.1)	if (22b)m	= 1, th	en (24d)r	n = (22)	o)m othe	erwise (2	.4d)m =	0.5 + [(2)]	2b)m² x	0.5]	0.70	0.70	I	(244)
(240)m=	0.83	0.82	0.81	0.75	0.74	0.69	0.69	0.68	0.71	0.74	0.76	0.78		(240)
ЕПе(			rate - en	1000000000000000000000000000000000000	) or (24)	$\frac{1}{1000}$ or (240	c) or (24		(25)	0.74	0.76	0.79	l	(25)
(23)11-	0.05	0.02	0.01	0.75	0.74	0.03	0.03	0.00	0.71	0.74	0.70	0.70		(20)
3. He	at losses	and he	eat loss p	aramet	er:									
ELEN	IENT	Gros area	ss (m²)	Openin m	gs 1 <sup>2</sup>	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/ł	<)	k-value kJ/m²∙ł	e ≺	A X k kJ/K
Doors						1.83	x	3	=	5.49				(26)
Windov	ws Type	1				0.39	x1	/[1/( 4.8 )+	0.04] =	1.57				(27)
Windov	ws Type :	2				2.44	x1	/[1/( 4.8 )+	0.04] =	9.83				(27)
Windov	ws Type	3				1.36	x1	/[1/( 4.8 )+	0.04] =	5.48				(27)
Windov	ws Type	4				1.36	x1	/[1/( 4.8 )+	0.04] =	5.48				(27)
Windov	ws Type	5				2	x1	/[1/( 4.8 )+	0.04] =	8.05				(27)
Windov	ws Type	6				1.75	x1	/[1/( 4.8 )+	0.04] =	7.05				(27)
Windov	ws Type	7				8.74	x1	/[1/( 1.8 )+	0.04] =	14.68				(27)
Windov	ws Type	8				2.63	x1	/[1/( 1.8 )+	0.04] =	4.42				(27)
Windov	ws Type	9				2.13	x1	/[1/( 4.8 )+	0.04] =	8.58				(27)
Windov	ws Type	10				1.56	x1	/[1/( 4.8 )+	0.04] =	6.28				(27)
Windov	ws Type	11				0.28		/[1/( 4.8 )+	0.04] =	1.13	=			(27)
Rooflig						h				·	=			(07)
-	phts					2.66	x1	/[1/(1.6) +	0.04] =	4.256				(Z7D)
Floor T	jhts ⁻ype 1					2.66 39.9	x1	/[1/(1.6) + 0	0.04] =	4.256 14.364				(276)
Floor T Floor T	jhts ⁻ype 1 ⁻ype 2					2.66 39.9 18.2	x1 x x	/[1/(1.6) + 0 0.36 0.22	0.04] =	4.256 14.364 4.004				(275)
Floor T Floor T Walls <sup>-</sup>	jhts ⁻ype 1 ⁻ype 2 Гype1	73.2	23	23.0	4	2.66 39.9 18.2 50.19	x1 x x x x x	/[1/(1.6) + 0 0.36 0.22 2.1	0.04] =	4.256 14.364 4.004 105.4				(27b) (28) (28) (29)

Roof 1	Гуре1	38.8	В	0		38.8	x	0.16	=	6.21				(30)
Roof 1	Гуре2	1.7	,	0		1.7	x	2.3	=	3.91				(30)
Roof 7	ГуреЗ	17.6	6	2.66	;	14.94	ı x	0.18	=	2.69	T T		╡	(30)
Total a	rea of el	ements	, m²			202.6	8							(31)
* for win	dows and i	roof winde	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapł	3.2	
** inclua	e the areas	s on both	sides of in	ternal wal	ls and par	titions								
Fabric	heat loss	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				241.24	(33)
Heat c	apacity C	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass <sub>l</sub>	parame	ter (TMF	? = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For desi can be ι	gn assessi ised instea	nents wh d of a dei	ere the de tailed calcເ	tails of the ılation.	construct	ion are not	t known pr	recisely the	e indicative	e values of	TMP in Te	able 1f		
Therm	al bridge	s : S (L	x Y) cal	culated u	using Ap	pendix ł	<						30.4	(36)
<i>if details</i> Total fa	of thermal abric hea	<i>bridging</i> It loss	are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			271.64	(37)
Ventila	tion heat	t loss ca	alculated	monthly	v				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(38)m=	105.99	104.34	102.73	95.13	93.71	87.09	87.09	85.86	89.64	93.71	96.58	99.59		(38)
Heat tr	ansfer co	Defficier	nt W/K		I	1	I		(39)m	= (37) + (3	1 38)m			
(39)m=	377.63	375.98	374.36	366.77	365.35	358.73	358.73	357.5	361.28	365.35	368.22	371.23		
									I	I Average =	Sum(39)1.	<sub>12</sub> /12=	366.76	(39)
Heat lo	oss parar	neter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	2.78	2.77	2.76	2.7	2.69	2.64	2.64	2.63	2.66	2.69	2.71	2.74		
Numbe	or of days	s in mor	oth (Tabl	0 1 2)						Average =	Sum(40)1.	12 /12=	2.7	(40)
NUTIDE		Eab	Mor	Apr	Mov	lup	lul	<u> </u>	Son	Oct	Nov	Dee		
(41)m-	31	28	1VIA1 31	Арі 30	1VIA y	30	31	71 Aug	30	31	30	31		(41)
(11)		20					01			01				()
4 \\/-	ten heed!													
