Assessor Name:				lloor F	Notoile:						
## Acade   Section   Secti		•			Strom Softwa	are Vei					
Area(m²)	Address :	Flat 1 16 Rochest									
Area(m/*)			er mews	, LOND	<b>311</b> , 1 <b>111</b>	30B					
Number of chimneys	<u> </u>					(1a) x		_ , ,	(2a) =	<u> </u>	<u> </u>
Number of chimneys	Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	60.44	(4)			_		
Number of chimneys				· L			)+(3c)+(3c	d)+(3e)+	.(3n) =	169.23	(5)
Number of chimneys	2. Ventilation rate:										
Number of intermittent fans    2		heating	heating	· 		] = [		x	40 =		_
Number of intermittent fans    2	Number of open flues	0 +	0	╡ + F	0	i	0	x	20 =	0	(6b)
Number of passive vents	Number of intermittent fa	ans				J	2	x	10 =	20	=
Number of flueless gas fires						F		x	10 =		Ⅎ``
Air changes per hour	•					Ļ					= ' '
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20	Number of flueless gas	illes					0	^	+0 =	0	(7c)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)   Number of storeys in the dwelling (ns)									Air ch	nanges per ho	our
Number of storeys in the dwelling (ns)   Additional infiltration   (19)-1)x0.1 =   0 (10) (10)	Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	<b>7</b> a)+(7b)+(	(7c) =	Г	20		÷ (5) =	0.12	(8)
Additional infiltration	If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) ÷ 100] =  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor  (20) = 1 - [0.075 × (19)] =  0.78  (20)  Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4	•	the dwelling (ns)								0	(9)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) ÷ 100] = 0  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) = 0  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor  (20) = 1 - [0.075 × (19)] = 0.78  (20)  Infiltration rate incorporating shelter factor  (21) = (18) × (20) = 0.21  Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4								[(9)	-1]x0.1 =	0	<b>⊣</b> `′
If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) ± 100] = 0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) = 0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) ± 20]+(8), otherwise (18) = (16) (17)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor  (20) = 1 - [0.075 × (19)] = 0.78 (20)  Infiltration rate incorporating shelter factor  (21) = (18) × (20) = 0.21 (21)  Infiltration rate modified for monthly wind speed  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4	if both types of wall are p	present, use the value corre				•	ruction			0	(11)
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times$	If suspended wooden	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0 $ Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0 $ Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0 $ Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0 $ Infiltration rate incorporating shelter factor $ (20) = 1 - [0.075 \times (19)] = 0.78 $ Infiltration rate modified for monthly wind speed $ (20) = 1 - [0.075 \times (19)] = 0.78 $ Infiltration rate modified for monthly wind speed $ (21) = (18) \times (20) = 0.21 $ Infiltration rate modified from Table 7 $ (22)m = 5.1 + 5 + 4.9 + 4.4 + 4.3 + 3.8 + 3.8 + 3.7 + 4 + 4.3 + 4.5 + 4.7 $ Wind Factor $(22a)m = (22)m \div 4 $	•									0	(13)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.27$ (18)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.78$ (20)  Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.21$ (21)  Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor $(22a)m = (22)m \div 4$	J	vs and doors draught s	stripped		0.05 10.0	(4.4)	001			0	= ' '
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] = $ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = $ Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7 $(22)m = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7$ Wind Factor $(22a)m = (22)m \div 4$								. (15) -			= ' '
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $(21) = (18) \times (20) =$ Monthly average wind speed from Table 7 $(22)m = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7$ Wind Factor $(22a)m = (22)m \div 4$		aEO overegoed in ou	hia matra	o por be					oroo		= ' '
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.78  (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.21  (21)$ Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7 $(22)m = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7$ Wind Factor $(22a)m = (22)m \div 4$				•	•	•	elle oi e	rivelope	area		= ' '
Number of sides sheltered Shelter factor $ (20) = 1 - [0.075 \times (19)] = 0.78 $ (20) Infiltration rate incorporating shelter factor $ (21) = (18) \times (20) = 0.21 $ (21) Infiltration rate modified for monthly wind speed	·	•					is being u	sed		0.27	(10)
Infiltration rate incorporating shelter factor	Number of sides shelter	ed			-					3	(19)
Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4	Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.78	(20)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Monthly average wind speed from Table 7           (22)m=         5.1         5         4.9         4.4         4.3         3.8         3.7         4         4.3         4.5         4.7           Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.21	(21)
Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate modified	for monthly wind spee	d		•			•	•	•	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind s	peed from Table 7								_	
	(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
	Wind Factor (22a)m = (2	22)m ÷ 4									
	<u> </u>	<del></del>	0.95	0.95	0.92	1	1.08	1.12	1.18	]	

Adjusted infiltra	ation rate	(allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.27	0.26	0.25	0.23	0.22	0.2	0.2	0.19	0.21	0.22	0.23	0.24	1	
Calculate effec		•	rate for t	he appli	cable ca	ise		!	!	•			_
If mechanica			andiv NL (O	12h) (22a	a) Em. /	aguatian (I	\ E\\	muiaa (22h	) (225)			0	(23a)
If exhaust air he		•	•	, ,	,			•	) = (23a)			0	(23b)
If balanced with		-	-	_					OL ) (		4 (00.)	0	(23c)
a) If balance	ed mecna	nicai ve	ntilation	with nea	at recove	ery (MV)	HR) (248	$\frac{a)m = (2)}{0}$	2b)m + (   0	$\frac{(230) \times [}{0}$	$\frac{1 - (23c)}{0}$	) ÷ 100] ]	(24a)
` '		-										]	(244)
b) If balance	o mecha	nicai ve	ntilation 0	without 0	neat red		0 (24)	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	26)m + (   0	230)	0	1	(24b)
c) If whole h	<u> </u>			ļ	<u> </u>	<u> </u>	<u> </u>	<u> </u>					(210)
,	n < 0.5 ×			•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24c)
d) If natural	ventilatio	n or wh	ole hous	e positiv	ve input	ventilatio	on from	loft	<u>!</u>	<u>!</u>	ļ	ı	
,	n = 1, the			•	•				0.5]			_	
(24d)m= 0.54	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.53	0.53		(24d)
Effective air	change r	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.54	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.53	0.53		(25)
3. Heat losses	s and hea	at loss p	paramete	er:									
ELEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		X k J/K
Windows Type	e 1												
					10.8	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	12.37				(27)
Windows Type					2.88	_	/[1/( 1.2 )+ /[1/( 1.2 )+		12.37				(27) (27)
Windows Type Windows Type	2					x1		0.04] =					` '
• •	2				2.88	x1	/[1/( 1.2 )+	0.04] =	3.3		75	4533	(27)
Windows Type	2		15.7	8	2.88	x1 x1 4 x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] =	3.3		75	4533	(27) (27) 3 (28)
Windows Type Floor	e 2 e 3		15.76	8	2.88 2.1 60.44	x1 x1 4 x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 	0.04] =	3.3 2.4 6.044			= =	(27) (27) 8 (28) 2 (29)
Windows Type Floor Walls Type1	64.4	1		8	2.88 2.1 60.44 48.62	x1 x1 4 x 2 x 4 x	/[1/( 1.2 )+ /[1/( 1.2 )+ 	0.04] =	3.3 2.4 6.044 11.18		60	2917	(27) (27) (28) 2 (29) 4 (29)
Windows Type Floor Walls Type1 Walls Type2	64.4 21.84 11.05	ļ 5	0	8	2.88 2.1 60.44 48.62 21.84	x1 x1 x1 x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.1 0.23	0.04] =	3.3 2.4 6.044 11.18 4.16		60	2917	(27) (27) (28) 2 (29) 4 (29)
Windows Type Floor Walls Type1 Walls Type2 Roof	64.4 21.84 11.05	ļ 5	0	8	2.88 2.1 60.44 48.62 21.84 11.05	x1 x1 x1 x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.1 0.23	0.04] =	3.3 2.4 6.044 11.18 4.16		60	2917	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e	64.4 21.84 11.05	ļ 5	0	8	2.88 2.1 60.44 48.62 21.84 11.05	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] =	3.3 2.4 6.044 11.18 4.16 1.44		60 60 9	2917 1310 99.4	(27) (27) (28) (28) (29) (4) (29) (5) (30) (31) (32)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e	64.4 21.84 11.05 elements,	ļ 5	0	8	2.88 2.1 60.44 48.62 21.84 11.05 157.7	x1 x1 x1 x x1 x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] =	3.3 2.4 6.044 11.18 4.16 1.44		60 60 9 45	2917 1310 99.4	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (31) (32) (7) (32b)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling	64.4 21.84 11.05 1 roof windo	m <sup>2</sup> ws, use e	0 0	indow U-va	2.88  2.1  60.44  48.62  21.84  11.05  157.7  13.44  49.39  66.64  alue calcul	x1 x1 x1 x1 x x1 x x1 x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] =   0.04] =   =   =   =   =	3.3 2.4 6.044 11.18 4.16 1.44	as given in	60 60 9 45 30 9	2917 1310 99.4: 604. 1481 599.7	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (31) (32) (7) (32b)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** *for windows and	64.4 21.84 11.05 Elements,	m <sup>2</sup> ws, use e	0 0	indow U-va	2.88  2.1  60.44  48.62  21.84  11.05  157.7  13.44  49.39  66.64  alue calcul	x1 x1 x1 x1 x x1 x x1 x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	= 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	3.3 2.4 6.044 11.18 4.16 1.44	as given in	60 60 9 45 30 9	2917 1310 99.4: 604. 1481 599.7	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (31) (32) (7) (32b)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area	64.4 21.84 11.05 21.84 17.05 21.84 17.05 21.84 17.05 21.84 2	m <sup>2</sup> ws, use e sides of in	0 0	indow U-va	2.88  2.1  60.44  48.62  21.84  11.05  157.7  13.44  49.39  66.64  alue calcul	x1 x1 x1 x1 x x1 x x1 x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	= 0.04] =   = 0.04] =   =   =   =   =   =   =   =	3.3 2.4 6.044 11.18 4.16 1.44 0	as given in [2] + (32a).	60 60 9 45 30 9	2917 1310 99.4 604. 1481 599.7	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (32) (7) (32b) (6) (32c)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los	64.4 21.84 11.05 elements, 7 roof windo as on both s ss, W/K = Cm = S(A	ws, use e sides of in	0 0 offective winternal walk	indow U-va	2.88  2.1  60.44  48.62  21.84  11.05  157.7  13.44  49.38  66.64  alue calcultitions	x1 x1 x1 x x1 x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	= 0.04] =   = 0.04] =   =   =   =   =   =   =   =	3.3 2.4 6.044 11.18 4.16 1.44 0		60 60 9 45 30 9	2917 1310 99.4 604.4 1481 599.7 7 3.2	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (33) (6) (32c)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los Heat capacity	64.4  21.84  11.05  elements,  roof windo as on both s ss, W/K = Cm = S(A parameter sments whee	ws, use e sides of in S (A x A x k) er (TMF	o offective winternal walk U) of the control of the	indow U-ve ls and pan	2.88 2.1 60.44 48.62 21.84 11.05 157.7 13.44 49.39 66.64 alue calculatitions	x1 x1 x1 x1 x x1 x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	= 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	3.3 2.4 6.044 11.18 4.16 1.44 0 0 ue)+0.04] & & & & & & & & & & & & & & & & & & &	2) + (32a).	60 9 45 30 9 paragraph (32e) =	2917 1310 99.4 604. 1481 599.7 7 3.2	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (8) (32) (7) (32b) (6) (32c) (33) (34)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	64.4 21.84 21.84 11.05 elements,  roof windo as on both s as, W/K = Cm = S(A parameter and of a deta	ws, use esides of interest the decided calculary	o o o o o o o o o o o o o o o o o o o	indow U-vals and pan	2.88 2.1 60.44 48.62 21.84 11.05 157.7 13.44 49.33 66.64 alue calculatitions	x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+	= 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	3.3 2.4 6.044 11.18 4.16 1.44 0 0 ue)+0.04] & & & & & & & & & & & & & & & & & & &	2) + (32a).	60 9 45 30 9 paragraph (32e) =	2917 1310 99.4 604. 1481 599.7 7 3.2	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (8) (32) (7) (32b) (6) (32c) (33) (34)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** *for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used instead	64.4  21.84  11.05  elements,  roof windo as on both s ss, W/K =  Cm = S(A  paramet sments whe ad of a deta es : S (L x al bridging a	ws, use e sides of in S (A x A x k) er (TMF ere the dec ailed calcu x Y) calc	o o o o o o o o o o o o o o o o o o o	TFA) ir construct	2.88 2.1 60.44 48.62 21.84 11.05 157.7 13.44 49.35 66.64 alue calculatitions  n kJ/m²K ion are not	x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+	= 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	3.3 2.4 6.044 11.18 4.16 1.44 0 0 ue)+0.04] & & & & & & & & & & & & & & & & & & &	2) + (32a).	60 9 45 30 9 paragraph (32e) =	2917 1310 99.4 604.4 1481 599.7 7 3.2 40.89 11546.31 191.04	(27) (27) (27) (28) (29) (4) (29) (5) (30) (31) (8) (32) (7) (32b) (6) (32c) (33) (34) (35)

Ventila	tion hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	29.88	29.81	29.73	29.39	29.32	29.01	29.01	28.96	29.13	29.32	29.45	29.59		(38)
Heat tra	ansfer c	coefficier	nt, W/K	-	-	-	-	-	(39)m	= (37) + (3	38)m	-		
(39)m=	82.92	82.84	82.77	82.42	82.35	82.05	82.05	81.99	82.16	82.35	82.49	82.62		
Heat lo	ss para	meter (H	HLP), W/	/m²K				-		Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	82.42	(39)
(40)m=	1.37	1.37	1.37	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.37		
Numbe	er of day	s in moi	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub> .	12 /12=	1.36	(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)
			rgy requi	irement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		99		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by	5% if the $a$	lwelling is	designed t			se target o		.56		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	89.71	86.45	83.19	79.93	76.66	73.4	73.4	76.66	79.93	83.19	86.45	89.71		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x C	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		978.69	(44)
(45)m=	133.04	116.36	120.07	104.68	100.44	86.68	80.32	92.17	93.27	108.69	118.65	128.84		
If instant	aneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1283.22	(45)
(46)m=	19.96	17.45	18.01	15.7	15.07	13	12.05	13.82	13.99	16.3	17.8	19.33		(46)
	storage		مالد ما دماله		-1 \	/\// IDC	-1							\
If commodule of the com	munity h vise if no storage	eating a stored loss:	includin and no ta hot wate	ink in dw er (this ir	velling, e ncludes i	nter 110 nstantar	litres in neous co	(47)			47)			(47)
•			eclared l		or is kno	wn (kvvr	n/day):				0.	54		(48)
•			m Table									0		(49)
			storage eclared o	-		or is not		(48) x (49)	) =			0		(50)
		_	factor fr ee secti		e 2 (kW	h/litre/da	ıy)					0		(51)
Volume	e factor	from Ta	ble 2a									0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	` '	(54) in (5	•					((50)	==\		0.	32		(55)
vvater s	storage	ioss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m=	10.04	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(56)