4. VV2	iter neati	ng ener	rgy requi	rement:								KVVN/ye	ear:	
Assum	ed occup	bancy, I	N								2.	91		(42)
if TF	A > 13.9	, N = 1 N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.	.9)			
Annua	l average	e hot wa	ater usad	ie in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		103	3.27		(43)
Reduce	the annual	average	hot water	, usage by :	5% if the a	lwelling is	designed	to achieve	a water u	se target o	f			
not more	e that 125 l	itres per p	person per	day (all w	ater use, l	hot and co	ld)		·				1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	litres per	day for ea	ich month	Vd,m = fa	ctor from 1	Table 1c x	(43) T					1	
(44)m=	113.6	109.47	105.34	101.21	97.08	92.95	92.95	97.08	101.21	105.34	109.47	113.6		<b>—</b>
Enerav (	content of l	not water	used - cal	culated mo	onthly $= 4$ .	190 x Vd.r	n x nm x Г	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )	) kWh/moi	Total = Su hth (see Ta	m(44) <sub>112</sub> = ables 1b. 1	= c. 1d)	1239.3	(44)
(4E)m-	169 47	147.24	152.05	122 56	127.10	100.76	101 71	116 71	1101	127.64	150.24	162.15		
(45)111=	100.47	147.34	102.05	132.90	127.19	109.76	101.71	110./1	1 10.1	$\begin{bmatrix} 137.04 \\ Total = Stress$	m(45)	103.15	162/ 01	(45)
lf instan	taneous wa	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46	i) to (61)	i otai = 30	112 =	-	1024.91	(-0)
(46)m=	25.27	22.1	22.81	19.88	19.08	16.46	15.26	17.51	17.72	20.65	22.54	24.47		(46)
Water	storage I	OSS:							•					
Storag	e volume	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		170		(47)

lf comr Otherw Water	nunity h /ise if no storage	eating a stored loss:	ind no ta hot wate	ink in dw er (this in	velling, e Icludes i	nter 110 nstantar	litres in neous co	(47) mbi boil	ers) ente	er '0' in (	47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0	]	(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		17	70		(50)
b) If m Hot wa	anufact	urer's de age loss	eclared of factor fr	cylinder I com Tabl	oss fact e 2 (kW	or is not h/litre/da	known: ıy)				0.	02	]	(51)
If comr	nunity r a factor	from Tal	ee secti ble 2a	on 4.3								90	1	(52)
Tempe	rature f	actor fro	m Table	2b							0.	69 54		(52)
Energy Enter	/ lost fro (50) or (	m water (54) in (5	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	56		(54) (55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)r	n			1	
(56)m=	48.4	43.72	48.4	46.84	48.4	46.84	48.4	48.4	46.84	48.4	46.84	48.4		(56)
If cylinde	er contains	s dedicate	l d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	I lix H	
(57)m=	48.4	43.72	48.4	46.84	48.4	46.84	48.4	48.4	46.84	48.4	46.84	48.4		(57)
Primar	v circuit	loss (an	nual) fro	m Table	3							0		(58)
Primar (mod	y circuit dified by	loss (al loss cal	culated t	for each le H5 if t	month ( here is s	59)m = ( solar wat	(58) ÷ 36 er heatir	5 × (41) ng and a	m cylinder	r thermo	stat)	<u> </u>	I	()
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month (	(61)m =	(60) ÷ 36	55 x (41)	)m					1	
(61)m=	0	0		0	0			0	0	0	0	0	]	(61)
Total h	eat regi	uired for	water h	eating ca		for eacl	n month	(62)m –	0.85 v (	45)m +	(46)m +	(57)m +	 (59)m + (61)m	. ,
(62)m=	240.13	212.07	223.71	201.91	198.86	179.11	173.37	188.37	187.46	209.3	219.6	234.82		(62)
Solar DH	- W input o	calculated	usina App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix C	G)					
` (63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter										1	
(64)m=	240.13	212.07	223.71	201.91	198.86	179.11	173.37	188.37	187.46	209.3	219.6	234.82		
								Outp	out from wa	ater heate	r (annual)₁	12	2468.72	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	: [(46)m	+ (57)m	+ (59)m	1	-
(65)m=	113.35	100.78	107.89	99.56	99.62	91.98	91.15	96.14	94.75	103.1	105.44	111.58		(65)
inclu	de (57)	m in calo	ulation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Int	ernal ga	ains (see	e Table 5	and 5a	):	-		-				-	-	
Metabo	olic gain	s (Table	5) Wat	ts										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5	174.5		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equati	ion L9 oi	r L9a), a	lso see	Table 5				1	
(67)m=	67.86	60.27	49.02	37.11	27.74	23.42	25.3	32.89	44.15	56.05	65.42	69.74		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L'	13 or L1	3a), alsc	see Tal	ole 5	•		ı	
(68)m=	454.43	459.14	447.26	421.96	390.03	360.02	339.97	335.25	347.13	372.43	404.37	434.38		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				

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(69)m=	55.36	55.36	55.36	55.36	55.36	5	5.36	55.36	55.	36	55.36	55.36	55.36	55.	.36		(69)
Pumps	and fa	ns gains	(Table	5a)				•	•	-							
(70)m=	3	3	3	3	3		3	3	3		3	3	3	3	3		(70)
Losses	s e.g. e	vaporatio	n (nega	itive val	ues) (Ta	ble	5)			•			•	•			
(71)m=	-116.34	-116.34	-116.34	-116.34	-116.34	· -1	16.34	-116.34	-116	.34 -	116.34	-116.3	4 -116.34	-116	6.34		(71)
Water	heating	, gains (T	able 5)											•			
(72)m=	152.35	149.96	145.01	138.28	133.9	1	27.75	122.51	129	.22	131.6	138.5	7 146.44	149	9.97		(72)
Total i	nterna	l gains =					(66)	m + (67)m	n + (68	3)m + (	69)m + (i	70)m +	(71)m + (72	:)m			
(73)m=	791.16	785.91	757.81	713.87	668.2	6	27.71	604.31	613	.89	639.41	683.5	8 732.76	770	).62		(73)
6. Sol	ar gain	s:															
Solar g	ains are	calculated u	using sola	ar flux fror	n Table 6a	a and	assoc	iated equa	tions	to conv	vert to the	e applio	able orienta	tion.			
Orienta	ation:	Access F Table 6d	actor	Are m²	а		Flu Tal	x ole 6a		g Tal	]_ ble 6b		FF Table 6c			Gains (W)	
North	0.9x	0.77	x	1	.36	x	1	0.63	x	(	0.85	x	0.7		=	5.96	(74)
North	0.9x	0.77	×	1	.36	x	2	0.32	x	(	0.85	۲ × آ	0.7		=	11.4	(74)
North	0.9x	0.77	x	1	.36	x	3	4.53	x	(	0.85	×	0.7		=	19.36	(74)
North	0.9x	0.77	x	1	.36	x	5	5.46	x	(	0.85	×	0.7		=	31.1	(74)
North	0.9x	0.77	x	1	.36	x	7	4.72	x	(	0.85	x	0.7		=	41.9	(74)
North	0.9x	0.77	x	1	.36	x	7	9.99	x	(	0.85	x	0.7		=	44.85	(74)
North	0.9x	0.77	x	1	.36	x	7	4.68	x	(	0.85	x	0.7		=	41.88	(74)
North	0.9x	0.77	x	1	.36	x	5	9.25	x	(	0.85	x	0.7		=	33.22	(74)
North	0.9x	0.77	x	1	.36	x	4	1.52	x	(	0.85	x	0.7		=	23.28	(74)
North	0.9x	0.77	x	1	.36	x	2	4.19	x	(	0.85	x	0.7		=	13.56	(74)
North	0.9x	0.77	x	1	.36	x	1	3.12	x	(	0.85	x	0.7		=	7.36	(74)
North	0.9x	0.77	X	1	.36	x		8.86	x	(	0.85	x	0.7		=	4.97	(74)
Southea	ast <mark>0.9</mark> x	0.77	x	8	.74	x	3	6.79	x	(	0.63	x	0.7		=	98.28	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	2	.63	x	3	6.79	x	(	0.63	x	0.7		=	29.57	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	2	.13	x	3	6.79	x	(	0.85	x	0.7		=	32.32	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1	.56	x	3	6.79	x	(	0.85	x	0.7		=	47.33	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	0	.28	x	3	6.79	x	(	0.85	x	0.7		=	4.25	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	8	.74	x	6	2.67	X	(	0.63	×	0.7		=	167.4	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	2	.63	x	6	2.67	X	(	0.63	×	0.7		=	50.37	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	2	.13	x	6	2.67	X	(	0.85	×	0.7		=	55.04	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	1	.56	x	6	2.67	X	(	0.85	×	0.7		=	80.63	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	0	.28	x	6	2.67	X	(	0.85	×	0.7		=	7.24	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	8	.74	x	8	5.75	X	(	0.63	×	0.7		=	229.05	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	2	.63	x	8	5.75	×	(	0.63	×	0.7		=	68.92	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	2	.13	x	8	5.75	×	(	0.85	×	0.7		=	75.31	(77)
Southea	ast <mark>0.9x</mark>	0.77	X	1	.56	x	8	5.75	×	(	0.85	×	0.7		=	110.32	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	0	.28	x	8	5.75	×	(	0.85	×	0.7		=	9.9	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	8	.74	x	1	06.25	X		0.63	x	0.7		=	283.8	(77)

Southeast 0.9x	0.77	×	2.63	x	106.25	x	0.63	x	0.7	=	85.4	(77)
Southeast 0.9x	0.77	x	2.13	×	106.25	x	0.85	x	0.7	i =	93.32	<b>–</b> (77)
Southeast 0.9x	0.77	x	1.56	×	106.25	x	0.85	x	0.7	i =	136.69	(77)
Southeast 0.9x	0.77	x	0.28	×	106.25	x	0.85	x	0.7	i =	12.27	<b>–</b> (77)
Southeast 0.9x	0.77	x	8.74	x	119.01	x	0.63	x	0.7	i =	317.88	<b>–</b> (77)
Southeast 0.9x	0.77	x	2.63	×	119.01	x	0.63	x	0.7	i =	95.66	<b>–</b> (77)
Southeast 0.9x	0.77	x	2.13	x	119.01	x	0.85	x	0.7	=	104.52	(77)
Southeast 0.9x	0.77	x	1.56	×	119.01	x	0.85	x	0.7	=	153.11	<b>(77</b> )
Southeast 0.9x	0.77	x	0.28	×	119.01	x	0.85	x	0.7	=	13.74	(77)
Southeast 0.9x	0.77	x	8.74	×	118.15	×	0.63	x	0.7	=	315.59	(77)
Southeast 0.9x	0.77	x	2.63	x	118.15	x	0.63	x	0.7	=	94.96	(77)
Southeast 0.9x	0.77	x	2.13	x	118.15	x	0.85	x	0.7	=	103.77	(77)
Southeast 0.9x	0.77	x	1.56	×	118.15	<b>x</b>	0.85	x	0.7	=	152	(77)
Southeast 0.9x	0.77	x	0.28	x	118.15	x	0.85	x	0.7	=	13.64	(77)
Southeast 0.9x	0.77	x	8.74	x	113.91	x	0.63	x	0.7	=	304.26	(77)
Southeast 0.9x	0.77	x	2.63	x	113.91	x	0.63	x	0.7	=	91.56	(77)
Southeast 0.9x	0.77	x	2.13	x	113.91	x	0.85	x	0.7	=	100.04	(77)
Southeast 0.9x	0.77	x	1.56	x	113.91	x	0.85	x	0.7	=	146.54	(77)
Southeast 0.9x	0.77	x	0.28	x	113.91	x	0.85	x	0.7	=	13.15	(77)
Southeast 0.9x	0.77	x	8.74	x	104.39	x	0.63	x	0.7	=	278.83	(77)
Southeast 0.9x	0.77	x	2.63	x	104.39	x	0.63	x	0.7	=	83.91	(77)
Southeast 0.9x	0.77	x	2.13	x	104.39	x	0.85	x	0.7	=	91.68	(77)
Southeast 0.9x	0.77	x	1.56	x	104.39	x	0.85	x	0.7	=	134.3	(77)