If cylinder contain	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	/)m = (56)	m wnere (	mii) is iid	m Append	lix H	
(57)m= 10.04	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(57)
Primary circuit	t loss (ar	nual) fro	m Table	3		-					0		(58)
Primary circuit	t loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 35.43	30.84	32.85	30.55	30.28	28.05	28.99	30.28	30.55	32.85	33.04	35.43		(61)
Total heat red	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 178.52	156.27	162.97	144.95	140.77	124.45	119.35	132.49	133.53	151.59	161.41	174.32		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 26.35	21.84	20.18	14.83	10.09	6.24	5.78	6.64	6.72	15.8	21.19	26.36		(63) (G2
Output from v	vater hea	ter											
(64)m= 151.08	133.47	141.74	129.1	129.64	117.21	112.5	124.78	125.76	134.7	139.18	146.86		
	•	•	•	•		•	Outp	out from wa	ater heate	r (annual) <sub>1</sub>	I12	1586.02	(64)
Heat gains 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	]	
(65)m= 61.13	53.66	56.17	50.22	49	43.61	41.99	46.25	46.42	52.39	55.49	59.73		(65)
<u> </u>	-												
include (57	m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	ı neating	
,				•	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Internal g	ains (see	e Table 5	and 5a	•	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
,	ains (see	e Table 5	and 5a	•	ylinder is Jun	s in the o			ater is fr	om com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a	):			Aug	or hot w			_	neating	(66)
5. Internal g Metabolic gai Jan (66)m= 99.7	ains (see	2 5), Wat Mar 99.7	ts Apr 99.7	May 99.7	Jun 99.7	Jul 99.7	Aug 99.7	Sep 99.7	Oct	Nov	Dec	neating	(66)
5. Internal g Metabolic gai	ains (see	2 5), Wat Mar 99.7	ts Apr 99.7	May 99.7	Jun 99.7	Jul 99.7	Aug 99.7	Sep 99.7	Oct	Nov	Dec	neating	(66) (67)
5. Internal g Metabolic gai  Jan (66)m= 99.7  Lighting gains (67)m= 15.52	resident (see all see	e Table 5 e 5), Wat Mar 99.7 ted in Ap	ts Apr 99.7 ppendix 8.49	May 99.7 L, equati	Jun 99.7 ion L9 or 5.36	Jul 99.7 r L9a), a 5.79	Aug 99.7 Iso see	Sep 99.7 Table 5	Oct 99.7	Nov 99.7	Dec 99.7	neating	, ,
5. Internal g Metabolic gai  Jan (66)m= 99.7  Lighting gains	ains (see ns (Table Feb 99.7 s (calcula 13.78 ains (calc	e Table 5 e 5), Wat Mar 99.7 ted in Ap	ts Apr 99.7 ppendix 8.49	May 99.7 L, equati	Jun 99.7 ion L9 or 5.36	Jul 99.7 r L9a), a 5.79	Aug 99.7 Iso see	Sep 99.7 Table 5	Oct 99.7	Nov 99.7	Dec 99.7	neating	, ,
5. Internal g Metabolic gai  Jan (66)m= 99.7  Lighting gains (67)m= 15.52  Appliances ga	res (Table Feb 99.7 c (calcula 13.78 ains (calcula 175.86	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in	ts Apr 99.7 ppendix 8.49 Appendix 161.62	May 99.7 L, equati 6.34 dix L, eq	Jun 99.7 ion L9 of 5.36 uation L	Jul 99.7 r L9a), a 5.79 13 or L1	Aug 99.7 Iso see 7.52 3a), also	Sep 99.7 Table 5 10.09 see Tal 132.96	Oct 99.7 12.82 ble 5 142.65	Nov 99.7	Dec 99.7	neating	(67)
Metabolic gai  Jan  (66)m= 99.7  Lighting gains  (67)m= 15.52  Appliances ga  (68)m= 174.05	res (Table Feb 99.7 c (calcula 13.78 ains (calcula 175.86	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in	ts Apr 99.7 ppendix 8.49 Appendix 161.62	May 99.7 L, equati 6.34 dix L, eq	Jun 99.7 ion L9 of 5.36 uation L	Jul 99.7 r L9a), a 5.79 13 or L1	Aug 99.7 Iso see 7.52 3a), also	Sep 99.7 Table 5 10.09 see Tal 132.96	Oct 99.7 12.82 ble 5 142.65	Nov 99.7	Dec 99.7	neating	(67)
Metabolic gain  Jan  (66)m= 99.7  Lighting gains  (67)m= 15.52  Appliances ga  (68)m= 174.05  Cooking gains	ains (see ns (Table Feb 99.7 s (calcula 13.78 ains (calcula 175.86 s (calcula 32.97	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in Ap 32.97	ts Apr 99.7 ppendix 8.49 Append 161.62 ppendix 32.97	May 99.7 L, equati 6.34 dix L, equati 149.39 L, equati	Jun 99.7 ion L9 or 5.36 uation L 137.89 ion L15	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a)	Aug 99.7 Iso see 7.52 3a), also 128.41	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table	Oct 99.7 12.82 ble 5 142.65	Nov 99.7 14.96	Dec 99.7 15.95 166.37	neating	(67) (68)
Metabolic gai  Jan  (66)m= 99.7  Lighting gains  (67)m= 15.52  Appliances ga  (68)m= 174.05  Cooking gains  (69)m= 32.97	ains (see ns (Table Feb 99.7 s (calcula 13.78 ains (calcula 175.86 s (calcula 32.97	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in Ap 32.97	ts Apr 99.7 ppendix 8.49 Append 161.62 ppendix 32.97	May 99.7 L, equati 6.34 dix L, equati 149.39 L, equati	Jun 99.7 ion L9 or 5.36 uation L 137.89 ion L15	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a)	Aug 99.7 Iso see 7.52 3a), also 128.41	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table	Oct 99.7 12.82 ble 5 142.65	Nov 99.7 14.96	Dec 99.7 15.95 166.37	neating	(67) (68)
Metabolic gai  Jan  (66)m= 99.7  Lighting gains  (67)m= 15.52  Appliances ga  (68)m= 174.05  Cooking gains  (69)m= 32.97  Pumps and fa	res (Table Feb 99.7 s (calcula 13.78 ains (calcula 32.97 ans gains 3	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in Ap 32.97 (Table 5	s and 5a ts Apr 99.7 ppendix 8.49 Appendix 161.62 ppendix 32.97 5a)	May 99.7 L, equati 6.34 dix L, equati 149.39 L, equati 32.97	Jun 99.7 ion L9 of 5.36 uation L 137.89 ion L15 32.97	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a) 32.97	Aug 99.7 Iso see 7.52 3a), also 128.41 , also se 32.97	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table 32.97	Oct 99.7 12.82 ble 5 142.65 5 32.97	Nov 99.7 14.96 154.88	Dec 99.7 15.95 166.37 32.97	neating	(67) (68) (69)
Metabolic gain  Jan  (66)m= 99.7  Lighting gains  (67)m= 15.52  Appliances gains  (68)m= 174.05  Cooking gains  (69)m= 32.97  Pumps and fains  (70)m= 3	res (Table Feb 99.7 s (calcula 13.78 ains (calcula 32.97 ans gains 3	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in Ap 32.97 (Table 5	s and 5a ts Apr 99.7 ppendix 8.49 Appendix 161.62 ppendix 32.97 5a)	May 99.7 L, equati 6.34 dix L, equati 149.39 L, equati 32.97	Jun 99.7 ion L9 of 5.36 uation L 137.89 ion L15 32.97	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a) 32.97	Aug 99.7 Iso see 7.52 3a), also 128.41 , also se 32.97	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table 32.97	Oct 99.7 12.82 ble 5 142.65 5 32.97	Nov 99.7 14.96 154.88	Dec 99.7 15.95 166.37 32.97	neating	(67) (68) (69)
Metabolic gains  (66)m= 99.7  Lighting gains (67)m= 15.52  Appliances gains (68)m= 174.05  Cooking gains (69)m= 32.97  Pumps and fains (70)m= 3  Losses e.g. e	ns (Table Feb 99.7 c (calcula 13.78 ains (calcula 32.97 ans gains 3 vaporatio -79.76	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in A 32.97 (Table 5 3 on (negat	ts Apr 99.7 ppendix 8.49 Appendix 161.62 ppendix 32.97 5a) 3	May 99.7 L, equati 6.34 dix L, eq 149.39 L, equat 32.97	Jun 99.7 ion L9 of 5.36 uation L 137.89 ion L15 32.97	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a) 32.97	Aug 99.7 Iso see 7.52 3a), also 128.41 , also se 32.97	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table 32.97	Oct 99.7 12.82 ble 5 142.65 5 32.97	Nov 99.7 14.96 154.88 32.97	Dec 99.7 15.95 166.37 32.97	neating	(67) (68) (69) (70)
Metabolic gains  (66)m= 99.7  Lighting gains (67)m= 15.52  Appliances gains (68)m= 174.05  Cooking gains (69)m= 32.97  Pumps and fains (70)m= 3  Losses e.g. e (71)m= -79.76	ns (Table Feb 99.7 c (calcula 13.78 ains (calcula 32.97 ans gains 3 vaporatio -79.76	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in A 32.97 (Table 5 3 on (negat	ts Apr 99.7 ppendix 8.49 Appendix 161.62 ppendix 32.97 5a) 3	May 99.7 L, equati 6.34 dix L, eq 149.39 L, equat 32.97	Jun 99.7 ion L9 of 5.36 uation L 137.89 ion L15 32.97	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a) 32.97	Aug 99.7 Iso see 7.52 3a), also 128.41 , also se 32.97	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table 32.97	Oct 99.7 12.82 ble 5 142.65 5 32.97	Nov 99.7 14.96 154.88 32.97	Dec 99.7 15.95 166.37 32.97	neating	(67) (68) (69) (70)
Metabolic gai  Jan  (66)m= 99.7  Lighting gains  (67)m= 15.52  Appliances ga  (68)m= 174.05  Cooking gains  (69)m= 32.97  Pumps and fa  (70)m= 3  Losses e.g. e  (71)m= -79.76  Water heating	ains (see ns (Table Feb 99.7 s (calcula 13.78 ains (calcula 32.97 ans gains 3 vaporatio 79.76 g gains (Table Feb 99.7 s (calcula 32.97 ans gains 3 vaporatio 79.76 g gains (Table Feb 99.85	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in Ap 32.97 (Table 5 3 on (negation of the color of th	ts Apr 99.7 ppendix 8.49 Appendix 161.62 ppendix 32.97 5a) 3 tive valu -79.76	May 99.7 L, equati 6.34 dix L, equati 149.39 L, equati 32.97  3 es) (Tab	Jun 99.7 ion L9 of 5.36 uation L 137.89 ion L15 32.97 3 le 5) -79.76	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a) 32.97	Aug 99.7 Iso see 7.52 3a), also 128.41 , also se 32.97 3	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table 32.97 3 -79.76	Oct 99.7  12.82 ble 5 142.65 5 32.97  3  -79.76	Nov 99.7 14.96 154.88 32.97 3 -79.76	Dec 99.7  15.95  166.37  32.97  3  -79.76	neating	(67) (68) (69) (70) (71)
Metabolic gains  (66)m= 99.7  Lighting gains (67)m= 15.52  Appliances ga (68)m= 174.05  Cooking gains (69)m= 32.97  Pumps and fa (70)m= 3  Losses e.g. e (71)m= -79.76  Water heating (72)m= 82.16	ains (see ns (Table Feb 99.7) s (calcula 13.78) ains (calcula 175.86) s (calcula 32.97) ans gains 3 vaporatio 79.76 g gains (Table Feb 99.7) gains (Table Feb 99.7)	e Table 5 e 5), Wat Mar 99.7 ted in Ap 11.21 culated in 171.31 ated in Ap 32.97 (Table 5 3 on (negation of the color of th	ts Apr 99.7 ppendix 8.49 Appendix 161.62 ppendix 32.97 5a) 3 tive valu -79.76	May 99.7 L, equati 6.34 dix L, equati 149.39 L, equati 32.97  3 es) (Tab	Jun 99.7 ion L9 of 5.36 uation L 137.89 ion L15 32.97 3 le 5) -79.76	Jul 99.7 r L9a), a 5.79 13 or L1 130.21 or L15a) 32.97	Aug 99.7 Iso see 7.52 3a), also 128.41 , also se 32.97 3	Sep 99.7 Table 5 10.09 see Tal 132.96 ee Table 32.97 3 -79.76	Oct 99.7  12.82 ble 5 142.65 5 32.97  3  -79.76	Nov 99.7 14.96 154.88 32.97 3 -79.76	Dec 99.7  15.95  166.37  32.97  3  -79.76	neating	(67) (68) (69) (70) (71)

Stroma FSAP 2012 Version: 1.0.1.9 (SAP 9.92) - http://www.stroma.com

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b	-	FF Table 6c		Gains (W)	
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	36.79	1	0.63	x [	0.8		26.99	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	62.67	ĺ	0.63		0.8	<u> </u>	45.97	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	85.75	i	0.63		0.8	<del>-</del>	62.9	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	106.25	j	0.63	_ x [	0.8	<b>=</b> i	77.93	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	119.01	ĺ	0.63	×	0.8	<u> </u>	87.29	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	118.15	ĺ	0.63	_ x [	0.8	=	86.66	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	113.91	ĺ	0.63	= x [	0.8	<u> </u>	83.55	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	104.39	ĺ	0.63	x [	0.8	=	76.57	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	92.85	]	0.63	_ x [	0.8	=	68.1	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	69.27		0.63	x [	0.8	=	50.81	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	44.07	]	0.63	x	0.8	=	32.32	(79)
Southwest <sub>0.9x</sub> 0.77	X	2.1	x	31.49		0.63	x	0.8	=	23.1	(79)
Northwest 0.9x 0.77	X	10.8	х	11.28	х	0.63	x [	0.8	=	42.56	(81)
Northwest 0.9x 0.77	X	2.88	х	11.28	x	0.63	x [	0.8	=	11.35	(81)
Northwest 0.9x 0.77	X	10.8	х	22.97	х	0.63	x	0.8	=	86.63	(81)
Northwest 0.9x 0.77	X	2.88	x	22.97	х	0.63	x	0.8	=	23.1	(81)
Northwest 0.9x 0.77	X	10.8	x	41.38	x	0.63	x [	0.8	=	156.09	(81)
Northwest 0.9x 0.77	X	2.88	х	41.38	х	0.63	x	0.8	=	41.62	(81)
Northwest 0.9x 0.77	X	10.8	x	67.96	x	0.63	x	0.8	=	256.34	(81)
Northwest 0.9x 0.77	X	2.88	x	67.96	x	0.63	x	0.8	=	68.36	(81)
Northwest 0.9x 0.77	X	10.8	x	91.35	х	0.63	x	0.8	=	344.57	(81)
Northwest <sub>0.9x</sub> 0.77	X	2.88	x	91.35	x	0.63	x [	0.8	=	91.89	(81)
Northwest <sub>0.9x</sub> 0.77	X	10.8	x	97.38	x	0.63	x [	0.8	=	367.35	(81)
Northwest 0.9x 0.77	X	2.88	x	97.38	x	0.63	x [	0.8	=	97.96	(81)
Northwest 0.9x 0.77	X	10.8	X	91.1	x	0.63	x [	0.8	=	343.65	(81)
Northwest 0.9x 0.77	X	2.88	x	91.1	x	0.63	x [	0.8	= [	91.64	(81)
Northwest 0.9x 0.77	X	10.8	x	72.63	x	0.63	x [	0.8	=	273.96	(81)
Northwest 0.9x 0.77	X	2.88	x	72.63	X	0.63	x [	0.8	=	73.06	(81)
Northwest 0.9x 0.77	X	10.8	x	50.42	x	0.63	x [	0.8	=	190.19	(81)
Northwest 0.9x 0.77	X	2.88	x	50.42	x	0.63	x [	0.8	=	50.72	(81)
Northwest 0.9x 0.77	X	10.8	x	28.07	X	0.63	x	0.8	=	105.87	(81)
Northwest 0.9x 0.77	X	2.88	x	28.07	x	0.63	x [	0.8	=	28.23	(81)
Northwest 0.9x 0.77	X	10.8	x	14.2	X	0.63	x [	0.8	=	53.55	(81)
Northwest 0.9x 0.77	X	2.88	x	14.2	X	0.63	x [	0.8	=	14.28	(81)
Northwest 0.9x 0.77	X	10.8	x	9.21	X	0.63	x [	0.8	=	34.76	(81)
Northwest 0.9x 0.77	X	2.88	x	9.21	X	0.63	x	0.8	=	9.27	(81)
Solar gains in watts, calcula	$\overline{}$		_	1	_	n = Sum(74)m .		1.			1551
(83)m= 80.9 155.71 260.0		402.63   523.79		51.97 518.83	423	.58 309.02	184.91	100.16	67.12		(83)
Total gains – internal and so		<del>`                                    </del>	<del>`</del>	<del></del>	677	E0 E70 40	466.7	400.07	205.04		(84)
(84)m= 408.54 481.1 574.	03	698.39 801.29	2   8	11.69 767.18	677	.58 572.46	466.7	402.97	385.64		(04)

7. Me	an inter	nal temp	perature	(heating	season	)								
						·	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ıble 9a)					ı		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.9	0.76	0.59	0.45	0.52	0.78	0.95	0.98	0.99		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.59	19.75	20.04	20.42	20.72	20.86	20.91	20.9	20.76	20.36	19.9	19.55		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.78	19.79	19.79	19.79	19.79	19.8	19.8	19.8	19.79	19.79	19.79	19.79		(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	0.95	0.87	0.71	0.5	0.34	0.4	0.7	0.92	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 1	7 in Tabl	le 9c)	-	-		
(90)m=	17.92	18.15	18.57	19.1	19.48	19.64	19.68	19.67	19.55	19.03	18.38	17.87		(90)
						•			1	fLA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=	18.66	18.87	19.23	19.69	20.03	20.19	20.23	20.22	20.09	19.62	19.06	18.62		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate	ļ.			
(93)m=	18.51	18.72	19.08	19.54	19.88	20.04	20.08	20.07	19.94	19.47	18.91	18.47		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the u	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	<u> </u>	Iviay	Juli	Jui	L	Seb	001	INOV	Dec		
(94)m=	0.99	0.97	0.94	0.86	0.71	0.52	0.37	0.43	0.71	0.92	0.97	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (9	4)m x (8	4)m	!	<u> </u>	<u> </u>	<u>I</u>	<u> </u>	<u>I</u>	<u> </u>		
(95)m=	402.45	468.35	541.79	601.66	569.13	421.51	280.25	291.77	405.93	428.15	392.86	380.9		(95)
Montl	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
					ì	1	r - `	x [(93)m		r –				
(97)m=			1040.99		673.81	446.31	285.39	300.91	479.81	730.77	973.93	1178.98		(97)
	e heatin 577.38	g require 454.43	T T	T T	nonth, k\ 77.88			24 x [(97]	)m – (95 0	m] x (4) 225.14	<del></del>	E02 77		
(98)m=	577.38	454.43	371.41	198.1	77.88	0	0	0 			418.37	593.77	2040.5	(08)
_								Tota	l per year	(kwn/year	) = Sum(9	8)15,912 =	2916.5	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								48.25	(99)
			nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_	at from s	econdar	v/supple	mentary	svstem					ĺ	0	(201)
	-		at from m			,	-	(202) = 1	- (201) =			l	1	(202)
	•		ng from	•	` '			(204) = (2	, ,	(203)] =			1	(204)
			ace heat	•				. , ,	· •			ļ	93.2	(206)
	•	•		•		g systen	n %					<u> </u>	0	(208)
LITTOR	orion or s	Joonida	. y ouppi	omoniai	y Hoadily	g oyalon	1, 70					l		(200)

												1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin	g require	371.41	alculate 198.1	77.88	0	0	0	0	225.14	418.37	593.77		
			<u> </u>				0	0	223.14	410.37	393.77		(244)
$(211)m = \{[(98) \\ 619.51\}$	487.59	398.51	212.55	83.57	06)	0	0	0	241.57	448.9	637.09		(211)
							Tota	l (kWh/yea	ar) =Sum(2			3129.29	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98 <u>)</u> m x (20	•		• , .										
(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>	=	0	(215)
Water heating		4 ( <u> </u> -		h \									
Output from w	133.47	141.74	129.1	129.64	117.21	112.5	124.78	125.76	134.7	139.18	146.86		
Efficiency of w	ater hea	ıter	<u> </u>	l		<u> </u>	<u> </u>		<u> </u>			80.1	(216)
(217)m= 87.9	87.69	87.16	85.93	83.61	80.1	80.1	80.1	80.1	86.13	87.45	88		(217)
Fuel for water	-					•			•			!	
(219)m = (64) (219)m = 171.88	m x 100	) ÷ (217) 162.61	m 150.25	155.04	146.33	140.45	155.78	157	156.39	159.15	166.89		
(213)111= 171.00	102.21	102.01	100.20	100.04	140.00	140.45			19a) <sub>112</sub> =	100.10	100.03	1873.98	(219)
Annual totals									<u>-</u>	Wh/year	•	kWh/year	<b>」</b> ``
Space heating	fuel use	ed, main	system	1						•		3129.29	
Water heating	fuel use	ed										1873.98	Ī
Electricity for p	oumps, f	ans and	electric	keep-ho	t						·		_
Electricity for p			electric	keep-ho	t						30		(230c)
	ng pump	:	electric	keep-ho	t						30 45		(230c) (230e)
central heatin	ng pump fan-assis	: sted flue		·	t		sum	of (230a).	(230g) =			75	, ,
central heating	ng pump fan-assis y for the	: sted flue		·	t		sum	of (230a).	(230g) =			75 274.03	(230e)
central heating boiler with a f	ng pump fan-assis y for the ighting	: sted flue above, l		·	t		sum	of (230a).	(230g) =				(230e)
central heating boiler with a formal electricity for li	ng pump fan-assis y for the ighting erated b	: sted flue above, l y PVs	kWh/yea	ır		uding mi		, ,	(230g) =			274.03	(230e) (231) (232)
central heating boiler with a formal electricity for line Electricity general control of the con	ng pump fan-assis y for the ighting erated b	: sted flue above, l y PVs	kWh/yea	ır	ems inclu	<u> </u>		, ,			45	274.03 -971.55	(230e) (231) (232) (233)
central heating boiler with a formal electricity for line Electricity general control of the con	ng pump fan-assis y for the ighting erated b	: sted flue above, l y PVs	kWh/yea	ır	ems inclu	uding mi n <b>ergy</b> /h/year		, ,		ion fac	45	274.03	(230e) (231) (232) (233)
central heating boiler with a formal electricity for line Electricity general control of the con	ng pump fan-assis y for the ighting erated b	: above, I y PVs – Individ	kWh/yea ual heat	ır	ems inclu En kW	ergy		, ,	Emiss	ion fac 2/kWh	45	274.03 -971.55 <b>Emissions</b>	(230e) (231) (232) (233)
central heating boiler with a formal electricity for life Electricity generated at the control of the control o	ng pump fan-assis y for the ighting erated b hissions	: above, I y PVs – Individ	kWh/yea ual heat	ır	ems inclu En kW (21	ergy /h/year		, ,	Emiss kg CO	ion fac 2/kWh	45	274.03 -971.55  Emissions kg CO2/yea	(230e) (231) (232) (233)
central heating boiler with a formal electricity for life Electricity generated at the control of the control o	ng pump fan-assis y for the ighting erated b hissions	: above, I y PVs – Individ	kWh/yea ual heat	ır	ems inclu En kW (21)	ergy /h/year		, ,	Emiss kg CO	<b>ion fac</b> 2/kWh 16	45 tor =	274.03 -971.55 <b>Emissions</b> kg CO2/yea 675.93	(230e) (231) (232) (233) (233)
central heating boiler with a formal electricity for life Electricity generated at the control of the control o	ng pump fan-assis y for the ighting erated b hissions	: above, I y PVs - Individ ystem 1	kWh/yea ual heat	ır	ems inclu En kW (21 (21)	nergy /h/year 1) x 5) x			Emiss kg CO:	<b>ion fac</b> 2/kWh 16	45 tor = =	274.03 -971.55 <b>Emissions</b> kg CO2/yea 675.93	(230e) (231) (232) (233) (233) (261) (263)
central heating boiler with a formal electricity. Electricity for line Electricity generated and the second	ing pump fan-assis y for the ighting erated b hissions	ested flue above, I y PVs - Individ system 1 dary)	kWh/yeaual heat	ing syste	ems inclu En kW (21) (21) (21) (26)	nergy /h/year 1) x 5) x	cro-CHP		Emiss kg CO:	ion fac 2/kWh 16 19 16	45 tor = =	274.03 -971.55  Emissions kg CO2/yea 675.93 0 404.78	(230e)  (231)  (232)  (233)  (233)  ar  (261)  (263)  (264)
central heating boiler with a formal electricity. Electricity for life Electricity generated and the second	ng pump fan-assis y for the ighting erated b issions (main s (second	ested flue above, I y PVs - Individ system 1 dary)	kWh/yeaual heat	ing syste	ems inclu En kW (21) (21) (21) (26)	nergy /h/year 1) x 5) x 9) x	cro-CHP		Emiss kg CO:  0.2  0.5	ion fac 2/kWh 16 19	45 tor = =	274.03 -971.55  Emissions kg CO2/yea 675.93 0 404.78 1080.71	(230e)  (231)  (232)  (233)  (233)  (261)  (263)  (264)  (265)
central heating boiler with a followith a following with a following boiler with a following boiler with a felectricity for life boiler with a felectricity for participal section of the felectricity for life boiler with a felectricity with a felectricity for life boiler with a felectricity	ng pump fan-assis y for the ighting erated b issions (main s (second ter heati	ested flue above, I y PVs - Individ system 1 dary)	wal heat	ing syste	ems inclu En kW (21) (21) (21) (26)	nergy /h/year 1) x 5) x 9) x 1) + (262)	cro-CHP		Emiss kg CO. 0.2 0.5 0.5	ion fac 2/kWh 16 19	45 tor = = =	274.03 -971.55  Emissions kg CO2/yea 675.93 0 404.78 1080.71 38.93	(230e)  (231)  (232)  (233)  (233)  (261)  (263)  (264)  (265)  (267)
central heating boiler with a formal electricity for life Electricity generated and the second secon	ng pump fan-assis y for the ighting erated b issions (main s (second ter heati	ested flue above, I y PVs - Individ system 1 dary)	wal heat	ing syste	ems inclu En kW (21) (21) (21) (26)	nergy /h/year 1) x 5) x 9) x 1) + (262)	cro-CHP	264) =	Emiss kg CO. 0.2 0.5 0.5	ion fac 2/kWh 16 19 16	45 tor = = =	274.03 -971.55  Emissions kg CO2/yea 675.93 0 404.78 1080.71 38.93	(230e)  (231)  (232)  (233)  (233)  (261)  (263)  (264)  (265)  (267)