Southeast 0.9x	0.77	x	0.28	×	104.39	x	0.85	x	0.7	] =	12.05	(77)
Southeast 0.9x	0.77	x	8.74	x	92.85	x	0.63	x	0.7	=	248.01	(77)
Southeast 0.9x	0.77	x	2.63	x	92.85	x	0.63	x	0.7	=	74.63	(77)
Southeast 0.9x	0.77	x	2.13	x	92.85	x	0.85	x	0.7	=	81.55	(77)
Southeast 0.9x	0.77	x	1.56	x	92.85	x	0.85	x	0.7	=	119.45	(77)
Southeast 0.9x	0.77	x	0.28	x	92.85	x	0.85	x	0.7	=	10.72	(77)
Southeast 0.9x	0.77	x	8.74	×	69.27	x	0.63	x	0.7	] =	185.02	(77)
Southeast 0.9x	0.77	x	2.63	x	69.27	x	0.63	x	0.7	=	55.67	(77)
Southeast 0.9x	0.77	x	2.13	x	69.27	x	0.85	x	0.7	=	60.84	(77)
Southeast 0.9x	0.77	x	1.56	x	69.27	x	0.85	x	0.7	=	89.11	(77)
Southeast 0.9x	0.77	x	0.28	x	69.27	x	0.85	x	0.7	=	8	(77)
Southeast 0.9x	0.77	x	8.74	x	44.07	x	0.63	x	0.7	=	117.71	(77)
Southeast 0.9x	0.77	x	2.63	x	44.07	x	0.63	x	0.7	=	35.42	(77)
Southeast 0.9x	0.77	x	2.13	×	44.07	x	0.85	x	0.7	=	38.71	(77)
Southeast 0.9x	0.77	x	1.56	×	44.07	x	0.85	x	0.7	=	56.7	(77)
Southeast 0.9x	0.77	x	0.28	×	44.07	x	0.85	x	0.7	=	5.09	(77)
Southeast 0.9x	0.77	x	8.74	×	31.49	x	0.63	×	0.7	] =	84.11	(77)
Southeast 0.9x	0.77	x	2.63	×	31.49	x	0.63	x	0.7	=	25.31	(77)

Southeast 0.9x	0.77	x	2.13	x	31.49	x	0.85	x	0.7	=	27.65	7(77)
Southeast 0.9x	0.77	] x	1.56	x	31.49	x	0.85	x	0.7	=	40.51	](77)
Southeast 0.9x	0.77	x	0.28	x	31.49	x	0.85	x	0.7	i =	3.64	] <sub>(77)</sub>
West 0.9x	0.77	x	1.36	x	19.64	x	0.85	x	0.7	1 =	11.01	_ ](80)
West 0.9x	0.77	x	1.36	x	38.42	×	0.85	x	0.7	i =	21.55	] (80)
West 0.9x	0.77	x	1.36	x	63.27	x	0.85	x	0.7	=	35.48	] (80)
West 0.9x	0.77	x	1.36	x	92.28	×	0.85	x	0.7	<b>i</b> =	51.75	(80)
West 0.9x	0.77	x	1.36	x	113.09	×	0.85	x	0.7	<b>j</b> =	63.42	(80)
West 0.9x	0.77	x	1.36	x	115.77	x	0.85	x	0.7	=	64.92	(80)
West 0.9x	0.77	x	1.36	×	110.22	×	0.85	x	0.7	] =	61.81	(80)
West 0.9x	0.77	x	1.36	x	94.68	x	0.85	x	0.7	] =	53.09	(80)
West 0.9x	0.77	x	1.36	x	73.59	x	0.85	x	0.7	=	41.27	(80)
West 0.9x	0.77	x	1.36	x	45.59	x	0.85	x	0.7	=	25.57	(80)
West 0.9x	0.77	x	1.36	x	24.49	x	0.85	x	0.7	=	13.73	(80)
West 0.9x	0.77	x	1.36	x	16.15	x	0.85	x	0.7	=	9.06	(80)
Northwest 0.9x	0.77	x	0.39	x	11.28	x	0.85	x	0.7	=	1.81	(81)
Northwest 0.9x	0.77	x	2.44	x	11.28	x	0.85	x	0.7	=	11.35	(81)
Northwest 0.9x	0.77	x	2	x	11.28	x	0.85	x	0.7	=	18.61	(81)
Northwest 0.9x	0.77	x	1.75	x	11.28	x	0.85	x	0.7	=	16.28	(81)
Northwest 0.9x	0.77	x	0.39	x	22.97	x	0.85	x	0.7	=	3.69	(81)
Northwest 0.9x	0.77	x	2.44	x	22.97	x	0.85	x	0.7	=	23.11	(81)
Northwest 0.9x	0.77	x	2	x	22.97	x	0.85	x	0.7	] =	37.88	(81)
Northwest 0.9x	0.77	x	1.75	x	22.97	x	0.85	x	0.7	=	33.14	(81)
Northwest 0.9x	0.77	x	0.39	x	41.38	x	0.85	x	0.7	=	6.65	(81)
Northwest 0.9x	0.77	x	2.44	x	41.38	x	0.85	x	0.7	] =	41.63	(81)
Northwest 0.9x	0.77	x	2	x	41.38	x	0.85	x	0.7	] =	68.25	(81)
Northwest 0.9x	0.77	x	1.75	x	41.38	x	0.85	x	0.7	] =	59.72	(81)
Northwest 0.9x	0.77	x	0.39	x	67.96	x	0.85	x	0.7	] =	10.93	(81)
Northwest 0.9x	0.77	x	2.44	x	67.96	x	0.85	x	0.7	] =	68.37	(81)
Northwest 0.9x	0.77	x	2	x	67.96	x	0.85	x	0.7	=	112.08	(81)
Northwest 0.9x	0.77	x	1.75	x	67.96	x	0.85	x	0.7	=	98.07	(81)
Northwest 0.9x	0.77	x	0.39	x	91.35	x	0.85	x	0.7	] =	14.69	(81)
Northwest 0.9x	0.77	x	2.44	x	91.35	x	0.85	x	0.7	] =	91.9	(81)
Northwest 0.9x	0.77	x	2	x	91.35	x	0.85	x	0.7	=	150.66	(81)
Northwest 0.9x	0.77	x	1.75	x	91.35	x	0.85	x	0.7	] =	131.83	(81)
Northwest 0.9x	0.77	x	0.39	x	97.38	x	0.85	x	0.7	=	15.66	(81)
Northwest 0.9x	0.77	x	2.44	x	97.38	x	0.85	x	0.7	=	97.98	(81)
Northwest 0.9x	0.77	x	2	x	97.38	x	0.85	x	0.7	=	160.62	(81)
Northwest 0.9x	0.77	x	1.75	×	97.38	<b>x</b>	0.85	x	0.7	] =	140.54	(81)
Northwest 0.9x	0.77	x	0.39	×	91.1	×	0.85	x	0.7	=	14.65	(81)
Northwest 0.9x	0.77	x	2.44	×	91.1	×	0.85	x	0.7	=	91.66	(81)

Northw	est 0.9x	0.77	)	ĸ	2		×	91.1	x	0.85	x	0.7	=	150.26	(81)
Northw	est 0.9x	0.77		ĸ	1.75		× 🔽	91.1	] x	0.85	x	0.7	=	131.47	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	0.39	Ŧ.	× 🗌	72.63	x	0.85	x	0.7	=	11.68	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2.44	1	× 🕅	72.63	×	0.85	x	0.7	=	73.07	(81)
Northw	est 0.9x	0.77	)	ĸ	2	٦.	× 🗌	72.63	x	0.85	x	0.7	=	119.79	(81)
Northw	est 0.9x	0.77	,	ĸ	1.75	٦,	× 🗌	72.63	x	0.85	x	0.7	=	104.81	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	0.39	1	× 🕅	50.42	×	0.85	x	0.7	=	8.11	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2.44	Ŧ.	× 🗌	50.42	x	0.85	x	0.7	=	50.73	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2		× 🕅	50.42	×	0.85	x	0.7	=	83.16	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	1.75	1	× 🕅	50.42	×	0.85	x	0.7	=	72.77	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	0.39	Ŧ.	× 🗌	28.07	x	0.85	x	0.7	=	4.51	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2.44	1	× 🕅	28.07	x	0.85	x	0.7	=	28.24	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2		× 🗌	28.07	×	0.85	x	0.7	=	46.29	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	1.75	Ē	× 🕅	28.07	x	0.85	x	0.7	=	40.51	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	0.39	1	× 🕅	14.2	x	0.85	x	0.7	=	2.28	(81)
Northw	est <mark>0.9x</mark>	0.77	}	ĸ	2.44		× 🕅	14.2	×	0.85	x	0.7	=	14.28	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2	Ŧ.	× 🗌	14.2	x	0.85	x	0.7	=	23.42	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	1.75		× 🕅	14.2	×	0.85	x	0.7	=	20.49	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	0.39	1	× 🕅	9.21	x	0.85	x	0.7	=	1.48	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2.44	1	× 🕅	9.21	×	0.85	x	0.7	=	9.27	(81)
Northw	est <mark>0.9x</mark>	0.77	)	ĸ	2		×	9.21	×	0.85	x	0.7	=	15.2	(81)
Northw	est <mark>0.9x</mark>	0.77	}	ĸ	1.75	1	× 🕅	9.21	x	0.85	x	0.7	=	13.3	(81)
Rooflig	hts <mark>0.9x</mark>	1	>	ĸ	2.66		×	26	×	0.63	x	0.7	=	27.45	(82)
Rooflig	hts 0.9x	1	)	ĸ	2.66		×	54	x	0.63	x	0.7	=	57.01	(82)
Rooflig	hts <mark>0.9x</mark>	1	>	ĸ	2.66		× 🔽	96	×	0.63	x	0.7	=	101.35	(82)
Rooflig	hts <mark>0.9x</mark>	1	)	ĸ	2.66		×	150	×	0.63	x	0.7	=	158.36	(82)
Rooflig	hts <mark>0.9x</mark>	1	)	ĸ	2.66		×	192	x	0.63	x	0.7	=	202.7	(82)
Rooflig	hts <mark>0.9x</mark>	1	>	ĸ	2.66		×	200	×	0.63	x	0.7	=	211.15	(82)
Rooflig	hts <mark>0.9x</mark>	1	)	ĸ	2.66		×	189	x	0.63	x	0.7	=	199.54	(82)
Rooflig	hts <mark>0.9</mark> x	1	)	ĸ	2.66		×	157	×	0.63	x	0.7	=	165.75	(82)
Rooflig	hts <mark>0.9x</mark>	1	)	ĸ	2.66		×	115	×	0.63	x	0.7	=	121.41	(82)
Rooflig	hts <mark>0.9x</mark>	1	)	ĸ	2.66		×	66	x	0.63	x	0.7	=	69.68	(82)
Rooflig	hts <mark>0.9</mark> x	1	)	ĸ	2.66		×	33	×	0.63	x	0.7	=	34.84	(82)
Rooflig	hts <mark>0.9x</mark>	1	>	ĸ	2.66		× 🗌	21	x	0.63	x	0.7	=	22.17	(82)
Solar g	pains in	watts, ca	alculate	d	for each mo	nth			(83)m	n = Sum(74)m	(82)m			1	
(83)m=	304.23	548.46	825.96		1142.15 1382	2.01	1415.6	8 1346.81	1162	2.19 935.09	627	370.03	256.66		(83)
l otal g	jains – i	nternal a	ind sola	ar T	(84)m = (73)	ו- m( ד	- (83)r	n, watts	1		r			1	(2.1)
(84)m=	1095.4	1334.37	1583.77	1	1856.02 2050	).21	2043.3	9 1951.12	1776	5.08 1574.5	1310.5	1102.79	1027.28		(84)
7. Me	an inter	rnal temp	erature	e (	heating seas	son)									
Temp	erature	during h	eating	pe	eriods in the	livir	ng area	a from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisa	ation fac	ctor for ga	ains for	· li T	ving area, h	1,m	(see ]	able 9a)						1	
	Jan	⊢eb	Mar	1	Apr   M	ay	Jun	Jul		ug   Sep	Uct	Nov	Dec		

(86)m=	0.99	0.99	0.97	0.94	0.88	0.77	0.65	0.71	0.87	0.96	0.99	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	18.22	18.47	18.92	19.55	20.14	20.61	20.83	20.79	20.39	19.63	18.83	18.2		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	18.86	18.87	18.88	18.91	18.91	18.94	18.94	18.94	18.93	18.91	18.9	18.89		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.96	0.92	0.82	0.63	0.4	0.47	0.77	0.94	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	16.51	16.76	17.21	17.84	18.39	18.79	18.91	18.9	18.64	17.94	17.14	16.51		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.37	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA x T1	+ (1 – fL	A) × T2					