#### **Dwelling CO2 Emission Rate**

El rating (section 14)

 $(272) \div (4) =$ 

12.54 (273)

90 (274)

			User D	) otoilo:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 20			Strom Softwa	are Vei				0002943 on: 1.0.1.9	
Address :	Flat 2, 16, Rochest		· ·	Address						
1. Overall dwelling dim		or mone	LOND	314, 1400	008					
<b>. . .</b>			Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.8	(2a) =	243.54	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) ====	36.98	(4)			_		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	243.54	(5)
2. Ventilation rate:										
		secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0	] = [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	+ [	0	] = [	0	x :	20 =	0	(6b)
Number of intermittent f	ans					2	×	10 =	20	(7a)
Number of passive vent	S				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	x -	40 =	0	(7c)
					_					
								Air ch	nanges per h	our —
Infiltration due to chimne	•					20		÷ (5) =	0.08	(8)
Number of storeys in	been carried out or is intend the dwelling (ns)	iea, procee	a to (17),	otnerwise (	continue tr	om (9) to	(16)			(9)
Additional infiltration	the dwelling (113)						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber	frame or	0 35 fo	r masoni	v constr	ruction	[(0)	1]XO.1 =	0	(11)
	present, use the value corre				•	aotioi.			0	(\/
•	nings); if equal user 0.35		4 / 1	1\	0					<b>–</b> , .
·	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
• •	nter 0.05, else enter 0 vs and doors draught s	tripped							0	(13)
Window infiltration	vs and doors draught s	unpped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
	e, q50, expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	3	(17)
If based on air permeab			•	•	•				0.23	(18)
·	ies if a pressurisation test ha					is being u	sed			` ′
Number of sides shelter	red								3	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18)	) x (20) =				0.18	(21)
Infiltration rate modified	for monthly wind spee	d							1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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	]	
			ь			ь			_	

0.23	ation rate (a 0.22 0.	.22	0.2	0.19	0.17	0.17	0.17	0.18	0.19	0.2	0.21	]	
alculate effec		-	ate for t	he appli	cable ca	se	<b>I</b>		<u>!</u>		Į.	J	
If mechanica												0	(2
If exhaust air he									o) = (23a)			0	(2
If balanced with				_								0	(2
a) If balance					1	<del>-                                    </del>	<del>,                                    </del>	<del>í `</del>	<del>1 ′ `</del>	<u> </u>	<del>````</del>	÷ 100]	
24a)m= 0		0	0	0	0	0	0	0	0	0	0		(:
b) If balance					1	<del>,                                    </del>	<del>-                                    </del>	<del>í `</del>	<del> </del>			1	
(4b)m= 0	I	0	0	0	0	0	0	0	0	0	0		(:
c) If whole h if (22b)n	ouse extrac n < 0.5 × (23			•	•				.5 × (23b	)	_	_	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)m	ventilation on the second to t				•				0.5]				
44d)m= 0.53	0.53 0.	.52	0.52	0.52	0.51	0.51	0.51	0.52	0.52	0.52	0.52		(2
Effective air	change rate	e - en	ter (24a	or (24h	o) or (24	c) or (24	d) in bo	x (25)				_	
5)m= 0.53	0.53 0.	.52	0.52	0.52	0.51	0.51	0.51	0.52	0.52	0.52	0.52		(
B. Heat losse	s and heat I	oss p	aramete	er:									
LEMENT	Gross area (m²	·)	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²-l		A X k kJ/K
indows Type	: 1				5.6	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	6.41				(
/indows Type	2				8.12	<sub>X</sub> 1	/[1/( 1.2 )+	0.04] =	9.3				(
/indows Type	3				1.96	x1	/[1/( 1.2 )+	0.04] =	2.24				(
/indows Type	4				2.8	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	3.21				(:
loor					86.98	3 X	0.1	=	8.69800	1	75	652	23.5
/alls Type1	81.48	7	20.4	4	61.04	1 x	0.23	<del>-</del>	14.04	=	60	366	52.4
/alls Type2	19.88	Ī	0		19.88	3 x	0.19	<del>-</del>	3.79	=	60	119	92.8
loof	34.85	Ī	0		34.85	x	0.13	<del>-</del>	4.53	=	9	313	3.65
otal area of e		<b>」</b> 2			223.1	=							(;
arty wall	ŕ				13.44	=	0		0	$\neg$	45	60	4.8
arty ceiling					52.13	=					30	$\dashv$ $\models$	63.9
nternal wall **						=					9	= =	
for windows and	roof windows	USA A	ffective wi	ndow I I-ve	136.6 alue calcul		a formula 1	1/[(1/Ll-vali	ue)+0 041 a	ıs given i			9.76
include the area							, .c.maia i	van	5 <sub>7</sub> . 0.0 + <sub>1</sub> a	g.v O.i II	. paragrapi	<del>.</del>	
abric heat los	s, $W/K = S$	(A x l	U)				(26)(30	) + (32) =				54.46	(
eat capacity	Cm = S(A x)	k)						((28).	(30) + (32	2) + (32a)	(32e) =	15090.81	(
	narameter	(TMP	) = Cm -	- TFA) ir	n kJ/m²K	•		= (34)	) ÷ (4) =			173.5	(
hermal mass	parameter	(											
	: ments where t	he det	ails of the	construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in 1	Table 1f		

Total fabric heat loss					(33) +	(36) =		ı	00.0	(37)
Ventilation heat loss calculated	l monthly					, ,	25)m x (5)		66.6	(37)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 42.3 42.22 42.14	41.76 41.69	41.36	41.36	41.29	41.49	41.69	41.83	41.98		(38)
Heat transfer coefficient, W/K			ļ.	!	(39)m	= (37) + (3	38)m			
(39)m= 108.9 108.82 108.74	108.36 108.29	107.96	107.96	107.89	108.09	108.29	108.43	108.58		
Harther was a sector (III D) W/	21 <i>C</i>					_	Sum(39) <sub>1</sub> .	12 /12=	108.36	(39)
Heat loss parameter (HLP), W/ (40)m= 1.25 1.25 1.25	1.25 1.25	1.24	1.24	1.24	(40)m	= (39)m ÷	1.25	1.25		
(40)III= 1.23 1.23 1.23	1.25	1.24	1.24	1.24			Sum(40) <sub>1</sub> .	l	1.25	(40)
Number of days in month (Tabl	le 1a)				,	wordge =	Cum(40)1.	12712—	1.20	()
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28 31	30 31	30	31	31	30	31	30	31		(41)
4. Water heating energy requi	rement:							kWh/ye	ear:	
Assumed occupancy, N							2	58		(42)
if TFA > 13.9, N = 1 + 1.76 x	[1 - exp(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		36		(42)
if TFA £ 13.9, N = 1				(O.F. N.I.)	. 00					
Annual average hot water usage Reduce the annual average hot water	, ,		_	` ,		se target o		.52		(43)
not more that 125 litres per person per	• •	•	-			J				
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for ea	ach month Vd,m = fa	ctor from	Table 1c x	(43)	-					
(44)m= 105.08 101.26 97.44	93.61 89.79	85.97	85.97	89.79	93.61	97.44	101.26	105.08		
		400 - 1/-/		T / 0000			m(44) <sub>112</sub> =		1146.3	(44)
Energy content of hot water used - calc										
(45)m= 155.83 136.29 140.64	122.61 117.65	101.52	94.07	107.95	109.24	127.31	138.97	150.91		7(45)
If instantaneous water heating at point	of use (no hot wate	r storage),	enter 0 in	boxes (46)		l otal = Sui	m(45) <sub>112</sub> =		1502.98	(45)
(46)m= 23.37 20.44 21.1	18.39 17.65	15.23	14.11	16.19	16.39	19.1	20.85	22.64		(46)
Water storage loss:			<u> </u>							, ,
Storage volume (litres) including	g any solar or W	VWHRS	storage	within sa	ame ves	sel	0			(47)
If community heating and no ta	•			` '						
Otherwise if no stored hot water	er (this includes i	instantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage loss:  a) If manufacturer's declared lo	nee factor ie kno	wn (k\//k	J(day).					54		(48)
Temperature factor from Table		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ı, day).							(49)
Energy lost from water storage				(48) x (49)	_			0		(50)
b) If manufacturer's declared of	•	or is not		(40) X (43)	_			0		(30)
Hot water storage loss factor fr	•							0		(51)
If community heating see section	on 4.3									
Volume factor from Table 2a	2h						-	0		(52)
Temperature factor from Table				(47) (7:)	(50)	<b>-</b> 0)		0		(53)
Energy lost from water storage Enter (50) or (54) in (55)	, kvvn/year			(47) x (51)	x (52) x (	o3) =		0		(54)
							^	32		(55)

Water storage los	s calcul	ated for	r each	month			((56)m = (	55) × (41)	m				
(56)m= 10.04 9	0.07 1	0.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(56)
If cylinder contains de	dicated so	olar storaç	ge, (57)r	n = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 10.04 9	0.07 1	0.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(57)
Primary circuit los	s (annu	al) from	n Table	3							0		(58)
Primary circuit los	s calcul	ated for	r each	month (	59)m = (	(58) ÷ 36	5 × (41)	m				'	
(modified by fac	ctor from	n Table	H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)		•	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcul	ated for	each m	nonth (	61)m =	(60) ÷ 36	65 × (41)	m						
(61)m= 39.49 3	5.67 3	8.48	35.78	35.46	32.86	33.95	35.46	35.78	38.48	38.22	39.49		(61)
Total heat require	d for wa	ater hea	iting ca	lculated	I for eacl	n month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 205.36 18	31.03 18	39.16 1	168.11	163.15	144.1	138.07	153.46	154.74	175.83	186.91	200.45		(62)
Solar DHW input calcu	ulated usir	ng Appen	dix G or	Appendix	H (negati	ve quantity	) (enter '0	if no sola	r contribut	on to wate	er heating)		
(add additional lin	es if FG	HRS ar	nd/or V	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 30.69 2	24.2 2	1.73	15.88	11.31	7.31	6.77	7.77	7.87	16.55	23.81	31.06		(63) (G2)
Output from wate	r heater											_	
(64)m= 173.54 15	55.79 16	66.27	151.1	150.7	135.68	130.1	144.5	145.69	158.07	161.95	168.24		_
							Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	1841.61	(64)
Heat gains from v	vater he	ating, k\	Wh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	] + 0.8 >	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 69.72 6	1.49 6	4.42	57.49	56.02	49.75	47.8	52.79	53.04	59.99	63.54	68.09		(65)
include (57)m i	n calcula	ation of	(65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gains	s (see Ta	able 5 a	and 5a)	):									
Metabolic gains (	Table 5)	, Watts	_										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 129.1 12	29.1 1	29.1	129.1	129.1	129.1	129.1	129.1	129.1	129.1	129.1	129.1		(66)
Lighting gains (ca	lculated	l in Appe	endix l	_, equat	ion L9 o	r L9a), a	lso see <sup>-</sup>	Table 5				_	
(67)m= 20.81 18	8.48 1	5.03	11.38	8.51	7.18	7.76	10.09	13.54	17.19	20.06	21.39		(67)
Appliances gains	(calcula	ted in A	Append	lix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m= 233.41 23	35.83 22	29.73 2	216.74	200.33	184.92	174.62	172.2	178.3	191.29	207.7	223.11		(68)
Cooking gains (ca	alculated	in App	endix	L, equat	ion L15	or L15a)	, also se	e Table	5			'	
(69)m= 35.91 3	5.91 3	5.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91		(69)
Pumps and fans	gains (Ta	able 5a)	)						•			ı	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evapo	oration (	negativ	e valu	es) (Tab	le 5)				•		•	ı	
(71)m= -103.28 -10	03.28 -10	03.28 -1	103.28	-103.28	-103.28	-103.28	-103.28	-103.28	-103.28	-103.28	-103.28		(71)
Water heating gai	ins (Tab	le 5)							•		•	I	
	<del>`</del> —	<del></del>	79.85	75.29	69.09	64.25	70.96	73.67	80.63	88.25	91.51		(72)
Total internal ga	ins =		!		(66)	m + (67)m	+ (68)m +	- (69)m +	(70)m + (7	1)m + (72)	m	I	
		96.07 3	372.69	348.86	325.92	311.36	317.98	330.24	353.84	380.74	400.74		(73)
6. Solar gains:													

Stroma FSAP 2012 Version: 1.0.1.9 (SAP 9.92) - http://www.stroma.com

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Acces Table	s Factor 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x 0.	.77	x	5.6	x	36.79	x	0.63	x	0.8	=	71.97	(77)
Southeast 0.9x 0.	.77	x	8.12	x	36.79	x	0.63	х	0.8	=	104.35	(77)
Southeast 0.9x 0.	.77	x	5.6	x	62.67	x	0.63	х	0.8	=	122.58	(77)
Southeast 0.9x 0.	.77	x	8.12	x	62.67	х	0.63	x	0.8	] =	177.75	(77)
Southeast 0.9x 0.	.77	x	5.6	x	85.75	х	0.63	х	0.8	=	167.73	(77)
Southeast 0.9x 0.	.77	x	8.12	x	85.75	x	0.63	х	0.8	=	243.2	(77)
Southeast 0.9x 0	.77	x	5.6	x	106.25	x	0.63	х	0.8	=	207.82	(77)
Southeast 0.9x 0	.77	x	8.12	x	106.25	x	0.63	x	0.8	=	301.34	(77)
Southeast 0.9x 0	.77	x	5.6	x	119.01	x	0.63	х	0.8	=	232.78	(77)
Southeast 0.9x 0	.77	x	8.12	x	119.01	x	0.63	x	0.8	=	337.52	(77)
Southeast 0.9x 0.	.77	x	5.6	x	118.15	x	0.63	x	0.8	=	231.09	(77)
Southeast 0.9x 0.	.77	x	8.12	x	118.15	x	0.63	x	0.8	=	335.08	(77)
Southeast 0.9x 0	.77	x	5.6	x	113.91	x	0.63	x	0.8	=	222.8	(77)
Southeast 0.9x 0.	.77	x	8.12	x	113.91	x	0.63	x	0.8	=	323.06	(77)
Southeast 0.9x 0	.77	x	5.6	x	104.39	x	0.63	x	0.8	=	204.18	(77)
Southeast 0.9x 0	.77	x	8.12	x	104.39	x	0.63	x	0.8	=	296.06	(77)
Southeast 0.9x 0.	.77	x	5.6	x	92.85	x	0.63	x	0.8	=	181.61	(77)
Southeast 0.9x 0.	.77	x	8.12	x	92.85	x	0.63	x	0.8	=	263.34	(77)
Southeast 0.9x 0.	.77	x	5.6	x	69.27	x	0.63	x	0.8	=	135.48	(77)
Southeast 0.9x 0	.77	x	8.12	x	69.27	x	0.63	x	0.8	=	196.45	(77)
Southeast 0.9x 0.	.77	x	5.6	x	44.07	x	0.63	x	0.8	=	86.2	(77)
Southeast 0.9x 0.	.77	x	8.12	x	44.07	x	0.63	X	0.8	=	124.99	(77)
Southeast 0.9x 0.	.77	x	5.6	x	31.49	x	0.63	X	0.8	=	61.59	(77)
Southeast 0.9x 0.	.77	x	8.12	x	31.49	x	0.63	X	0.8	=	89.3	(77)
Southwest <sub>0.9x</sub> 0.	.77	x	1.96	x	36.79		0.63	X	0.8	=	50.38	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	2.8	x	36.79		0.63	x	0.8	=	35.98	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	1.96	x	62.67		0.63	x	0.8	=	85.81	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	2.8	x	62.67		0.63	X	0.8	=	61.29	(79)
Southwest <sub>0.9x</sub> 0	.77	x	1.96	X	85.75		0.63	X	0.8	=	117.41	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	2.8	x	85.75		0.63	x	0.8	=	83.86	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	1.96	x	106.25		0.63	X	0.8	=	145.47	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	2.8	x	106.25		0.63	x	0.8	=	103.91	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	1.96	x	119.01		0.63	X	0.8	=	162.94	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	2.8	x	119.01		0.63	X	0.8	=	116.39	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	1.96	x	118.15		0.63	x	0.8	=	161.76	(79)
Southwest <sub>0.9x</sub> 0	.77	x	2.8	x	118.15		0.63	x	0.8	=	115.55	(79)
Southwest <sub>0.9x</sub> 0	.77	x	1.96	x	113.91		0.63	x	0.8	=	155.96	(79)
Southwest <sub>0.9x</sub> 0	.77	x	2.8	x	113.91		0.63	x	0.8	=	111.4	(79)
Southwest <sub>0.9x</sub> 0.	.77	x	1.96	×	104.39		0.63	X	0.8	=	142.93	(79)

														_		_
Southwes	St <sub>0.9x</sub> 0.7	7 ×	2.	8	X	10	04.39			0.63	X	0.8		= [	102.09	(79)
Southwes	St <mark>0.9x</mark> 0.7	7 ×	1.9	96	X	9	2.85			0.63	x	0.8		= [	127.13	(79)
Southwes	st <mark>0.9x</mark> 0.7	7 ×	2.	8	X	9	2.85			0.63	x	0.8		= [	90.81	(79)
Southwes	st <sub>0.9x</sub> 0.7	7 ×	1.9	96	x	6	9.27			0.63	x [	0.8		= [	94.84	(79)
Southwes	st <sub>0.9x</sub> 0.7	7 ×	2.	8	x	6	9.27			0.63	x [	0.8	:	= [	67.74	(79)
Southwes	st <sub>0.9x</sub> 0.7	7 ×	1.9	96	x	4	4.07			0.63	x [	0.8	:	= [	60.34	(79)
Southwes	st <mark>0.9x</mark> 0.7	7 ×	2.	8	x	4	4.07			0.63	x [	0.8		= [	43.1	(79)
Southwes	st <mark>o.9x</mark> 0.7	7 ×	1.9	96	x	3	1.49			0.63	x [	0.8		= [	43.11	(79)
Southwes	st <sub>0.9x</sub> 0.7	7 ×	2.	8	x	3	1.49			0.63	x	0.8		= [	30.79	(79)
Solar ga	ins in watts,	calculate	d for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m					
(83)m= 2	262.68 447.43	612.2	758.54	849.63	84	43.49	813.21	745	.26	662.88	494.51	314.62	224.8	3		(83)
Total gai	ins – internal	and sola	r (84)m =	= (73)m	+ (8	33)m	, watts		•			•	•			
(84)m= 6	857.98	3 1008.27	1131.23	1198.5	11	69.41	1124.57	1063	3.23	993.12	848.35	695.36	625.5	4		(84)
7. Mear	n internal ten	nperature	(heating	season	)											
	rature during	•	`		<i>'</i>	area f	from Tab	ole 9.	. Th′	1 (°C)				ſ	21	(85)
-	on factor for	•			-			,	,	. ( -)				l		<b>」</b> ` ′
Г	Jan Feb	Ť	Apr	May	Ė	Jun	Jul	Aı	ug	Sep	Oct	Nov	De	c		
(86)m=	0.98 0.96	0.92	0.84	0.71	_	0.55	0.41	0.4	<del>-  </del>	0.66	0.88	0.97	0.99	-		(86)
Moon in	nternal temp	i	living or	oo T1 /f/	مالد	w cto	nc 2 to 7	l 7 in T	L	. 00)			l			
	19.72 19.95	1	20.54	20.76	_	0.88	20.91	20.9		20.83	20.53	20.05	19.66	<u>.                                    </u>		(87)
` ' _	t		1	<u> </u>				L			20.00	20.00	10.00	لـــُـــ		(0.)
· -	rature during		1	1	_					<u> </u>		_		_		(22)
(88)m=	19.88	19.88	19.88	19.88	1	9.89	19.89	19.8	89	19.89	19.88	19.88	19.88	3		(88)
Utilisati	on factor for	gains for	rest of d	welling,	h2,	m (se	e Table	9a)								
(89)m=	0.98 0.95	0.9	0.8	0.65	C	0.47	0.31	0.3	35	0.58	0.84	0.96	0.98			(89)
Mean ir	nternal tempo	erature in	the rest	of dwelli	ina	T2 (fc	ollow ste	eps 3	to 7	' in Tabl	e 9c)					
	18.18 18.52		19.34	19.61	<del>-</del>	9.74	19.77	19.	$\overline{}$	19.7	19.33	18.67	18.1	1		(90)
` ' _	<b>!</b>		1	l .	I			<u> </u>	!	f	LA = Liv	ng area ÷ (4	4) =	ᅱ	0.33	(91)
						\ (1	A <b>T</b> 4	/4		A) TO				ı		
	nternal temp	<u> </u>	1	i	_							1	l	$\neg$		(00)
` ′	18.69 18.99		19.73	19.99		0.11	20.15	20.		20.07	19.72	19.12	18.62	2		(92)
· · · · · · · —	djustment to	1		<del></del>	_			<del></del>			<del></del>	1	·	_		(00)
` ' <u>L</u>	18.54 18.84	19.21	19.58	19.84	1	9.96	20	19.9	99	19.92	19.57	18.97	18.47			(93)
	e heating re	•										<b>()</b>				
	o the mean i sation factor		•		ned	at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,m=	(76)m an	d re-c	alc	ulate	
	Jan Feb		Apr	May		Jun	Jul	Δι	ug	Sep	Oct	Nov	De	$\Box$		
L Utilisati	on factor for			Iviay		ouri	- Oui		ug į	ОСР	000	1101		<u> </u>		
_	0.97 0.94	0.89	0.79	0.65		).47	0.32	0.3	36	0.58	0.83	0.95	0.98			(94)
` ′ _	gains, hmGn		1													
	655.21 805.3	<u> </u>	894.35	778.78	55	54.65	362.22	380	.96	578	705.32	657.81	610.7	2		(95)
	/ average ex		Į	l	<u> </u>				!			1	I			•
(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)
	ss rate for m											1	L			
_	550.63 1517.3	1		r	_	79.13	366.63	387	<del>'</del> T	629.15	971.64	1287.51	1549.3	33		(97)
· L	I	-1	1		_			ь	!			1	<u> </u>			

Space heating requ	irement fo	or each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	)m – (95	5)m] x (4 <sup>-</sup>	1)m			
(98)m= 666.19 478.4	364.42	189.65	76.47	0	0	0	0	198.14	453.38	698.33		_
						Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	3125.07	(98)
Space heating requ	irement ir	n kWh/m²	<sup>2</sup> /year							[	35.93	(99)
9a. Energy requirem	ents – Ind	lividual h	eating s	ystems i	ncluding	micro-C	HP)					
Space heating:			, .							г		7,
Fraction of space h		·		mentary	•	(000) 4	(204)			ļ	0	(201)
Fraction of space h		-	, ,			(202) = 1 -		(000)1			1	(202)
Fraction of total hea	_	•				(204) = (20	J2) <b>x</b> [1 –	(203)] =		ļ	1	(204)
Efficiency of main s					0.4						93.2	(206)
Efficiency of second	1	_		g systen	า, % <del>เ</del>				-		0	(208)
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requ	<del> </del>	189.65	d above 76.47	)   0	0	0	0	198.14	453.38	698.33		
$(211)$ m = {[(98)m x (								100.14	400.00	000.00		(211)
714.8 513.3	<del></del>	203.49	82.05	0	0	0	0	212.6	486.46	749.28		(211)
LL	_!					Tota	l (kWh/yea	ar) =Sum(2	L 211) <sub>15,1012</sub>	<u> </u>	3353.08	(211)
Space heating fuel	(seconda	ry), kWh/	month							L		_
= {[(98)m x (201)] +	214) m } :	x 100 ÷ (	208)	,				,	T			
(215)m = 0 0	0	0	0	0	0	0	0	0	0	0		<b>-</b>
<b>187</b> 4 1 4						Tota	I (KWN/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F [	0	(215)
Water heating Output from water he	eater (calc	rulated a	hove)									
173.54 155.7		151.1	150.7	135.68	130.1	144.5	145.69	158.07	161.95	168.24		
Efficiency of water h	eater										80.1	(216)
(217)m= 87.91 87.49	86.77	85.42	83.24	80.1	80.1	80.1	80.1	85.42	87.3	88.04		(217)
Fuel for water heatin	•											
(219)m = $(64)$ m x 1 (219)m= 197.4 178.0	1	176.88	181.04	169.39	162.43	180.39	181.88	185.04	185.51	191.08		
		ļ.		!	!	Tota	I = Sum(2	19a) <sub>112</sub> =			2180.74	(219)
Annual totals								k\	Wh/year		kWh/yeaı	
Space heating fuel u	sed, main	system	1								3353.08	
Water heating fuel u	sed										2180.74	
Electricity for pumps	fans and	l electric	keep-ho	t								
central heating pur	p:									30		(230c
boiler with a fan-as	sisted flue	<b>!</b>								45		(230e
Total electricity for th	e above,	kWh/yea	r			sum	of (230a).	(230g) =		[	75	(231)
Electricity for lighting											367.49	(232)
Electricity generated	by PVs									j	-1391.46	(233)

	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	724.26 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	471.04 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1195.3 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	190.73 (268)
Energy saving/generation technologies Item 1		0.519 =	-722.17 (269)
Total CO2, kg/year	sum	of (265)(271) =	702.79 (272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	8.08 (273)
EI rating (section 14)			93 (274)

			User_[	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 20	)12		Strom Softwa					0002943 on: 1.0.1.9	
				Address						
Address :	Flat 3, 16, Roches	ter Mews	LOND	ON, NW1	9JB					
1. Overall dwelling dime	ensions:		Λ	a/m²\		Av. Ha	: a.b.4/\		Value a/m	2)
Ground floor				<b>a(m²)</b> 50.12	(1a) x		<b>ight(m)</b> 2.8	(2a) =	<b>Volume(m</b> 3	(3a)
Total floor area TFA = (1	(1a)+(1b)+(1c)+(1d)+(1	1e)+(1r	n) [	50.12	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	140.34	(5)
2. Ventilation rate:										
Number of chimneys	heating	secondar heating	'у    	other	] <sub>=</sub> [	total		40 =	m³ per hou	_
ŕ		0	╛╘	0	<u> </u>	0			0	(6a)
Number of open flues	0 +	0	+	0	] = [	0		20 =	0	(6b)
Number of intermittent fa	ans					2	X '	10 =	20	(7a)
Number of passive vents	S					0	Χ.	10 =	0	(7b)
Number of flueless gas t	fires					0	X 4	40 =	0	(7c)
								Δir cl	nanges per ho	our
Infiltration due to chimne	ove fluor and fans -	(6a)+(6b)+(7	7a)±(7h)±	(7c) –	г					_
If a pressurisation test has					ontinue fr	20 om (9) to i		÷ (5) =	0.14	(8)
Number of storeys in t		,	( /,			(-) (	,/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (					•	uction			0	(11)
if both types of wall are pure deducting areas of open	present, use the value corre	esponding to	the grea	ter wall are	a (after					
If suspended wooden	• / /	aled) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0	)	·	·					0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value				•	•	etre of e	envelope	area	3	(17)
If based on air permeab	· ·								0.29	(18)
Air permeability value appli Number of sides shelter		as been dor	ne or a de	gree aır pe	meability	is being u	sed			(19)
Shelter factor	eu			(20) = 1 -	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorpora	iting shelter factor			(21) = (18	x (20) =				0.23	(21)
Infiltration rate modified	-	ed								<b></b> _` ′
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	peed from Table 7	•					-	-	-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a) (2	)(2)m : 4								_	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(ΔΖα)ΙΙΙ- 1.21 1.20	1.20 1.1 1.00	0.95	0.95	0.92	'	1.00	1.12	1.10	]	

Adjusted infiltration rate (allowing for s	helter and wind	speed) - (S	21a) v (	(22a)m					
0.29 0.28 0.28 0.25	0.24 0.22	0.22	0.21	0.23	0.24	0.26	0.27		
Calculate effective air change rate for	1 ' 1 '	1 1	0.21	0.20	0.2 :	0.20	1 0.2.		
If mechanical ventilation:								0	(23a)
If exhaust air heat pump using Appendix N, (	$(23b) = (23a) \times Fmv$	equation (N5)	5)), other	wise (23b)	) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in 9	6 allowing for in-use	factor (from T	Table 4h)	=				0	(23c)
a) If balanced mechanical ventilation	with heat recov	ery (MVHF	R) (24a	m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation	without heat re	covery (M\	V) (24b)	)m = (22	2b)m + (2	23b)	1	Ī	
(24b)m = 0 0 0 0	0 0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation if (22b)m < 0.5 x (23b), then (24					5 × (23b	)			
(24c)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole hou if (22b)m = 1, then (24d)m = (22					0.5]				
(24d)m= 0.54 0.54 0.54 0.53	0.53 0.52	0.52	0.52	0.53	0.53	0.53	0.54		(24d)
Effective air change rate - enter (24	a) or (24b) or (24	c) or (24d)	) in box	(25)				•	
(25)m= 0.54 0.54 0.54 0.53	0.53 0.52	0.52	0.52	0.53	0.53	0.53	0.54		(25)
3. Heat losses and heat loss parame	ter:								
ELEMENT Gross Openin			U-valu W/m2l		A X U (W/I	<b>〈</b> )	k-value kJ/m²-l		
Windows Type 1	9.2		I/( 1.2 )+	0.04] =	10.53	,			(27)
Windows Type 2	9.72	x1/[1/	I/( 1.2 )+	0.04] =	11.13	=			(27)
Walls Type1 57.12 18.9		= -	0.23	─ <b>│</b>	8.79	=	60	2292	(29)
Walls Type2 21.84 0	21.8	=	0.19	<b>=</b>	4.16	<b>=</b>	60	1310.4	] (29)
Total area of elements, m <sup>2</sup>	78.9	= -							」` ′ (31)
Party wall	13.4	= -	0		0		45	604.8	(32)
Party floor	50.1	= -					40	2004.8	] (32a)
Party ceiling	50.1	=				_ 	30	1503.6	] (32b)
Internal wall **	66.6						9	599.76	(32c)
* for windows and roof windows, use effective w			ormula 1/	[(1/U-valu	e)+0.04] a	L Is given in			_(020)
** include the areas on both sides of internal wa		-							
Fabric heat loss, W/K = S (A x U)		(2)	26)(30)	+ (32) =				34.61	(33)
Heat capacity Cm = S(A x k)				((28)	.(30) + (32	2) + (32a).	(32e) =	8315.36	(34)
Thermal mass parameter (TMP = Cm	•			` '	÷ (4) =			165.91	(35)
For design assessments where the details of the can be used instead of a detailed calculation.			cisely the	indicative	values of	TMP in Ta	able 1f		_
Thermal bridges : S (L x Y) calculated	•	K						7.02	(36)
if details of thermal bridging are not known (36) Total fabric heat loss	$= 0.15 \times (31)$			(33) +	(36) =			41.62	(37)
Ventilation heat loss calculated month	lv				= 0.33 × (	25)m x <i>(</i> 5)	)	41.63	J <sup>(31)</sup>
Jan Feb Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 25.09 25.02 24.94 24.6	24.53 24.23		24.17	24.35	24.53	24.66	24.8		(38)
Heat transfer coefficient, W/K	<del> </del>				= (37) + (3	38)m	1	I	
(39)m=   66.72   66.65   66.57   66.23	66.16 65.86	65.86	65.81	65.98	66.16	66.29	66.43		
Stroma FSAP 2012 Version: 1.0.1.9 (SAP 9.92)		com	ļ	,	Average =		12 /12=	66.2β <sub>age 2</sub>	<del>(3/</del> 9)
,									-

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.33	1.33	1.33	1.32	1.32	1.31	1.31	1.31	1.32	1.32	1.32	1.33		
	!		<u>.                                    </u>	<u>.                                    </u>	<u>.                                    </u>	!	!		Average =	Sum(40) <sub>1</sub>	12 /12=	1.32	(40)
Number of day	1	<u> </u>	<u> </u>						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occur if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		69		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t			se target o		.42		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 81.87	78.89	75.91	72.93	69.96	66.98	66.98	69.96	72.93	75.91	78.89	81.87		
					100 1/1		·			m(44) <sub>112</sub> =		893.08	(44)
Energy content of													
(45)m= 121.4	106.18	109.57	95.52	91.66	79.09	73.29	84.1	85.11	99.19	108.27	117.57		7(45)
If instantaneous w	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1170.96	(45)
(46)m= 18.21	15.93	16.44	14.33	13.75	11.86	10.99	12.62	12.77	14.88	16.24	17.64		(46)
Water storage	l					<u> </u>	<u> </u>	<u> </u>					, ,
Storage volum	ne (litres	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	0			(47)
If community h	_			-			, ,						
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	(47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				0.	54		(48)
Temperature f					•	, , ,					0		(49)
Energy lost fro				ear			(48) x (49)	) =			0		(50)
b) If manufact			-										
Hot water stor	•			e 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	_		on 4.3								0		(52)
Temperature f			2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or		•								-	32		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 10.04	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 10.04	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	32.33	28.14	29.98	27.88	27.63	25.6	26.45	27.63	27.88	29.98	30.15	32.33		(61)
ı Total h	eat requ	uired for	water he	eating ca	alculated	l for eac	h month	(62)m :	= 0.85 × (	 (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	163.78	143.39	149.59	133.12	129.33	114.41	109.79	121.78	122.7	139.21	148.14	159.95		(62)
Solar DH	IW input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '	0' if no sola	r contribut	ion to wate	er heating)	1	
(add ad	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	20.92	16.91	15.36	10.28	7.77	5.69	5.28	6.06	6.13	11.32	16.77	21.04	'	(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	141.84	125.58	133.25	121.89	120.59	107.78	103.5	114.71	115.58	126.86	130.38	137.87		_
-					-	-	-	Ou	tput from w	ater heate	r (annual)₁	12	1479.83	(64)
Heat ga	ains froi	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	56.48	49.6	51.96	46.51	45.42	40.47	39.02	42.91	43.04	48.51	51.31	55.21		(65)
inclu	de (57)ı	m in cald	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	' leating	
5. Into	ernal ga	ains (see	e Table 5	and 5a	):									
Metabo	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.68	84.68	84.68	84.68	84.68	84.68	84.68	84.68	84.68	84.68	84.68	84.68		(66)
Lighting	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				ı	
(67)m=	13.15	11.68	9.5	7.19	5.38	4.54	4.9	6.38	8.56	10.87	12.68	13.52		(67)
ı Appliar	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	 3a), als	o see Ta	ble 5			I	
(68)m=	147.54	149.08	145.22	137	126.64	116.89	110.38	108.85	_	120.92	131.29	141.03		(68)
Cookin	g gains	(calcula	ted in A	pendix	L, equat	tion L15	or L15a	, also s	ee Table	5			1	
(69)m=	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	[	(69)
Pumps	and far	ns gains	(Table 5	āa)		ı					l		I	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (nega	ive valu	es) (Tab	le 5)			•	•				
(71)m=	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74	-67.74		(71)
Water I	heating	gains (T	able 5)							-	-			
(72)m=	75.92	73.81	69.84	64.59	61.05	56.21	52.44	57.67	59.78	65.2	71.27	74.21		(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m	+ (69)m +	(70)m + (7	1)m + (72)	m	ı	
(73)m=	288.02	285.97	275.96	260.19	244.46	229.05	219.13	224.3	232.45	248.39	266.64	280.17		(73)
6. Sol	ar gains	S:												
Solar g	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	ion.		
Orienta		Access F		Area		Flu			g_		FF		Gains	
	T	able 6d		m²		Tal	ole 6a	•	Table 6b	T	able 6c		(W)	
Southwe	est <sub>0.9x</sub>	0.77	X	9.7	′2	<b>x</b> 3	6.79		0.63	x [	0.8	=	124.91	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	9.7	′2	<b>x</b> 6	2.67		0.63	x	0.8	=	212.77	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	9.7	′2	<b>x</b> 8	5.75		0.63	x	0.8	=	291.12	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	9.7	′2	x 1	06.25		0.63	х	0.8	=	360.72	(79)