(92)m=	17.14	17.39	17.84	18.47	19.04	19.46	19.62	19.6	19.28	18.56	17.76	17.13		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	e 4e, whe	ere appro	opriate				
(93)m=	17.14	17.39	17.84	18.47	19.04	19.46	19.62	19.6	19.28	18.56	17.76	17.13		(93)
8. Spa	ace hea	ting requ	uirement					Table O		· <b>T</b> ' · · · /	70)		la ta	
the ut	to the r	nean int factor fo	ernal ter or dains	mperatui using Ta	re obtain able 9a	ied at ste	ep 11 of	l able 9	d, so tha	t II,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	<u>.</u> 1:			1							
(94)m=	0.99	0.97	0.95	0.91	0.82	0.67	0.5	0.56	0.79	0.93	0.98	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	1079.19	1300.89	1511.04	1684.73	1681.6	1375.12	976.07	993.48	1247.9	1223.7	1077.04	1014.52		(95)
Month	nly avera	age exte	ernal tem	perature	e from Ta	able 8	40.0	40.4	444	40.0	74	4.0		(06)
(96)m=	4.3	4.9	0.5	8.9		14.0	-[(20)m	v [(02)m	(06)m	10.6	7.1	4.2		(90)
(97)m=	4847.49	4696.28	4245.61	3510.65	2680.08	1743.82	1083.34	1142.75	1873.22	2908.15	3926.79	4800.05		(97)
Space	e heatin	a require	ement fo	r each n	nonth. k	Nh/mon	h = 0.02	24 x [(97)	)m – (95	)ml x (4'	1)m			
(98)m=	2803.61	2281.7	2034.52	1314.66	742.87	0	0	0	0	1253.23	2051.82	2816.43		
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	15298.84	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year							[	112.74	(99)
9a. En	erav rea	uiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	ı micro-C	CHP)			L		
Space	e heatir	ng:				)								
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	– (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1							ĺ	90.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %					ĺ	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space	e heatin	g require	ement (c	alculate	d above)	ı)	!						,	
	2803.61	2281.7	2034.52	1314.66	742.87	0	0	0	0	1253.23	2051.82	2816.43		
(211)m	= {[(98	)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	3101.34	2524.01	2250.57	1454.27	821.76	0	0	0	0	1386.31	2269.71	3115.52		
								Tota	ll (kWh/yea	ar) = Sum(2)	211) <sub>15,1012</sub>	=	16923.49	(211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)									
(215)m= 0 0 0 0	0 0	0	0	0	0	0	0		-
			Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u>7</u>	0	(215)
Water heating									
240.13 212.07 223.71 201.91 19	e) 8.86 179.11	173.37	188.37	187.46	209.3	219.6	234.82		
Efficiency of water heater		II						79.7	(216)
(217)m= 89.45 89.38 89.21 88.81 87	7.91 79.7	79.7	79.7	79.7	88.7	89.24	89.48		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$									
(219)m= 268.45 237.27 250.76 227.34 220	6.21 224.73	217.53	236.35	235.2	235.98	246.07	262.44		_
			Tota	I = Sum(2 <sup>^</sup>	19a) <sub>112</sub> =			2868.34	(219)
Annual totals					k	Wh/year	•	kWh/year	1
Water heating fuel used								2868.34	] ]
Electricity for pumps, fans and electric kee	p-hot								J
central heating pump:	F						30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								479.36	(232)
									_
10a. Fuel costs - individual heating syster	ms:								
10ā. Fuel costs - individual heating syster	ms: Fu	ما			Fuel P	rico		Fuel Cost	
10ā. Fuel costs - individual heating syster	ms: <b>Fu</b> kW	<b>el</b> /h/year			<b>Fuel P</b> (Table	<b>rice</b> 12)		<b>Fuel Cost</b> £/year	
Space heating - main system 1	ms: Fu kW (211	<b>el</b> /h/year 1) x			Fuel P (Table	rice 12) 8	x 0.01 =	<b>Fuel Cost</b> £/year	](240)