								_						
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	X	1	19.01		0.63	X	0.8	=	404.03	(79)
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	x	1	18.15		0.63	x	0.8	=	401.11	(79)
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	x	1	13.91		0.63	x	0.8	=	386.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	x	10	04.39	]	0.63	x	0.8	=	354.4	(79)
Southwest <sub>0.9x</sub>	0.77	x	9.7	2	x	9	2.85	Ì	0.63	×	0.8		315.23	(79)
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	x	6	9.27	ĺ	0.63	×	0.8	=	235.16	(79)
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	x	4	4.07	ĺ	0.63	×	0.8	=	149.62	(79)
Southwest <sub>0.9x</sub>	0.77	X	9.7	2	x	3	1.49	ĺ	0.63	×	0.8	=	106.9	(79)
Northwest 0.9x	0.77	X	9.2	2	x	1	1.28	x	0.63	x	0.8	=	36.26	(81)
Northwest 0.9x	0.77	X	9.2	2	x	2	2.97	x	0.63	×	0.8	=	73.8	(81)
Northwest 0.9x	0.77	X	9.2	2	x	4	1.38	x	0.63	x	0.8	=	132.96	(81)
Northwest 0.9x	0.77	X	9.2	2	x	6	7.96	x	0.63	×	0.8	=	218.36	(81)
Northwest 0.9x	0.77	X	9.2	2	x	9	1.35	x	0.63	×	0.8		293.52	(81)
Northwest 0.9x	0.77	х	9.2	2	x	9	7.38	х	0.63	x	0.8	=	312.93	(81)
Northwest 0.9x	0.77	Х	9.2	2	x	9	91.1	X	0.63	x	0.8	=	292.74	(81)
Northwest 0.9x	0.77	X	9.2	2	x	7	2.63	x	0.63	×	0.8	=	233.37	(81)
Northwest 0.9x	0.77	х	9.2	2	x	5	0.42	х	0.63	x	0.8	=	162.02	(81)
Northwest 0.9x	0.77	X	9.2	2	x	2	8.07	x	0.63	×	0.8	=	90.19	(81)
Northwest 0.9x	0.77	X	9.2	2	x		14.2	x	0.63	×	0.8	=	45.62	(81)
Northwest 0.9x	0.77	X	9.2	2	x	9	9.21	x	0.63	x	0.8	=	29.61	(81)
								='						
Solar gains in	watts, ca	lculated	for eacl	n mont	h			(83)m	n = Sum(74)m .	(82)m				
Solar gains in (83)m= 161.17	watts, ca	lculated 424.09	for eacl 579.08	n mont 697.55	$\overline{}$	14.04	679.45	( <mark>83</mark> )m		<mark>(82)m</mark> 325.3	1	136.51	]	(83)
ĭ——	286.57	424.09	579.08	697.55	7			ÈΈ				136.51	]	(83)
(83)m= 161.17	286.57 internal ar	424.09	579.08	697.55	7 + (			ÈΈ	.77 477.24		5 195.23	136.51 416.67	]	(83) (84)
(83)m= 161.17 Total gains –	286.57 internal ar 572.54	424.09 nd solar 700.05	579.08 (84)m = 839.27	697.55 : (73)m 942.02	7 1 + (8 2   9	83)m	, watts	587	.77 477.24	325.3	5 195.23	I	]	` '
(83)m= 161.17 Total gains – (84)m= 449.19	286.57 internal ar 572.54 rnal tempo	424.09 nd solar 700.05 erature (	579.08 (84)m = 839.27 (heating	697.55 (73)m 942.02 seaso	7 1 + (8 2 9	83)m 43.08	, watts 898.58	587 812	.77 477.24 .07 709.69	325.3	5 195.23	I	21	` '
(83)m= 161.17 Total gains – (84)m= 449.19 7. Mean inte	286.57 internal ar 572.54 rnal temper during he	424.09 and solar 700.05 erature (eating po	579.08 (84)m = 839.27 (heating eriods in	697.55 (73)m 942.02 seaso	n + (8 9 n)	83)m 43.08 area 1	, watts 898.58 from Tal	587 812	.77 477.24 .07 709.69	325.3	5 195.23	I	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean inte	286.57 internal ar 572.54 rnal temper during he	424.09 and solar 700.05 erature (eating po	579.08 (84)m = 839.27 (heating eriods in	697.55 (73)m 942.02 seaso	7 1 + (3 2 9 n) ving m (s	83)m 43.08 area 1	, watts 898.58 from Tal	812	.77 477.24 .07 709.69	325.3	195.23 4 461.88	I	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean inter Temperature Utilisation fa	286.57 internal ar 572.54 rnal temperaturing heat corfor gar	424.09 and solar 700.05 erature (eating points for li	579.08 (84)m = 839.27 (heating eriods in twing are	697.55 (73)m 942.02 seaso the lives, h1,r	7 + (3 9 9 ) ying m (s	83)m 43.08 area t ee Ta	, watts 898.58 from Tal ble 9a)	812	.77 477.24 .07 709.69 , Th1 (°C)	325.3 573.7	195.23 4 461.88 : Nov	416.67	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean inte Temperature Utilisation fa Jan (86)m= 0.97	286.57 internal ar 572.54 rnal temper during he ctor for gar Feb 0.94	424.09 Ind solar 700.05 Perature ( Peating peating for li Mar 0.87	579.08 (84)m = 839.27 (heating eriods in Apr 0.75	697.55 = (73)m 942.02 seaso the lives, h1, May 0.59	n)  ving m (s	83)m 43.08 area f ee Ta Jun 0.43	, watts 898.58 from Tal ble 9a) Jul 0.32	587 812 ole 9 A	.77 477.24 .07 709.69 ., Th1 (°C) ug Sep .96 0.58	325.3 573.7 Oct	195.23 4 461.88 : Nov	416.67 Dec	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean inte Temperature Utilisation fa	286.57 internal ar 572.54 rnal temper during he ctor for gar Feb 0.94	424.09 Ind solar 700.05 Erature ( eating peains for li Mar 0.87	579.08 (84)m = 839.27 (heating eriods in Apr 0.75	697.55 = (73)m 942.02 seaso the lives, h1, May 0.59	n)  ying  follo	83)m 43.08 area f ee Ta Jun 0.43	, watts 898.58 from Tal ble 9a) Jul 0.32	587 812 ole 9 A	.77 477.24 .07 709.69 ., Th1 (°C) ug Sep	325.3 573.7 Oct	195.23 4 461.88 Nov 0.95	416.67 Dec	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean intermediate Temperature Utilisation far Jan (86)m= 0.97  Mean intermediate Temperature Utilisation far Jan (86)m= 19.68	286.57 internal ar 572.54 rnal temper during he ctor for gar Feb 0.94 al tempera 19.94	424.09 Ind solar 700.05  erature ( eating peatins for li Mar 0.87  ature in l 20.27	579.08 (84)m = 839.27 (heating eriods in ving are 0.75 iving are 20.6	697.55 = (73)m 942.02 seaso the lives, h1,r May 0.59 ea T1 ( 20.81	n)  ying m (s	83)m 43.08 area f ee Ta Jun 0.43 w ste	, watts 898.58 from Tal ble 9a) Jul 0.32 ps 3 to 7	587 812 ole 9 A 0.3 7 in T 20.	.77 477.24 .07 709.69 ., Th1 (°C) ug Sep 66 0.58 Table 9c) 91 20.84	325.3 573.7 Oct 0.83	195.23 4 461.88 Nov 0.95	416.67  Dec 0.98	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean inte Temperature Utilisation fa  (86)m= 0.97  Mean interna (87)m= 19.68  Temperature	286.57 internal ar 572.54 rnal temper during he ctor for gar Feb 0.94 al tempera 19.94	424.09 Ind solar 700.05  erature ( eating peatins for li Mar 0.87  ature in l 20.27	579.08 (84)m = 839.27 (heating eriods in ving are 0.75 iving are 20.6	697.55 = (73)m 942.02 seaso the lives, h1,r May 0.59 ea T1 ( 20.81	n)  ring  m (s  follo	83)m 43.08 area f ee Ta Jun 0.43 w ste	, watts 898.58 from Tal ble 9a) Jul 0.32 ps 3 to 7	587 812 ole 9 A 0.3 7 in T 20.	.77 477.24  .07 709.69  , Th1 (°C)  ug Sep  .6 0.58  Table 9c)  91 20.84  .9, Th2 (°C)	325.3 573.7 Oct 0.83	195.23 4 461.88 Nov 0.95	416.67  Dec 0.98	21	(84)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean interest Temperature Utilisation fa  (86)m= 0.97  Mean interna (87)m= 19.68  Temperature (88)m= 19.82	286.57 internal ar 572.54 rnal temper during he ctor for gar lemper al temperar 19.94 e during he 19.82	d24.09 Ind solar roo.05 Perature ( Peating points for li Mar 0.87 Pature in l 20.27 Peating points 19.82	579.08 (84)m = 839.27 (heating eriods in Apr 0.75 iving are 20.6 eriods in 19.82	697.55 (73)m 942.02 seaso the lives, h1,r May 0.59 ea T1 ( 20.81 rest of	n)  ring m (s  follo  2  f dw  1	area face Ta Jun 0.43 w ste 20.89 velling 9.83	, watts 898.58 from Tab ble 9a) Jul 0.32 ps 3 to 7 20.91 from Ta	812 812 812 A 0.3 7 in T 20.	.77 477.24  .07 709.69  ., Th1 (°C)  ug Sep  .6 0.58  .able 9c)  .91 20.84  .9, Th2 (°C)	325.3 573.7 Oct 0.83 20.53	195.23 4 461.88 Nov 0.95	Dec 0.98	21	(84) (85) (86) (87)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean interpretation fared Jan (86)m= 0.97  Mean internation (87)m= 19.68  Temperature (88)m= 19.82  Utilisation fared	286.57 internal ar 572.54 rnal temper during he ctor for gar 19.94 rnal temperar 19.94	d24.09 Ind solar roo.05  erature ( eating periods for li Mar 0.87  ature in l 20.27 eating periods for roots for roo	579.08  (84)m = 839.27  (heating eriods in ving are 20.6 eriods in 19.82  est of decrease of the second sec	697.55 = (73)m 942.02 seaso n the lives, h1,n May 0.59 ea T1 ( 20.81 n rest o 19.83 welling	n) n) ring m (s follo  2 f dw  1 f, h2,	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 velling 9.83 ,m (se	from Talble 9a)  Jul  0.32  ps 3 to 7  20.91  from Talble 9a)	8122 812 812 812 812 812 812 812 812 812	.77 477.24  .07 709.69  ., Th1 (°C)  ug Sep .66 0.58  .6able 9c) .91 20.84  .9, Th2 (°C) .83 19.83	325.3 573.7 Oct 0.83 20.53	195.23 4 461.88 Nov 0.95 3 20.03	Dec 0.98 19.62	21	(84) (85) (86) (87) (88)
(83)m= 161.17  Total gains – (84)m= 449.19  7. Mean interpretation fared Jan (86)m= 0.97  Mean interpretation (87)m= 19.68  Temperature (88)m= 19.82  Utilisation fared (89)m= 0.96	286.57 internal ar 572.54 rnal temper during he ctor for gar 19.94 rnal temperar 19.94	d24.09 Ind solar roo.05 Perature ( Peating points for lime of	579.08 (84)m = 839.27 (heating eriods in ving are 20.6 eriods in 19.82 est of do 0.71	697.55 = (73)m 942.02 seaso the lives, h1,r May 0.59 ea T1 ( 20.81 n rest o 19.83 welling 0.53	n)  n)  ring m (s  follo  2  f dw  1  1  1  1  1  1  1  1  1  1  1  1  1	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 relling 9.83 ,m (se 0.36	, watts 898.58  from Tal ble 9a) Jul 0.32 ps 3 to 7 20.91 from Tal 19.83 ee Table 0.24	812 812 812 A 0.3 7 in T 20. 19. 9a) 0.2	.77 477.24 .07 709.69 ., Th1 (°C) .08 Sep .06 0.5809 20.8409 1 20.8409 19.8309 19.83	325.3 573.7 Oct 0.83 20.53	195.23 4 461.88 Nov 0.95	Dec 0.98	21	(84) (85) (86) (87)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean interest of the second of the secon	286.57 internal ar 572.54 rnal temper during he ctor for gar 19.94 rnal temperar 19.82 rnal temperar 19.82 rnal temperar 19.92	d24.09 Ind solar roo.05 Perature ( Peating points for li Mar 0.87 Peating points ature in l 20.27 Peating points 19.82 Peating points 1	579.08 (84)m = 839.27 (heating eriods in Apr 0.75 iving are 20.6 eriods in 19.82 est of do 0.71 he rest	697.55 = (73)m 942.02 seaso the livea, h1,t May 0.59 ea T1 ( 20.81 the livean rest of the	n)  ring m (s  follo  2  f dw  1  1  1  1  1  1  1  1  1  1  1  1  1	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 velling 9.83 ,m (se 0.36	ywatts 898.58  from Table 9a) Jul 0.32 ps 3 to 7 20.91 from Ta 19.83 ee Table 0.24 collow ste	812 812 812 A 0.3 7 in T 20. 4 able 9 19. 9 a) 0.2	.77 477.24  .07 709.69  ., Th1 (°C)  ug Sep .66 0.58  Table 9c) .91 20.84 .9, Th2 (°C) .83 19.83  .88 0.5 .to 7 in Tabl	325.3 573.7 Oct 0.83 20.53 19.83 0.79 e 9c)	195.23 4 461.88  Nov 0.95 20.03 19.82	Dec 0.98 19.62 19.82 0.97		(84) (85) (86) (87) (88) (89)
(83)m= 161.17  Total gains – (84)m= 449.19  7. Mean interpretation fared Jan (86)m= 0.97  Mean interpretation (87)m= 19.68  Temperature (88)m= 19.82  Utilisation fared (89)m= 0.96	286.57 internal ar 572.54 rnal temper during he ctor for gar 19.94 rnal temperar 19.94	d24.09 Ind solar roo.05 Perature ( Peating points for lime of	579.08 (84)m = 839.27 (heating eriods in ving are 20.6 eriods in 19.82 est of do 0.71	697.55 = (73)m 942.02 seaso the lives, h1,r May 0.59 ea T1 ( 20.81 n rest o 19.83 welling 0.53	n)  ring m (s  follo  2  f dw  1  1  1  1  1  1  1  1  1  1  1  1  1	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 relling 9.83 ,m (se 0.36	, watts 898.58  from Tal ble 9a) Jul 0.32 ps 3 to 7 20.91 from Tal 19.83 ee Table 0.24	812 812 812 A 0.3 7 in T 20. 19. 9a) 0.2	.77 477.24 .07 709.69 ., Th1 (°C) .08 Sep .06 0.58 .09 20.84 .09, Th2 (°C) .09 19.83 .05 19.83 .05 to 7 in Table .71 19.65	325.3 573.7 Oct 0.83 20.53 19.83 0.79 e 9c) 19.29	195.23 4 461.88  Nov 0.95 20.03 19.82 0.93	19.62 19.82 0.97		(84) (85) (86) (87) (88) (89)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean interest of the second of the secon	286.57 internal ar 572.54 rnal temper during he ctor for gar 19.94 rnal temperar 19.82 rnal temperar 19.82 rnal temperar 19.92	d24.09 Ind solar roo.05 Perature ( Peating points for li Mar 0.87 Peating points ature in l 20.27 Peating points 19.82 Peating points 1	579.08 (84)m = 839.27 (heating eriods in Apr 0.75 iving are 20.6 eriods in 19.82 est of do 0.71 he rest	697.55 = (73)m 942.02 seaso the livea, h1,t May 0.59 ea T1 ( 20.81 the livean rest of the	n)  ring m (s  follo  2  f dw  1  1  1  1  1  1  1  1  1  1  1  1  1	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 velling 9.83 ,m (se 0.36	ywatts 898.58  from Table 9a) Jul 0.32 ps 3 to 7 20.91 from Ta 19.83 ee Table 0.24 collow ste	812 812 812 A 0.3 7 in T 20. 4 able 9 19. 9 a) 0.2	.77 477.24 .07 709.69 ., Th1 (°C) .08 Sep .06 0.58 .09 20.84 .09, Th2 (°C) .09 19.83 .05 19.83 .05 to 7 in Table .71 19.65	325.3 573.7 Oct 0.83 20.53 19.83 0.79 e 9c) 19.29	195.23 4 461.88  Nov 0.95 20.03 19.82	19.62 19.82 0.97	21	(84) (85) (86) (87) (88) (89)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean intermodular Temperature Utilisation fa  (86)m= 0.97  Mean intermodular 19.68  Temperature (88)m= 19.82  Utilisation fa (89)m= 0.96  Mean intermodular 18.08  Mean intermodular 18.08	286.57 internal ar 572.54 rnal tempore during he ctor for ga Red 19.94 red during he 19.82 ctor for ga 0.92 rd tempera 18.45	d24.09 Ind solar roo.05 Perature ( Peating points for li Mar 0.87 Peating points 19.82 Peatin	579.08 (84)m = 839.27 (heating eriods in a seriods in a seriod in a	697.55 = (73)m 942.02 seaso a the livea, h1,r May 0.59 ea T1 ( 20.81 a rest of 19.83 welling 0.53 of dwe 19.6	7 1 + (3 2 9 9 n)  ving m (s 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 yelling 9.83 ,m (se 0.36 T2 (fo 9.69	rom Talble 9a) Jul 0.32 ps 3 to 7 20.91 from Tal 19.83 ee Table 0.24 collow ste	8122 812 812 812 812 812 812 812 812 812	.77 477.24  .07 709.69  ., Th1 (°C)  ug Sep .66 0.58  Table 9c) .91 20.84  .9, Th2 (°C) .83 19.83  .88 0.5  to 7 in Table .71 19.65	325.3 573.7 Oct 0.83 20.53 19.83 0.79 e 9c) 19.29	195.23  4 461.88  Nov 0.95  3 20.03  19.82  0.93  18.6  ving area ÷ (-	19.62 19.82 0.97		(84) (85) (86) (87) (88) (89) (90) (91)
(83)m= 161.17 Total gains – (84)m= 449.19  7. Mean interest of the second of the secon	286.57 internal ar 572.54 rnal temper during he ctor for gar 19.94 rnal temperar 19.82 rnal temperar 19.2 rnal temperar 19.2	d24.09 Ind solar roo.05  erature ( eating period of the solar) Mar 0.87  eture in I 20.27 eating period of the solar of th	579.08  (84)m = 839.27  (heating eriods in ving are 20.6 eriods in 19.82 est of do 0.71 he rest 19.36  r the wh 19.99	697.55  (73)m  942.02  seaso  the lives, h1,r  May  0.59  ea T1 ( 20.81  rest of  19.83  welling  0.53  of dwe  19.6	n)  ring m (s  follo  2  f dw  1  1  1  ellling  2	83)m 43.08 area f ee Ta Jun 0.43 w ste 20.89 yelling 9.83 m (se 0.36 T2 (fe 9.69	, watts 898.58  from Tal ble 9a)  Jul 0.32 ps 3 to 7 20.91  from Ta 19.83 pe Table 0.24  ollow ste 19.71  A × T1 20.31	8122	.77 477.24  .07 709.69  ., Th1 (°C)  ug Sep .66 0.58  .7able 9c) .91 20.84  .9, Th2 (°C) .83 19.83  .7able 7 in Table .7d 19.65	325.3 573.7 Oct 0.83 20.53 19.83 0.79 e 9c) 19.29 LA = Li	195.23  4 461.88  Nov 0.95  20.03  19.82  0.93  18.6  ving area ÷ (-	19.62 19.82 0.97		(84) (85) (86) (87) (88) (89)

(00)	10.05	10.45	10.01	00.00		00.40		00.4	10.70	10.17	40.00	l	(02)
(93)m= 18.73	19.05	19.45	19.84	20.06	20.14	20.16	20.16	20.1	19.76	19.17	18.66		(93)
8. Space hea						44 -4	Table O	41	4 T: /	70)	-11-		
Set Ti to the the utilisation			•		ied at ste	ep 11 oi	rable 9i	o, so tha	t 11,m=(	76)m an	d re-caid	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	<del></del>	1										l	
(94)m= 0.96	0.91	0.84	0.71	0.54	0.38	0.26	0.3	0.52	0.79	0.92	0.96		(94)
Useful gains,	1	<del>` ` `</del>	, ,	<del> </del>			T	I			l		(05)
(95)m= 429.2	523.76	588.6	595.3	509.82	355.54	232.73	244.11	368.54	453.08	427.19	401.51		(95)
Monthly aver	<del></del>	1		r	r	40.0	1 40 4	444	40.0	7.4	1.0	1	(06)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat (97)m= 962.95	942.91	861.92	724.23	552.92	365.09	=[(39)m 234.66	247.4	- (96)m	606.29	799.97	960.81		(97)
Space heating	l .			L	l		l .	l		<u> </u>	960.61		(91)
(98)m= 397.11	281.67	203.35	92.83	32.06	0	0.02	0	0	113.99	268.4	416.12		
(50)111	201.07	200.00	32.00	32.00				l per year				1805.53	(98)
							Tota	ii pei yeai	(KVVII/yeai	) = Sum(9	O)15,912 =	1005.55	╡``
Space heating	ig require	ement in	kWh/m²	<sup>2</sup> /year								36.02	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heati	•												_
Fraction of sp	pace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	oace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.2	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating	g require	ement (c	alculate	d above)	)							1	
397.11	281.67	203.35	92.83	32.06	0	0	0	0	113.99	268.4	416.12		
(211)m = {[(98	3)m x (20	)4)] + (21	0)m } x	100 ÷ (2	(06)								(211)
426.09	302.22	218.18	99.6	34.4	0	0	0	0	122.3	287.98	446.48		
		-			-	-	Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	1	1937.27	(211)
Space heating	g fuel (s	econdar	y), kWh/	month							'		
$= \{[(98) \text{m x } (26)]\}$	01)] + (2	14) m } x	100 ÷ (	208)									
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<del>_</del>	0	(215)
Water heating	g												
Output from w	T											I	
141.84	125.58	133.25	121.89	120.59	107.78	103.5	114.71	115.58	126.86	130.38	137.87		7
Efficiency of w	1						,	1			1	80.1	(216)
(217)m= 87.3	86.82	85.91	84.17	82.03	80.1	80.1	80.1	80.1	84.58	86.63	87.46		(217)
Fuel for water	•												
(219)m = (64) (219)m = 162.47	1	) ÷ (217) 155.1	m 144.8	147	134.55	129.22	143.21	144.29	149.98	150.51	157.65		
(210)111-102.47	1 177.04	100.1	1.77.0	171	107.00	120.22		I = Sum(2		1 100.01	107.00	1763.43	(219)
Annual totals							. 0 10	20.11(2		Whkee			<b>」</b> `
Space heating		ed, main	system	1					K	Wh/year		kWh/year 1937.27	7
,	,	,	,										_

					_
Water heating fuel used				1763.43	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30	]	(230c)
boiler with a fan-assisted flue			45	]	(230e)
Total electricity for the above, kWh/year	sum of (23	80a)(230g) =		75	(231)
Electricity for lighting				232.3	(232)
Electricity generated by PVs				-798.65	(233)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fa		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	418.45	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	380.9	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=		799.35	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	120.56	(268)
Energy saving/generation technologies Item 1		0.519	=	-414.5	(269)
Total CO2, kg/year	su	um of (265)(271) =		544.34	(272)
Dwelling CO2 Emission Rate	(2	272) ÷ (4) =		10.86	(273)

El rating (section 14)

(274)

92

			User I	Details:						
Assessor Name:	Neil Inghar	n		Strom	a Num	ber:		STRO	002943	
Software Name:	Stroma FS			Softwa				Versio	n: 1.0.1.9	
			Property							
Address :	Flat 4, 16, R	ochester Me	· · ·							
Overall dwelling dime			,	J. 1, 1111	. 552					
<b>J</b>			Are	a(m²)		Av. He	eight(m)		Volume(m <sup>3</sup>	3)
Ground floor				50.61	(1a) x		2.8	(2a) =	141.71	, (3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1d)+(1e)+	.(1n) 	50.61	(4)			_		
Dwelling volume			`			)+(3c)+(3c	d)+(3e)+	(3n) =	141.71	(5)
2. Ventilation rate:										
2. Ventilation rate.	main	secon		other		total			m³ per hou	ır
Number of chimneys	heating 0	heatin	<u>ig</u>   + [	0	] = [	0	x	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0	i = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	
Number of passive vents	S				F	0	x	10 =	0	    (7b)
Number of flueless gas f					L F	0	×	40 =	0	(7c)
g					L				Ů	(. •)
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = (6a)+(6b	)+(7a)+(7b)+	(7c) =	Γ	20		÷ (5) =	0.14	(8)
If a pressurisation test has l	been carried out or	is intended, pro	ceed to (17),	otherwise	continue fr	rom (9) to	(16)			_
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9)	)-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or	timber frame	or 0.35 fc	r mason	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi			ng to the grea	ter wall are	ea (after					
If suspended wooden	floor, enter 0.2	(unsealed) o	r 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught strippe	d						0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic me	etres per h	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 2]$	0]+(8), otherv	vise (18) =	(16)				0.29	(18)
Air permeability value applie	es if a pressurisatio	on test has been	done or a de	gree air pe	rmeability	is being u	ised			
Number of sides sheltered	ed								3	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.23	(21)
Infiltration rate modified	for monthly win	d speed								
Jan Feb	Mar Apr	May Ju	ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a) (2	(2)m · 4									
Wind Factor $(22a)m = (2a)m =$	, <del>-</del> 4	100 00	F 0.05	1 0 00	<del> </del>	T	Т	T	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infilt	ration rate	(allowir	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m						
0.29	0.28	0.28	0.25	0.24	0.21	0.21	0.21	0.23	0.24	0.25	0.27			
Calculate effe		•	ate for t	he appli	cable ca	se			!			·		٦,,,,
If mechanic			ndiv N (2	2h) _ (22a	) Em. (a	auation (N	JEN otho	nuico (22h	) - (22a)				0	(23a
If exhaust air I									) = (23a)				0	_](23b
If balanced wi		-	-	_					21.) (4	201 ) [	4 (00.)		0	(230
a) If balanc	1	- i				<u> </u>	<del>- ^ ` `</del>	<del>í `</del>	<del> </del>		<u>`</u>	÷ 100] I		(24a
(24a)m= 0	0 1	0	0	0	0	0	0	0	0 (	0	0			(246
b) If balanc	T T	r					<del>- ^ `</del>	<del>``</del>	<del>r `</del>		Ι ,	l		(24h
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24b
c) If whole	house extr m < 0.5 ×			•	•				5 v (23h	١				
(24c)m = 0	0.5 2	0	0	0	0	0	0	0	0	0	0	]		(240
d) If natural												J		
,	m = 1, the			•	•				0.5]					
(24d)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54			(240
Effective ai	r change r	ate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-		-	•		
(25)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54			(25)
3. Heat loss	os and has	at loce n	aramata	or:					•		•	•		
ELEMENT	es and nea Gross	·	Openin		Net Ar	<b>6</b> 2	U-valı	IA.	AXU		k-value	۵	ΑX	k
ELEIVIEINI	area (		m		A,r		W/m2		(W/ł	()	kJ/m²-ł		kJ/k	
Windows Typ	e 1				16.8	x1.	/[1/( 1.2 )+	0.04] =	19.24					(27)
Windows Typ	e 2				3.78	x1.	/[1/( 1.2 )+	0.04] =	4.33					(27)
Walls Type1	56.56	;	24.36	3	32.2	x	0.23	=	7.41	<b>=</b>	60	7 [	1932	(29)
Walls Type2	19.88		0		19.88	x	0.19	<b>=</b>	3.79	<b>=</b>	60	<b>=</b>	1192.8	] (29)
Roof	35.7		0		35.7	x	0.13	<b>=</b>	4.64	<b>=</b>	9	≓ i	321.3	] (30)
Total area of		m²			112.1	4								(31) (31)
Party wall	,				13.44		0		0	<b>–</b> [	45	— г	604.8	(32)
Party floor					50.61	=	<u> </u>		U		40	<b>-</b>	2024.4	](32a
Party ceiling						=				L		북 ¦		╡
, ,	*				14.91	_				L	30	<b>- </b>	447.3	](32b
Internal wall *			ee - e:		43.12		. fa	/5/4/11	) . 0 0 41 -	_ 	9		388.08	(320
* for windows an  ** include the are						ated using	TOTTIUIA I	/[( I/ <b>U-</b> VaIU	ie)+0.04j a	s giveri iri	paragrapr	1 3.2		
Fabric heat lo	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				43	3.73	(33)
Heat capacity	/ Cm = S(A	Axk)						((28).	(30) + (32	!) + (32a).	(32e) =	691	0.68	(34)
Thermal mass	s paramete	er (TMP	e Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			130	6.55	(35)
For design asses				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f			_ ^
Thermal bridg	ges : S (L x	(Y) cald	culated u	using Ap	pendix ł	<						9.	66	(36)
if details of therm Total fabric he	nal bridging a	,		• .	•			(33) +	(36) =					_
		loulotod	monthly	,						25)m v (F)	\	53	5.39	(37)
Ventilation he	<del> </del>	- t			ميرا	1, ,1	۸۰۰۰		= 0.33 × (2		i	l		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l		

Signe   25.32   25.24   25.17   24.82   24.76   24.46   24.46   24.47   24.57   24.58   24.50   25.02   (38)	(38)m= 25.32 2	5.24	25.17	24.82	24.76	24.46	24.46	24.4	24.57	24.76	24.89	25.02		(38)
139   12   158	` '			24.02	24.70	24.40	24.40	24.4			l .	25.02		(30)
Average = Sum(38), \( \text{ 2} \)   12				78 21	78 14	77 85	77 85	77 79			1	78 41		
(40)   (41)	(66)	0.00	70.00	70.21	70.11	77.00	11.00	77.70				<u> </u>	78.21	(39)
Average   Sum(40)	Heat loss parame	eter (H	ILP), W/	m²K										_
Number of days in month (Table 1a)    Man	(40)m= 1.56	1.55	1.55	1.55	1.54	1.54	1.54	1.54			<u> </u>	igsquare		_
	Number of days i	n mon	ith (Tabl	le 1a)					/	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.55	(40)
4. Water heating energy requirement:  **Notice of the string energy requirement in the string energy en					May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Assumed occupancy, N					•			<del>-</del>			-	31		(41)
Assumed occupancy, N														
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Not more than 125 litres per person per day (all water use, hot and cold)  Lan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd.m = factor from Table 1 x (43)  (44)me 82.24 79.25 76.26 73.27 70.28 67.29 67.29 70.28 73.27 76.26 79.25 82.24  Total = Sum(44) = 897.21 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)me 121.97 106.67 110.08 95.97 92.08 79.46 73.63 84.49 85.5 99.84 108.77 118.12  Total = Sum(45) = 1176.38 (45)  It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)ma 18.29 16 16.51 14.4 13.81 11.92 11.04 12.67 12.83 14.95 16.32 17.72 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  3) If manufacturer's declared closs factor is known (kWh/day): 0.54 (48)  Temperature factor from Table 2b 0.0 (49)  Energy lost from water storage, kWh/year (48) x (49) = 0.0 (50)  If community heating see section 4.3  Volume factor from Table 2b 0.0 (50)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0. (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0. (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0. (52)  Temperature factor from Table 2b 0.0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0. (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0. (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (	4. Water heating	gener	gy requi	rement:								kWh/ye	ear:	
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Not more than 125 litres per person per day (all water use, hot and cold)  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Not more than 125 litres per person per day (all water use, hot and cold)  Annual average in litres per day for each month Vd.m = factor from Table to x (43)  (44)me	Assumed essure	nov N	ı									1		(40)
Annual average hot water usage in litres per day Vd, average = (25 x N) + 36	if TFA > 13.9, N	N = 1 -		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		71		(42)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	,		ter usac	ae in litre	s per da	ıv Vd.av	erage =	(25 x N)	+ 36		74	.77		(43)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Reduce the annual av	verage i	hot water	usage by	5% if the a	welling is	designed t			se target o		···		, ,
Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)  (44)m= 82.24 79.25 76.26 73.27 70.28 67.29 67.29 70.28 73.27 76.26 79.25 82.24  Total = Sum(44)e = 897.21 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables tb, 1c, 1d)  (45)m= 121.97 106.67 110.08 95.97 92.08 79.46 73.63 84.49 85.5 99.64 108.77 118.12  Total = Sum(45)e = 1176.38 (45)  It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 18.29 16 16.51 14.4 13.81 11.92 11.04 12.67 12.83 14.95 16.32 17.72 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  1 energy lost from Water storage, kWh/year (48) x (49) = 0 (50)  Energy lost from water storage, kWh/year (48) x (49) = 0 (50)  Energy lost from Table 2b (50)  Energy lost from Table 2a (50)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Energy lost from water storage loss calculated for each month (56)  Energy lost from water storage loss calculated for each month (56)  Energy lost from water st		· ·		,			,				·			
(44)m=   82.24   79.25   76.26   73.27   70.28   67.29   70.28   73.27   76.26   79.25   82.24					,				Sep	Oct	Nov	Dec		
Total = Sum(44) v =   897.21   (44)		<u>,</u>						. /	73 27	76.26	79.25	82 24		
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m=	(44)111- 02.24 1	9.23	70.20	13.21	70.20	07.29	07.29	70.20				L	897.21	<b>\</b> (44)
Total = Sum(45)   1   176.38   (45)   18.29   16   16.51   14.4   13.81   11.92   11.04   12.67   12.83   14.95   16.32   17.72   (46)   17.72   18.29   16   16.51   14.4   13.81   11.92   11.04   12.67   12.83   14.95   16.32   17.72   (46)   18.29   16.32   17.72   (46)   18.29   16.35   16.51   14.4   13.81   11.92   11.04   12.67   12.83   14.95   16.32   17.72   (46)   17.72   18.29   18.	Energy content of hot	t water i	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x D	OTm / 3600			` '	L		<b></b>  ` ′
## Instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  ## Instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  ## Instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  ## Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel  ## O	(45)m= 121.97 10	06.67	110.08	95.97	92.08	79.46	73.63	84.49	85.5	99.64	108.77	118.12		
(46)me       18.29       16       16.51       14.4       13.81       11.92       11.04       12.67       12.83       14.95       16.32       17.72       (46)         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:         a) If manufacturer's declared loss factor is known (kWh/day):       0.54       (48)         Colspan="6">Colspan="	If instantaneous water	r hootin	a ot noint	of upo (no	, bot water	· otorogol	antar O in	havea (16		Γotal = Su	m(45) <sub>112</sub> =	=	1176.38	(45)
Water storage loss:       0       (47)         Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)       Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:       a) If manufacturer's declared loss factor is known (kWh/day):       0.54       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       0       (54)         Enter (50) or (54) in (55)       0.32       (55)         Water storage loss calculated for each month       ((56)m = (55) × (41)m       (56)														(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:         a) If manufacturer's declared loss factor is known (kWh/day):       0.54       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Temperature factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       0       (54)         Enter (50) or (54) in (55)       0.32       (55)         Water storage loss calculated for each month       ((56)m = (55) × (41)m       (56)         (56)m=       10.04       9.07       10.04       9.72       10.04       10.04       9.72       10.04 <t< td=""><td>` '</td><td></td><td>16.51</td><td>14.4</td><td>13.81</td><td>11.92</td><td>11.04</td><td>12.67</td><td>12.83</td><td>14.95</td><td>16.32</td><td>17.72</td><td></td><td>(46)</td></t<>	` '		16.51	14.4	13.81	11.92	11.04	12.67	12.83	14.95	16.32	17.72		(46)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:       (48)         a) If manufacturer's declared loss factor is known (kWh/day):       0.54       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       0       (54)         Enter (50) or (54) in (55)       0.32       (55)         Water storage loss calculated for each month       ((56)m = (55) × (41)m       (56)m = (55) × (41)m         (56)m = 10.04 9.07 10.04 9.72 10.04 9.72 10.04 9.72 10.04 9.72 10.04 9.72 10.04 9.72 10.04       (56)m	· ·		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel	0			(47)
Water storage loss:       a) If manufacturer's declared loss factor is known (kWh/day):       0.54       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       0       (50)         b) If manufacturer's declared cylinder loss factor is not known:            Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3        0       (52)         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (54)         Enter (50) or (54) in (55)       0.32       (55)         Water storage loss calculated for each month       ((56)m = (55) x (41)m       (56)m = (55) x (41)m          (56)m = 10.04 9.07 10.04 9.72 10.04 9.72 10.04 10.04 9.72 10.04 9.72 10.04 9.72 10.04       9.72 10.04 9.72 10.04	If community hea	ting a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= 10.04 9.07 10.04 9.72 10.04 9.72 10.04 10.04 9.72 10.04 9.72 10.04 9.72 10.04 (56)			not wate	er (this in	ıcludes i	nstantan	eous co	mbi boil	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b $0$ $(49)$ Energy lost from water storage, kWh/year $(48) \times (49) = 0$ $(50)$ b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) $0$ $(51)$ If community heating see section 4.3  Volume factor from Table 2a $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	_		clared l	nee facto	or is kno	wn (k\N/h	/dav/)·					<i>-</i> 1		(48)
Energy lost from water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3  Volume factor from Table 2a 0 (52)  Temperature factor from Table 2b 0 (53)  Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54)  Enter (50) or (54) in (55) 0.32 (55)  Water storage loss calculated for each month ((56)m = (55) × (41)m)  (56)m= 10.04 9.07 10.04 9.72 10.04 9.72 10.04 10.04 9.72 10.04 9.72 10.04 (56)	•				) 10 KHO	WII (ICVVI	i/day).							
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= $\begin{bmatrix} 10.04 & 9.07 & 10.04 & 9.72 & 10.04 & 9.7$	•				ear			(48) x (49)	=					, ,
If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= $10.04$ 9.07 $10.04$ 9.72 $10.04$ 9.72 $10.04$ 10.04 9.72 $10.04$ 9.72 $10.04$ 9.72 $10.04$ 9.72 $10.04$ (56)			-	-		or is not		( - ) ( - )				<u> </u>		(00)
Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0       (54)         Enter (50) or (54) in (55)       0.32       (55)         Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)         (56)m=       10.04       9.07       10.04       9.72       10.04       9.72       10.04       9.72       10.04       (56)	•				e 2 (kWl	n/litre/da	y)					0		(51)
Temperature factor from Table 2b	•	-		on 4.3										(52)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) $0.32$ (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56) $m = 10.04  9.07  10.04  9.72  10.04  9.72  10.04  9.72  10.04  9.72  10.04  (56)$				2b							<b>—</b>			
Enter (50) or (54) in (55) $0.32$ (55)  Water storage loss calculated for each month ((56)m = (55) × (41)m  (56)m= $10.04$ 9.07 $10.04$ 9.72 $10.04$ 9.72 $10.04$ 9.72 $10.04$ 9.72 $10.04$ 9.72 $10.04$ (56)	-				ear			(47) x (51)	x (52) x (	53) =				
(56)m= 10.04 9.07 10.04 9.72 10.04 9.72 10.04 9.72 10.04 9.72 10.04 9.72 10.04 (56)	••		_	,				, , , , ,	, , ,	•				
	Water storage los	ss calc	culated f	or each	month			((56)m = (	55) × (41)r	m				
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	(56)m= 10.04 S	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(56)
	If cylinder contains de	edicated	l solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
(57)m= 10.04 9.07 10.04 9.72 10.04 9.72 10.04 10.04 9.72 10.04 9.72 10.04 (57)	(57)m= 10.04 S	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(57)

Primary c	ircuit loss (a	nnual) fro	om Table	e 3							0		(58)
•	ircuit loss ca	,			(59)m =	(58) ÷ 36	65 × (41)	m				•	
(modifie	ed by factor	from Tab	le H5 if t	here is	solar wa	ter heati	ng and a	cylinde	r thermo	stat)	-	_	
(59)m=	0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi los	s calculated	I for each	month (	(61)m =	(60) ÷ 30	65 × (41	)m						
	2.48 28.27	30.12	28	27.76	25.72	26.58	27.76	28	30.12	30.29	32.48		(61)
Total heat	t required fo	r water h	eating ca	alculated	for eac	h month	(62)m =	: 0.85 × (	(45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
	4.49 144.01	150.24	133.69	129.88	114.9	110.25	122.29	123.23	139.81	148.78	160.64		(62)
Solar DHW	input calculated	d using App	endix G o	r Appendix	ι κ Η (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	l	
	ional lines it										0,		
(63)m=	0 0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 2	1.86 17.21	15.6	10.85	8.31	5.72	5.3	6.08	6.16	11.53	17.24	22.13	ı	(63) (G2
Output fro	m water hea	ater											
· —	1.61 125.9	133.65	121.89	120.6	108.23	103.94	115.2	116.07	127.24	130.55	137.47		
` ′			<u> </u>	<u> </u>	!	!	ļ	out from w	L ater heate	I r (annual)₁	12	1482.35	(64)
Heat gain	s from wate	r heating	kWh/m	onth 0 2	5 ′ [0 85	x (45)m	ı + (61)m	nl + 0.8 x	( [(46)m	+ (57)m	+ (59)m	1	_
	6.71 49.79	52.17	46.69	45.59	40.63	39.16	43.07	43.21	48.7	51.51	55.43	]	(65)
	(57)m in cal	lculation	<u> </u>	<u> </u>	l	l	l	<u> </u>	l	l	munity h	l neating	` '
	` '			-	yiii iddi i		awciiiig	OI HOLW	ator is ii	OIII COIII	indinity i	icating	
	al gains (se			).									
	gains (Tabl	T T	Ĭ	May	Lun	l 11		Con	Oct	Nov	l Doo	]	
	Jan Feb 5.4 85.4	Mar 85.4	Apr 85.4	May 85.4	Jun 85.4	Jul 85.4	Aug 85.4	Sep 85.4	Oct 85.4	Nov 85.4	Dec		(66)
` ′		<u> </u>	<u> </u>	<u> </u>	ļ			<u> </u>	65.4	00.4	85.4		(00)
, <u>, , , , , , , , , , , , , , , , , , </u>	ains (calcula	<del> </del>	·	· · · ·		<del>, , , , , , , , , , , , , , , , , , , </del>		r —	1 40 00	10.70	1 40 04	1	(67)
` '	3.27 11.78	9.58	7.26	5.42	4.58	4.95	6.43	8.63	10.96	12.79	13.64		(67)
· · · —	s gains (cal		<del>-                                    </del>				<del></del>				T	1	(00)
` '	8.82 150.36		138.19	127.73	117.9	111.33	109.79	113.68	121.97	132.42	142.25		(68)
	ains (calcul	1		<del></del>	1	·		i	1	i	i	1	(22)
(69)m= 3°	1.54 31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54		(69)
· -	nd fans gains	s (Table	5a)			1	1		1	1	1	1	
(70)m=	3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.	g. evaporati	on (nega	tive valu	es) (Tab	ole 5)							•	
(71)m= -6	8.32 -68.32	-68.32	-68.32	-68.32	-68.32	-68.32	-68.32	-68.32	-68.32	-68.32	-68.32		(71)
Water hea	ating gains (	Table 5)										_	
(72)m= 76	6.22 74.1	70.11	64.84	61.28	56.42	52.64	57.89	60.01	65.45	71.55	74.5		(72)
Total inte	rnal gains	=			(66)	)m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	)m		
(73)m= 28	9.93 287.87	277.79	261.91	246.05	230.53	220.54	225.73	233.94	250	268.38	282.01		(73)
6. Solar	gains:												
Solar gains	are calculated	l using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	ne applicat	ole orientat	tion.		
Orientatio	n: Access		Area		Flu		<del>.</del>	g_ Table Ch	_	FF		Gains	
	Table 6	ג 	m²		ı a	ble 6a	, <u> </u>	able 6b	_   _ =	able 6c		(W)	_
Southeast	0.9x 0.77	7 X	16	.8	<b>x</b> 3	86.79	x	0.63	×	0.8	=	215.9	(77)