Space heating - main system 1 Space heating - main system 2	ms: Fu kW (211 (213	el /h/year <sup>1) x</sup> 3) x			Fuel P (Table	rice 12) 8	x 0.01 = x 0.01 =	Fuel Cost £/year <sup>588.94</sup>	](240) ](241)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary	ms: Fu kW (211 (211 (211) (211)	<b>el</b> /h/year 1) x 3) x 5) x			<b>Fuel P</b> (Table 3.4 0 13.	12) 8	x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 588.94 0 0	](240) ](241) ](242)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel)	ms: Fu kW (211 (213 (215) (215) (215)	<b>el</b> /h/year 1) x 3) x 5) x			Fuel P (Table 3.4 0 13.	rice 12) 8 19 8	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	<b>Fuel Cost</b> £/year 588.94 0 0 99.82	)(240) )(241) )(242) )(247)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot	ms: Fu kW (211 (213 (215 (215) (231	<b>el</b> /h/year 1) x 3) x 5) x 9) 1)			Fuel P (Table 3.4 0 13. 3.4 13.	rice 12) 8 19 8 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	<b>Fuel Cost</b> £/year 588.94 0 0 99.82 9.89	)(240) )(241) )(242) )(247) )(249)
Space heating - main system 1 Space heating - main system 2 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230 Energy for lighting	ms: Fu kW (211 (213 (215 (215 (237 )g) separately (235	el /h/year 1) x 3) x 5) x 9) 1) / as appli	cable a	nd apply	Fuel P (Table 3.4 0 13. 3.4 13. 7 fuel pri	rice 12) 8 19 19 19 19 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to - x 0.01 =	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a	](240) ](241) ](242) ](247) ](249)
Space heating - main system 1 Space heating - main system 2 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230 Energy for lighting Additional standing charges (Table 12)	ms: Fu kW (211 (213 (215 (215 (215 (231 )g) separately (232	el /h/year 1) x 3) x 5) x 9) 1) / as appli 2)	cable a	nd apply	Fuel P           (Table           3.4           0           13.           3.4           13.           13.           fuel priv           13.	rice 12) 8 19 8 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ \hline x \ 0.01 = \\ \hline cling \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a 63.23	](240) ](241) ](242) ](247) ](249) ](250) ](250)
Space heating - main system 1 Space heating - main system 2 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230 Energy for lighting Additional standing charges (Table 12)	ms: Fu kW (211 (213 (214 (214 (214 (214) (232) )g) separately (232)	el /h/year 1) x 3) x 5) x 9) 1) y as appli	cable a	nd apply	Fuel P           (Table           3.4           0           13.           3.4           13.           13.           fuel priv           13.	rice 12) 8 19 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ \hline c \ c \ 0.01 = \\ \end{array}$	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a 63.23 120	](240) ](241) ](242) ](247) ](249) ](250) ](251)
Space heating - main system 1 Space heating - main system 2 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) and ( <b>Total energy cost</b> (2	ms: Fu kW (211 (213 (214 (214 (214) (232 (232) (254) as need (45)(247) + (25)	el /h/year 1) x 3) x 5) x 9) 1) / as appli 2) ded 60)(254) =	cable a	nd apply	Fuel P         (Table         3.4         0         13.         3.4         13.         fuel priv         13.	rice 12) 8 19 8 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ \hline x \ 0.01 = \\ \hline cling \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a 63.23 120	](240) ](241) ](242) ](247) ](249) ](250) ](251)
Space heating - main system 1Space heating - main system 1Space heating - main system 2Space heating - secondaryWater heating cost (other fuel)Pumps, fans and electric keep-hot(if off-peak tariff, list each of (230a) to (230Energy for lightingAdditional standing charges (Table 12)Appendix Q items: repeat lines (253) and (Total energy cost(211a. SAP rating - individual heating system	ms: Fu kW (211 (213 (216 (216 (216 (216 (216 (216 (217) (232 (254) as need (254) as need (254) as need	el /h/year 1) x 3) x 5) x 9) 1) / as appli 2) ded 50)(254) =	cable a	nd apply	Fuel P (Table 3.4 0 13. 3.4 13. fuel pri 13.	rice 12) 8 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ \hline x \ 0.01 = \\ \hline c \ ding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 588.94 0 0 999.82 9.89 Fable 12a 63.23 120 881.88	](240) ](241) ](242) ](247) ](249) ](250) ](251) ](255)