о и . <b>Г</b>		_					, ,		_ ,				_
Southeast 0.9x	0.77	×	16.8	×	6	2.67	X	0.63	×	0.8	=	367.75	(77)
Southeast 0.9x	0.77	X	16.8	X	8	5.75	X	0.63	X	0.8	=	503.18	(77)
Southeast 0.9x	0.77	X	16.8	x	10	06.25	X	0.63	X	0.8	=	623.46	(77)
Southeast 0.9x	0.77	X	16.8	X	1	19.01	X	0.63	X	8.0	=	698.33	(77)
Southeast 0.9x	0.77	X	16.8	X	1	18.15	X	0.63	х	0.8	=	693.28	(77)
Southeast 0.9x	0.77	X	16.8	х	1	13.91	X	0.63	X	0.8	=	668.39	(77)
Southeast 0.9x	0.77	×	16.8	x	10	04.39	X	0.63	X	0.8	=	612.54	(77)
Southeast 0.9x	0.77	x	16.8	x	9	2.85	X	0.63	x	0.8	=	544.83	(77)
Southeast 0.9x	0.77	X	16.8	x	6	9.27	X	0.63	x	0.8	=	406.45	(77)
Southeast 0.9x	0.77	×	16.8	X	4	4.07	x	0.63	x [	0.8	=	258.6	(77)
Southeast 0.9x	0.77	×	16.8	X	3	1.49	X	0.63	x	0.8	=	184.76	(77)
Southwest <sub>0.9x</sub>	0.77	×	3.78	X	3	6.79		0.63	x	0.8	=	97.15	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	X	6	2.67	] [	0.63	x	0.8	=	165.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	3.78	X	8	5.75	]	0.63	x	0.8	=	226.43	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	X	10	06.25		0.63	x	0.8	=	280.56	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	1	19.01		0.63	x	0.8	=	314.25	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	1	18.15	]	0.63	x	0.8	=	311.97	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	1	13.91		0.63	x	0.8	=	300.78	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	10	04.39	] [	0.63	x	0.8	=	275.64	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	9	2.85	j i	0.63	x	0.8	=	245.18	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	6	9.27	j i	0.63	x	0.8	=	182.9	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	4	4.07	j i	0.63	T x	0.8	=	116.37	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.78	x	3	1.49	i i	0.63	x	0.8	=	83.14	(79)
_		_											_
Solar gains in	watts, calcu	lated	for each m	onth			(83)m	= Sum(74)m .	(82)m				
(83)m= 313.05	533.24 72	9.61	904.02 10	12.57 1	005.25	969.17	888	.18 790.01	589.35	374.96	267.91		(83)
Total gains – i	nternal and	solar	(84)m = $(7$	3)m +	(83)m	, watts						•	
(84)m= 602.98	821.11 10	07.4	1165.92 12	58.63 1	235.78	1189.71	1113	3.91 1023.95	839.35	643.35	549.92		(84)
7. Mean inter	nal tempera	iture (	heating se	ason)									
Temperature	during heat	ing pe	eriods in th	e living	area t	rom Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	for li	ving area,	h1,m (s	see Ta	ble 9a)					!		
Jan	Feb N	Mar	Apr I	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 0.93	0.86 0	.77	0.65 0	.51	0.38	0.28	0.3	0.48	0.71	0.88	0.94		(86)
Mean interna	I temperatu	re in li	iving area	T1 (foll	ow ste	ps 3 to 7	7 in T	able 9c)		-		•	
(87)m= 19.43		0.18		<del>`</del>	20.84	20.88	20.8		20.48	19.88	19.34		(87)
Temperature	during heat	ina ne	eriods in re	et of di	velling	from Ta	hle (	Th2 (°C)				l	
(88)m= 19.65		9.65			19.66	19.66	19.0	<del></del>	19.65	19.65	19.65		(88)
` '	!I						0-/						, ,
Utilisation fac	<del></del> _	.73		iing, n∠ 0.45	2,m (se 0.31	0.2	9a) 0.2	2 0.4	0.66	0.86	0.93		(89)
` '	!I						l	1		1 0.00	0.33		(03)
Mean interna			<u> </u>		`		<del>i                                     </del>			1.5	4	l	(00)
(90)m= 17.62	18.15 18	3.66	19.1	9.35	19.47	19.5	19.		19.07	18.27	17.5		(90)
								ı	LA = LIV	ing area ÷ (4	+) =	0.63	(91)

N.A		/ /					. /4 (1	۸\ <u> </u>					
Mean inter	<del></del>	19.62	19.99	20.22	20.34	20.37	+ (1 – IL 20.37	20.29	19.96	19.28	18.66		(92)
` '										19.20	10.00		(32)
Apply adju	1	19.47	19.84	20.07	20.19	20.22	20.22	20.14	19.81	19.13	18.51		(93)
8. Space h				20.07	20.13	20.22	20.22	20.14	13.01	13.13	10.51		(00)
Set Ti to th				ro obtain	and at et	on 11 of	Table 0	h so tha	t Ti m_/	76\m an	d re-calc	ulato	
the utilisat					ieu at sti	ер птог	i abie si	b, 50 iiia	t 11,111—(	r O)III aii	u re-caic	uiate	
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation		jains, hm	•										
(94)m= 0.9	0.82	0.73	0.61	0.47	0.34	0.23	0.26	0.43	0.67	0.85	0.92		(94)
Useful gai	ns, hmGm	, W = (94	4)m x (84	4)m	•	•		•					
(95)m= 542.	38 675.94	733.99	706.67	592.69	416.7	277.08	290.17	436.31	560.01	543.76	503.51		(95)
Monthly av	erage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	rate for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m= 1126	.13 1111.9	1018.92	855.93	654.4	434.87	281.85	296.83	471.03	719.55	941.98	1121.81		(97)
Space hea	ting requir	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m= 434.	31 292.97	211.99	107.47	45.92	0	0	0	0	118.7	286.72	460.02		_
							Tota	ıl per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1958.1	(98)
Space hea	iting requir	ement in	kWh/m²	<sup>2</sup> /year								38.69	(99)
9a. Energy	requireme	nts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	CHP)					
Space hea					,	_ · · · · <u>J</u>		,					
Fraction of	•	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of													
i idolioni o	space nea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
	•	at from m ina from i	-	, ,				- (201) = 02) × [1 -	(203)] =				╡ .
Fraction of	total heat	ing from	main sys	stem 1				, ,	(203)] =			1	(204)
Fraction of Efficiency	total heat	ing from a	main syste	stem 1 em 1	a evetom			, ,	(203)] =			93.2	(204)
Fraction of Efficiency	total heation of main sportseconds	ing from a	main sysing syste	stem 1 em 1 y heating	· ·	n, %	(204) = (2	02) × [1 –	, ,,			93.2	(204) (206) (208)
Fraction of Efficiency Efficiency Ja	f total heati of main sp of seconda n Feb	ing from ace heating from the heating from the heating from the heating from the heat	main systemater systementar Apr	stem 1 em 1 y heating May	Jun			, ,	(203)] =	Nov	Dec	93.2	(204) (206) (208)
Fraction of Efficiency Efficiency Ja Space hea	total heation for main sport secondary  Tebuting requires	ing from ace heating ary/supplement (c	main systementar  Apr  alculate	stem 1 em 1 y heating May d above	Jun	n, % Jul	(204) = (2	02) × [1 –	Oct			93.2	(204) (206) (208)
Efficiency Efficiency Ja Space hea	f total heating from the front front from the front from the front from the front from the front front from the front front from the front from the front front from the front front from the front from the front from the front front from the front front from the front front from the front front front from the front front front from the front	ace heating from Mar ement (c	main systementar Apr alculated	stem 1 em 1 y heating May d above 45.92	Jun ) 0	n, %	(204) = (2	02) × [1 –	, ,,	Nov 286.72	Dec 460.02	93.2	(204) (206) (208) ar
Fraction of Efficiency Efficiency Ja Space hea 434. (211)m = {[	f total heati of main sp of seconda n Feb ating requir 31 292.97	ing from ace heating mary/supplement (compared 211.99 (21)] + (21	main systementar Apr alculatee 107.47 0)m} x	stem 1 em 1 y heating May d above 45.92 100 ÷ (2	Jun ) 0	n, % Jul 0	(204) = (2 Aug	02) × [1 –	Oct 118.7	286.72	460.02	93.2	(204) (206) (208)
Efficiency Efficiency Ja Space hea	f total heati of main sp of seconda n Feb ating requir 31 292.97	ace heating from Mar ement (c	main systementar Apr alculated	stem 1 em 1 y heating May d above 45.92	Jun ) 0	n, % Jul	(204) = (2 Aug 0	02) × [1 -	Oct 118.7	286.72	460.02 493.58	1 93.2 0 kWh/ye	(204) (206) (208) ar
Fraction of Efficiency Efficiency Ja Space hea 434. (211)m = {[i	f total heating from the following requires t	mary/supplement (c 211.99 227.46	main systementar Apr alculated 107.47 0)m } x	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27	Jun ) 0	n, % Jul 0	(204) = (2 Aug 0	02) × [1 –	Oct 118.7	286.72	460.02 493.58	93.2	(204) (206) (208) ar
Fraction of Efficiency Efficiency  Ja Space hea  434.  (211)m = {[i 466]}	f total heating from the second and	mary/supplement (compared 211.99 compared 227.46 compared 227.	main systementar Apr alculated 107.47 0)m } x 115.31	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27	Jun ) 0	n, % Jul 0	(204) = (2 Aug 0	02) × [1 -	Oct 118.7	286.72	460.02 493.58	1 93.2 0 kWh/ye	(204) (206) (208) ar
Fraction of Efficiency Efficiency  Space head 434.  (211)m = {[ 466]  Space head 466  Space head 466	f total heating feed in Februing require (98)m x (20) 314.34 atting fuel (\$\((201)\)] + (2)	mare heating from Marement (con 211.99 (21.99 (227.46))   + (21 (2	main systementar  Apr alculated 107.47  0)m } x 115.31  y), kWh/ 100 ÷ (	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27	Jun ) 0 206) 0	n, %  Jul  0	(204) = (2 Aug 0 Tota	02) × [1 –  Sep  0  0  kWh/yea	Oct  118.7  127.36  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub>	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar
Fraction of Efficiency Efficiency  Ja Space hea  434.  (211)m = {[i 466]}	f total heating from the second and	mary/supplement (compared 211.99 compared 227.46 compared 227.	main systementar Apr alculated 107.47 0)m } x 115.31	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27	Jun ) 0	n, % Jul 0	(204) = (2 Aug 0 Tota	02) x [1 - Sep 0	Oct  118.7  127.36  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub>	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar (211)
Fraction of Efficiency Efficiency  Space head 434.  (211)m = {[i 466]}  Space head 466  Space head 466  Space head 466  (215)m = 0	f total heating from the following of secondary from the following requires the following from the following	mare heating from Marement (con 211.99 (21.99 (227.46))   + (21 (2	main systementar  Apr alculated 107.47  0)m } x 115.31  y), kWh/ 100 ÷ (	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27	Jun ) 0 206) 0	n, %  Jul  0	(204) = (2 Aug 0 Tota	02) × [1 –  Sep  0  0  kWh/yea	Oct  118.7  127.36  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub>	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar
Fraction of Efficiency Efficiency  Ja Space hea  434.  (211)m = {[  460  Space hea = {[(98)m x (215)m= 0  Water heat	f total heating from the following from the following requires the following from the fol	mace heating from the area heating ary/supple ary/suppl	main systementar Apr alculated 107.47 0)m } x 115.31 y), kWh/	stem 1 em 1 y heating May d above; 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0	n, %  Jul  0	(204) = (2 Aug 0 Tota	02) x [1 - Sep 0	Oct  118.7  127.36  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub>	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar (211)
Fraction of Efficiency Efficiency  Space head 434.  (211)m = {[i 466]}  Space head 466  Space head 466  Space head 466  Water head Output from	f total heating from the following from the following fuel (\$\frac{1}{2}\text{0}\text{1} \text{1} \text{1} \text{1} \text{1} \text{2} \text{1} \text{1} \text{2} \text{2} \text{2} \text{3} \text{1} \text{3} \text{4} \text{5} \text{4} \text{5} \text{6} \text{5} \text{6} \text{7} \text{7} \text{6} \text{7} \text{6} \text{7} \text{7} \text{6} \text{7} \text{7} \text{6} \text{7} \tex	mare heating from the mark (colors are h	main systementar  Apr alculated 107.47  0)m } x 115.31  y), kWh/ 100 ÷ (100)	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0	n, %  Jul  0	(204) = (2  Aug  0  Tota  0  Tota	02) x [1 - Sep  0  0  0  1 (kWh/yea	Oct  118.7  127.36  ar) = Sum(2  0  ar) = Sum(2	286.72 307.64 211) <sub>15,1012</sub> 0	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar (211)
Fraction of Efficiency Efficiency  Ja Space head 434.  (211)m = {[i definition of the color of t	f total heating from the following from the followi	mary/supplement (color)  211.99  04)] + (21 227.46  secondary 14) m } x  0  atter (calciliates)	main systementar Apr alculated 107.47 0)m } x 115.31 y), kWh/	stem 1 em 1 y heating May d above; 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0	n, %  Jul  0	(204) = (2 Aug 0 Tota	02) x [1 - Sep 0	Oct  118.7  127.36  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub>	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar (211) (211)
Fraction of Efficiency  Efficiency  Jacob Paragraphic Space head 434.  (211)m = {[i 46i 46i 46i 46i 46i 46i 46i 46i 46i 46	f total heating of main spoof secondaring requirements of the secondaring requirements of the secondaring requirements of the secondaring fuel (secondaring	mare heating from ace heating from ace heating from arry/supple ar	main systementar  Apr alculated 107.47  0)m } x 115.31  y), kWh/ 100 ÷ (1) 0	stem 1 em 1 y heating d above 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0 108.23	n, %  Jul  0  0	(204) = (2  Aug  0  Tota  115.2	02) x [1 - Sep  0  0  0  1 (kWh/yea  116.07	Oct  118.7  127.36  ar) =Sum(2  0  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	460.02 493.58 = 0 =	1 93.2 0 kWh/ye	(204) (206) (208) ar (211) (211)
Fraction of Efficiency Efficiency  Ja Space hea  434.  (211)m = {[i] 460  Space hea = {[(98)m x (215)m= 0  Water heat Output from 141. Efficiency of (217)m= 87.4	f total heating from the second and	mace heating ary/supple Mar ement (c 211.99 04)] + (21 227.46 eccondary 14) m } x 0 exter (calculation 133.65 exter 86.01	main systementar  Apr alculated 107.47  0)m } x  115.31  y), kWh/ x 100 ÷ (x) 0  ulated al 121.89	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0	n, %  Jul  0	(204) = (2  Aug  0  Tota  0  Tota	02) x [1 - Sep  0  0  0  1 (kWh/yea	Oct  118.7  127.36  ar) = Sum(2  0  ar) = Sum(2	286.72 307.64 211) <sub>15,1012</sub> 0	460.02	1 93.2 0 kWh/ye	(204) (206) (208) ar (211) (211)
Fraction of Efficiency Efficiency  Ja Space hea  434.  (211)m = {[i] 466  Space hea = {[(98)m x (215)m= 0  Water heat Output from 141.  Efficiency o (217)m= 87.4  Fuel for war	f total heating from the second and	mace heating from a mace heating ary/supple	main systementar  Apr alculated 107.47  0)m } x  115.31  y), kWh/ x 100 ÷ (x) 0  ulated al 121.89  84.54  onth	stem 1 em 1 y heating d above 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0 108.23	n, %  Jul  0  0	(204) = (2  Aug  0  Tota  115.2	02) x [1 - Sep  0  0  0  1 (kWh/yea  116.07	Oct  118.7  127.36  ar) =Sum(2  0  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	460.02 493.58 = 0 =	1 93.2 0 kWh/ye	(204) (206) (208) ar (211) (211)
Fraction of Efficiency Efficiency  Ja Space hea  434.  (211)m = {[i] 460  Space hea = {[(98)m x (215)m= 0  Water heat Output from 141. Efficiency of (217)m= 87.4	f total heating of main spoof secondaring requires and the secondaring requires and the secondaring fuel (secondaring fuel (secondaring fuel (secondaring fuel (secondaring fuel fuel fuel fuel fuel fuel fuel fuel	mace heating from a mace heating ary/supple	main systementar  Apr alculated 107.47 0)m } x 115.31 y), kWh/(100 ÷ (100 † (10	stem 1 em 1 y heating d above 45.92 100 ÷ (2 49.27  month 208) 0	Jun ) 0 206) 0 108.23	n, %  Jul  0  0	(204) = (2  Aug  0  Tota  115.2	02) x [1 - Sep  0  0  0  1 (kWh/yea  116.07	Oct  118.7  127.36  ar) =Sum(2  0  ar) =Sum(2	286.72 307.64 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	460.02 493.58 = 0 =	1 93.2 0 kWh/ye	(204) (206) (208) ar (211) (211)
Fraction of Efficiency Efficiency  Space head  434.  (211)m = {[i definition of the color of the	f total heating of main spoof secondaring requires and the secondaring requires and the secondaring fuel (secondaring fuel (secondaring fuel (secondaring fuel (secondaring fuel fuel fuel fuel fuel fuel fuel fuel	mar sement (c 211.99 24)] + (21 227.46 227.46 23.65 ater 86.01 , kWh/mc 0 ÷ (217)	main systementar  Apr alculated 107.47  0)m } x 115.31  y), kWh/ 100 ÷ (1) 0  ulated al 121.89  84.54  onth m	stem 1 em 1 y heating May d above 45.92 100 ÷ (2 49.27  month 208) 0  bove) 120.6	Jun ) 0 206) 0 108.23	n, %  Jul  0  0  103.94	(204) = (2  Aug  0  Tota  115.2  80.1	02) x [1 - Sep  0  0  0  0  1 (kWh/yea  116.07	Oct  118.7  127.36  ar) =Sum(2  127.24  84.68	286.72 307.64 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub> 130.55	460.02 493.58 = 0 = 137.47 87.66	1 93.2 0 kWh/ye	(204) (206) (208) ar (211) (211)

Annual totals		kWh/year	kWh/year
Space heating fuel used, main system 1			2100.96
Water heating fuel used			1763.37
Electricity for pumps, fans and electric keep-hot			
central heating pump:			30 (230c)
boiler with a fan-assisted flue			45 (230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	75 (231)
Electricity for lighting			234.31 (232)
Electricity generated by PVs			-806.88 (233)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	_		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	<b>.</b>		kg CO2/year
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh	kg CO2/year 453.81 (261)
	kWh/year (211) x	kg CO2/kWh	kg CO2/year  453.81 (261)  0 (263)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh  0.216 =  0.519 =	kg CO2/year  453.81 (261)  0 (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh  0.216 =  0.519 =	kg CO2/year  453.81 (261)  0 (263)  380.89 (264)  834.7 (265)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh  0.216 =  0.519 =  0.216 =	kg CO2/year  453.81 (261)  0 (263)  380.89 (264)  834.7 (265)  38.93 (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	kg CO2/kWh  0.216 =  0.519 =  0.519 =	kg CO2/year  453.81 (261)  0 (263)  380.89 (264)  834.7 (265)  38.93 (267)  121.6 (268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh  0.216 =  0.519 =  0.519 =  0.519 =	kg CO2/year  453.81 (261)  0 (263)  380.89 (264)  834.7 (265)  38.93 (267)  121.6 (268)