Space heating - main system 1Space heating - main system 2Space heating - main system 2Space heating - secondaryWater heating cost (other fuel)Pumps, fans and electric keep-hot(if off-peak tariff, list each of (230a) to (230Energy for lightingAdditional standing charges (Table 12)Appendix Q items: repeat lines (253) and (Total energy cost(211a. SAP rating - individual heating systeEnergy cost deflator (Table 12)	ms: Fu kW (211 (213 (214 (214 (214 (214 (214 (214 (214 (214	el /h/year 1) x 3) x 5) x 9) 1) / as appli 2) ded 50)(254) =	cable a	nd apply	Fuel P         (Table         3.4         0         13.         3.4         13.         7 fuel priv         13.	rice 12) 8 19 8 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ \hline x \ 0.01 = \\ \hline cling \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a 63.23 120 881.88	](240) ](241) ](242) ](247) ](249) ](250) ](251) ](255)
Toa. Fuel costs - individual heating systemSpace heating - main system 1Space heating - main system 2Space heating - secondaryWater heating cost (other fuel)Pumps, fans and electric keep-hot(if off-peak tariff, list each of (230a) to (230Energy for lightingAdditional standing charges (Table 12)Appendix Q items: repeat lines (253) and (Total energy cost(211a. SAP rating - individual heating systeEnergy cost deflator (Table 12)Energy cost factor (ECF)	ms: Fu kW (211 (213 (214) (214 (214) (215)	el /h/year 1) x 3) x 5) x 9) 1) / as appli ded 50)(254) =	cable a	nd apply	Fuel P (Table 3.4 0 13. 3.4 13. 13.	rice 12) 8 19 19 19 19 19	$\begin{array}{l} x \ 0.01 = \\ \hline x \ 0.01 = \\ \hline c \ ding \ to \\ x \ 0.01 = \end{array}$	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a 63.23 120 881.88 881.88	](240) ](241) ](242) ](247) ](249) ](250) ](251) ](255) ](255) ](256) ](257)
Space heating - main system 1         Space heating - main system 2         Space heating - secondary         Water heating cost (other fuel)         Pumps, fans and electric keep-hot         (if off-peak tariff, list each of (230a) to (230         Energy for lighting         Additional standing charges (Table 12)         Appendix Q items: repeat lines (253) and (         Total energy cost       (2         11a. SAP rating - individual heating syste         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(2         SAP rating (Section 12)	ms: Fu kW (211 (213 (214 (214 (214 (214 (214 (215) (232 (232 (254) as need (45)(247) + (25 ms (255) × (256)] ÷ [(	el /h/year 1) x 3) x 5) x 9) 1) / as appli ded 60)(254) =	icable a = =	nd apply	Fuel P (Table 3.4 0 13. 3.4 13. fuel pri 13.	rice 12) 8 19 8 19 19 19 19 19	x 0.01 =      rding to      x 0.01 =      x 0.01 =	Fuel Cost £/year 588.94 0 0 99.82 9.89 Fable 12a 63.23 120 881.88 881.88	](240) ](241) ](242) ](247) ](249) ](250) ](250) ](251) ](255) ](256) ](257) ](258)

	<b>Energy</b> kWh/year	<b>Emission factor</b> kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	3655.47 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	619.56 (264)
Space and water heating	(261) + (262) + (263)	+ (264) =	4275.04 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	248.79 (268)
Total CO2, kg/year		sum of (265)(271) =	4562.75 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	33.62 (273)
El rating (section 14)			66 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	20646.66 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	3499.38 (264)
Space and water heating	(261) + (262) + (263)	+ (264) =	24146.04 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	1471.64 (268)
'Total Primary Energy		sum of (265)(271) =	25847.93 (272)