El rating (section 14)

(274)

			11	\						
			User D	etails:						
Assessor Name:	Neil Ingham			Strom					0002943	
Software Name:	Stroma FSAF			Softwa		rsion:		Versio	on: 1.0.1.9	
				Address						
Address :	Flat 5, 16, Roc	chester Mews	, LOND(	ON, NW1	9JB					
1. Overall dwelling dime	ensions:		Δ	n (ma 2)		Asz IIa	: or lo 4 / roo \		\/ala/m3	n.
Ground floor				a(m²)	(1a) x		ight(m) 2.8	(2a) =	Volume(m <sup>3</sup>	(3a)
		1) . (4 . ) (4	,				2.0	(2a) –	196.07	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1c	l)+(1e)+(1r	1)7	70.74	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	198.07	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	Ī + Ē	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent fa	ans				,	2	x	10 =	20	(7a)
Number of passive vents	3				F	0	x	10 =	0	(7b)
·					Ļ			40 =		=
Number of flueless gas f	ires					0	^.	+0 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	evs flues and fans	s = (6a) + (6b) + (7a)	′a)+(7b)+(	7c) =	Г	20		÷ (5) =		(8)
If a pressurisation test has	-				ontinue fr			<del>.</del> (3) =	0.1	(0)
Number of storeys in t		.,	, ,,				, ,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or tir	mber frame or	0.35 fo	r masoni	y constr	ruction			0	(11)
if both types of wall are p deducting areas of open			the great	ter wall are	a (after					
If suspended wooden			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	,	•	•	,.					0	(13)
Percentage of window	s and doors drau	ght stripped							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	•		•	-	•	etre of e	envelope	area	3	(17)
If based on air permeabi	-								0.25	(18)
Air permeability value applie Number of sides sheltere		est has been dor	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	au			(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18	) x (20) =				0.19	(21)
Infiltration rate modified									0.10	(= : /
Jan Feb		May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp		- 1		<u>.                                     </u>			1			
(22)m= 5.1 5		4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
	1 1	I	I	1		1	1	I	ı	
Wind Factor $(22a)m = (2a)m =$	22)m ÷ 4								1	
(22a)m= 1.27 1.25	1.23	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration rate (allowing for shelter ar	nd wind sne	ed) - (21a) v	(22a)m					
0.25 0.24 0.24 0.21 0.21	<del>- i</del>	$\frac{e(1)}{0.18} = \frac{(21a)}{0.18}$	0.19	0.21	0.22	0.23		
Calculate effective air change rate for the appl	1	I	00	0.2.	V	0.20		
If mechanical ventilation:							0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23	a) x Fmv (equa	ation (N5)) , other	wise (23b)	) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing	for in-use facto	or (from Table 4h)	) =				0	(23c)
a) If balanced mechanical ventilation with he	at recovery	(MVHR) (24a	)m = (22	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0 0 0 0 0	0	0 0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without	t heat recove	ery (MV) (24b	)m = (22	2b)m + (2	23b)		•	
(24b)m= 0 0 0 0 0	0	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation or positi if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•			5 × (23b	o)			
(24c)m= 0 0 0 0 0	0	0 0	0	0	0	0		(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other	•			0.5]				
(24d)m= 0.53 0.53 0.53 0.52 0.52	0.52	0.52 0.52	0.52	0.52	0.52	0.53		(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) c	or (24d) in box	(25)		-	-	•	
(25)m= 0.53 0.53 0.53 0.52 0.52	0.52	0.52 0.52	0.52	0.52	0.52	0.53		(25)
3. Heat losses and heat loss parameter:								
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-valı W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-l		
Windows Type 1	9.18	x1/[1/( 1.2 )+	0.04] =	10.51	<u></u>			(27)
Windows Type 2	11.88	X1/[1/( 1.2 )+	0.04] =	13.6				(27)
Windows Type 3	16.2		0.04] =	18.55				(27)
Walls Type1 81.48 37.26	44.22	x 0.23	┑╻	10.17		60	2653.2	(29)
Walls Type2 32.48 0	32.48	x 0.19	Ħ₌i	6.19	<b>=</b>	60	1948.8	(29)
Roof 70.74 0	70.74	x 0.13	╡┇	9.2	<b>=</b>	9	636.66	╡゛゛
Total area of elements, m <sup>2</sup>	184.7	]						」、 / (31)
Party floor	70.74	<u> </u>			Г	40	2829.6	(32a)
Internal wall **	73.92	_ ]				9	665.28	(32c)
* for windows and roof windows, use effective window U-v		<b>⅃</b> d usina formula 1.	/[(1/U-valu	e)+0.041 a	L ns aiven in			
** include the areas on both sides of internal walls and par		<b>J</b>		., ] .	3	7		
Fabric heat loss, $W/K = S (A \times U)$		(26)(30)	+ (32) =				68.22	(33)
Heat capacity $Cm = S(A \times k)$			((28)	.(30) + (32	2) + (32a).	(32e) =	8733.54	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) i	n kJ/m²K		= (34)	÷ (4) =			123.46	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	tion are not kno	own precisely the	indicative	values of	TMP in Ta	able 1f		_
Thermal bridges: S (L x Y) calculated using A	ppendix K						9.66	(36)
if details of thermal bridging are not known (36) = $0.15 x$ (3) Total fabric heat loss	31)		(33) +	(36) -			77.00	7(27)
Ventilation heat loss calculated monthly					25)m x (5)		77.88	(37)
	lun	lul Aug	· , ,		<u> </u>			
(38)m=	+ +	Jul Aug 33.8 33.74	Sep 33.92	Oct 34.11	Nov 34.24	Dec 34.39		(38)
` '	1 00.0	33.7			<u> </u>	1 07.00		(30)
Heat transfer coefficient, W/K (39)m= 112.58 112.49 112.42 112.06 111.99	111.68 11	11.68 111.62	(39)m 111.8	= (37) + (3 111.99	38)m 112.12	112.27		
	1 1				Sum(39) <sub>1</sub>		112. <b>0</b> 6age 2	] <sub>(39)</sub>
Stroma FSAP 2012 Version: 1.0.1.9 (SAP 9.92) - http://wv	vw.suoma.com	I	,	go =	Juni(00)1.		· · <del>· · • · • · a</del> ge 2	<u>.</u> ψι 7-7

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.59	1.59	1.59	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.59		
		!							Average =	Sum(40) <sub>1</sub> .	12 /12=	1.58	(40)
Number of day	<u> </u>	<u> </u>							I -				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		26		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.97		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i							_	1 - 22		L			
(44)m= 96.77	93.25	89.73	86.21	82.69	79.17	79.17	82.69	86.21	89.73	93.25	96.77		
, ,									I Total = Su	m(44) <sub>112</sub> =		1055.64	(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 143.5	125.51	129.51	112.91	108.34	93.49	86.63	99.41	100.6	117.24	127.98	138.97		
			. ,						Total = Su	m(45) <sub>112</sub> =		1384.11	(45)
If instantaneous v	vater heati	ng at point	of use (no	not water	storage),	enter 0 ın	boxes (46)	) to (61)		1	·		
(46)m= 21.53	18.83	19.43	16.94	16.25	14.02	13	14.91	15.09	17.59	19.2	20.85		(46)
Water storage Storage volum		) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ച	0			(47)
If community h	•					_		x1110 100	00.				(41)
Otherwise if no	-			•			' '	ers) ente	er '0' in (	47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				0.	54		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =			0		(50)
b) If manufact			-										(54)
Hot water stor If community h	-			e z (KVVI	n/iitie/ua	iy)					0		(51)
Volume factor	_		011 1.0								0		(52)
Temperature f	actor fro	m Table	2b							<b>—</b>	0		(53)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or	(54) in (	55)								0.	32		(55)
Water storage	loss cal	culated t	or each	month			((56)m = (	55) × (41)	m				
(56)m= 10.04	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 10.04	9.07	10.04	9.72	10.04	9.72	10.04	10.04	9.72	10.04	9.72	10.04		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	<u></u>							0		(58)
Primary circuit	,	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi lo	oss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
	38.22	33.26	35.44	32.95	32.66	30.26	31.27	32.66	32.95	35.44	35.64	38.22		(61)
Total he	at requ	uired for	water he	eating ca	alculated	l for eac	n month	(62)m	= 0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	191.76	167.84	174.99	155.58	151.04	133.47	127.95	142.1	1 143.27	162.72	173.34	187.24		(62)
Solar DHV	N input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	1	
(add add	ditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	( G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	28.82	22.39	19.9	14.31	10.42	6.73	6.24	7.16	7.24	15.49	22.32	29.25	•	(63) (G2)
Output f	rom w	ater hea	ter										_	
(64)m=	161.8	144.45	153.99	140.2	139.54	125.69	120.58	133.8	3 134.91	146.08	149.92	156.83		_
								0	utput from w	ater heate	r (annual)₁	12	1707.82	(64)
Heat ga	ins fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61	m] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	1	
(65)m=	65.3	57.3	59.96	53.56	52.22	46.43	44.66	49.25	49.46	55.88	59.24	63.8		(65)
includ	le (57)ı	m in cald	culation of	of (65)m	only if c	ylinder i	s in the	dwellir	g or hot w	ater is fr	om com	munity h	eating	
5. Inte	rnal ga	ains (see	Table 5	and 5a	):									
Metabol	lic gain	s (Table	5), Wat	ts									_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	113.2	113.2	113.2	113.2	113.2	113.2	113.2	113.2	113.2	113.2	113.2	113.2		(66)
Lighting	gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5		•		•	
(67)m=	17.74	15.76	12.82	9.7	7.25	6.12	6.62	8.6	11.54	14.66	17.11	18.24	1	(67)
Appliand	ces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5		1	ı	
(68)m=	199.02	201.08	195.88	184.8	170.82	157.67	148.89	146.8	3 152.03	163.11	177.09	190.24		(68)
Cooking	gains	(calcula	ted in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5	•		'	
(69)m=	34.32	34.32	34.32	34.32	34.32	34.32	34.32	34.32	34.32	34.32	34.32	34.32	[	(69)
Pumps a	and far	ns gains	(Table 5	 ба)		!							ı	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (nega	ive valu	es) (Tab	le 5)			'				ı	
(71)m=	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.5	6 -90.56	-90.56	-90.56	-90.56		(71)
Water h	eating	gains (T	able 5)						•				'	
(72)m=	87.77	85.28	80.59	74.38	70.19	64.48	60.02	66.2	68.7	75.1	82.28	85.75		(72)
Total in	ternal	gains =	:			(66)	m + (67)m	ı + (88)r	n + (69)m +	(70)m + (7	1)m + (72)	m	I	
_	364.5	362.08	349.24	328.85	308.22	288.24	275.49	281.5	9 292.23	312.83	336.44	354.18		(73)
6. Sola	ır gains	S:												
Solar gai	ins are c	alculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	e applicat	ole orientat	ion.		
Orientat	ion: A	Access F	actor	Area		Flu			g_		FF		Gains	
	Т	able 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
Southeas	st <sub>0.9x</sub>	0.77	X	16	.2	<b>x</b> 3	6.79	×	0.63	x	0.8	=	208.19	(77)
Southeas	st <sub>0.9x</sub>	0.77	X	16	.2	x 6	2.67	x	0.63	x	0.8	=	354.62	(77)
Southeas	st <sub>0.9x</sub>	0.77	X	16	.2	x 8	5.75	×	0.63	x	0.8	=	485.21	(77)
Southeas	st <sub>0.9x</sub>	0.77	х	16	.2	x 1	06.25	x	0.63	x	0.8	=	601.19	(77)

Southeast 0.9x	0.77	x	16.2	1 x	119.01	1 x	0.63	x [	0.8		673.39	(77)
Southeast 0.9x	0.77	x	16.2	] x	118.15	] x	0.63	]	0.8		668.52	(77)
Southeast 0.9x	0.77	X	16.2	] ]	113.91	] ] <sub>X</sub>	0.63	_	0.8	=	644.52	(77)
Southeast 0.9x	0.77	X	16.2	] ]	104.39	] ]	0.63	x	0.8	<del>-</del>	590.66	(77)
Southeast 0.9x	0.77	x	16.2	] ]	92.85	] ] <sub>X</sub>	0.63	x	0.8	<b>=</b>	525.38	(77)
Southeast 0.9x	0.77	X	16.2	)   x	69.27	)   x	0.63	x	0.8	<del>-</del>	391.93	(77)
Southeast 0.9x	0.77	x	16.2	) ] x	44.07	)   x	0.63	x	0.8		249.36	(77)
Southeast 0.9x	0.77	x	16.2	)   x	31.49	)   x	0.63	x	0.8	<del>-</del>	178.16	(77)
Southwest <sub>0.9x</sub>	0.77	X	11.88	X	36.79	ĺ	0.63	_ x	0.8	=	152.67	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	X	62.67	i	0.63	x	0.8	=	260.05	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	X	85.75	ĺ	0.63	x	0.8	=	355.82	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	X	106.25	]	0.63	_ x [	0.8	=	440.88	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	X	119.01	i	0.63	i x	0.8	=	493.82	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	x	118.15	i	0.63	x	0.8	<u> </u>	490.25	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	x	113.91	ĺ	0.63	x	0.8	<u> </u>	472.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	x	104.39	j	0.63	×	0.8		433.15	(79)
Southwest <sub>0.9x</sub>	0.77	X	11.88	x	92.85	ĺ	0.63	×	0.8	=	385.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	x	69.27	ĺ	0.63	x	0.8	=	287.42	(79)
Southwest <sub>0.9x</sub>	0.77	x	11.88	x	44.07	ĺ	0.63	x	0.8	=	182.86	(79)
Southwest <sub>0.9x</sub>	0.77	X	11.88	x	31.49	]	0.63	x	0.8	=	130.65	(79)
Northwest <sub>0.9x</sub>	0.77	X	9.18	X	11.28	x	0.63	x	0.8	=	36.18	(81)
Northwest 0.9x	0.77	X	9.18	x	22.97	х	0.63	x	0.8	=	73.64	(81)
Northwest <sub>0.9x</sub>	0.77	X	9.18	X	41.38	x	0.63	x	0.8	=	132.67	(81)
Northwest <sub>0.9x</sub>	0.77	X	9.18	X	67.96	x	0.63	x [	0.8	=	217.89	(81)
Northwest <sub>0.9x</sub>	0.77	X	9.18	X	91.35	x	0.63	x [	0.8	=	292.88	(81)
Northwest 0.9x	0.77	X	9.18	X	97.38	x	0.63	x	0.8	=	312.25	(81)
Northwest 0.9x	0.77	X	9.18	X	91.1	X	0.63	x	0.8	=	292.1	(81)
Northwest 0.9x	0.77	X	9.18	X	72.63	x	0.63	x	0.8	=	232.86	(81)
Northwest 0.9x	0.77	X	9.18	X	50.42	X	0.63	x	8.0	=	161.66	(81)
Northwest 0.9x	0.77	X	9.18	X	28.07	x	0.63	x	0.8	=	89.99	(81)
Northwest 0.9x	0.77	X	9.18	X	14.2	x	0.63	x	0.8	=	45.52	(81)
Northwest 0.9x	0.77	X	9.18	X	9.21	X	0.63	x	0.8	=	29.54	(81)
Solar gains in v		-		$\overline{}$		<del></del>	s = Sum(74)m.		T		1	(00)
(83)m= 397.03			1259.96 1460.0		71.01 1409.27	1256	5.68 1072.32	769.34	477.74	338.36		(83)
Total gains – in			<del>`                                    </del>	<u> </u>	<del></del>	1500	27 1264 55	1000 17	014 10	600 FF		(84)
` '			1588.81 1768.3		759.24 1684.76	1538	3.27 1364.55	1082.17	814.18	692.55		(04)
7. Mean interr		•										_
Temperature	_	• .		_		ole 9	Th1 (°C)				21	(85)
Utilisation fact				Ť		_		<b>-</b>			1	
Jan	Feb	Mar	Apr Ma	_	Jun Jul	<del>                                     </del>	ug Sep	Oct	Nov	Dec		(96)
(86)m= 0.93	0.87	0.78	0.65 0.51		0.38 0.28	0.3	0.49	0.74	0.89	0.94		(86)

Moon	intorno	l tompor	oturo in	living or	oo T1 (fa	allow etc	no 2 to 7	7 in Tabl	o ()o)					
I		<del></del>		_ <u> </u>	<u> </u>	i	ps 3 to 7	1	20.75	20.25	40.07	40.00		(87)
(87)m=   Temn	19.18 erature	19.57	20.01	20.42 periods in	20.68	dwelling	20.87 from Ta	20.86 hle 9 Ti		20.35	19.67	19.08		(07)
(88)m=	19.62	19.62	19.62	19.62	19.63	19.63	19.63	19.63	19.63	19.63	19.62	19.62		(88)
` ′				<u> </u>		<u>!</u>	ee Table		10.00	10.00	10.02	.0.02		,
(89)m=	0.92	0.85	0.75	0.61	0.45	0.31	0.2	0.23	0.41	0.69	0.87	0.93		(89)
` ′		ļ		ļ		<b>I</b>	l		l	<u> </u>	0.0.	0.00		( )
ı		<del></del>				<del>- ` `</del>	ollow ste	<del></del>	i	<del></del>		1	l	(00)
(90)m=	17.26	17.82	18.42	18.95	19.27	19.42	19.46	19.45	19.36	18.89	17.97	17.13		(90)
									I	rLA = LIVIN	g area ÷ (4	<del>+</del> ) =	0.47	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.15	18.64	19.16	19.64	19.93	20.07	20.11	20.11	20.01	19.57	18.76	18.04		(92)
Apply	adjustn	nent to tl	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18	18.49	19.01	19.49	19.78	19.92	19.96	19.96	19.86	19.42	18.61	17.89		(93)
8. Spa	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a	,							l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	1:									ı	
(94)m=	0.9	0.83	0.73	0.6	0.46	0.32	0.22	0.25	0.43	0.68	0.85	0.92		(94)
Usefu	I gains,	hmGm ,	W = (94)	4)m x (8	4)m								ı	
(95)m=	685.83	868.67	966.41	954.24	809.53	565.95	368.29	386.26	584.98	732.19	691.48	634.44		(95)
Month	ly aver	age exte	rnal tem	perature	from Ta	able 8							ı	
(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)
				<del></del>		i e	=[(39)m :	x [(93)m	<del>`</del>	<del></del>			ı	
` ′		1528.42		1186.2	904.97	594.27	375.7	397.04	643.44	987.64	1290.65	1537.26		(97)
Space	heatin			r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95		1)m		ı	
(98)m=	637.6	443.35	327.34	167.01	71.01	0	0	0	0	190.05	431.4	671.7		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	2939.46	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								41.55	(99)
9a. Ene	erav red	uiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatir	•			Jam. 9 J	, 0100			, ,					
-		_	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 heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.2	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space	heatin	g require	ement (c	alculate	d above)	 )	•		•	•			l	
	637.6	443.35	327.34	167.01	71.01	0	0	0	0	190.05	431.4	671.7		
(211)m	= {[(98	)m x (20	4)] + (21	10)m } x	100 ÷ (2	206)				=				(211)
	684.12	475.69	351.22	179.2	76.19	0	0	0	0	203.92	462.88	720.71		• •
ı		<u> </u>	<u> </u>	<u> </u>	<u> </u>	I	I	Tota	l I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	3153.92	(211)

Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208)								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0	0	0	0	0	0		
	<b>!</b>	Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water heating								_
Output from water heater (calculated above)  161.8	25.69 120.58	133.83	134.91	146.08	149.92	156.83		
Efficiency of water heater	20.00	100.00	104.01	140.00	140.02	100.00	80.1	(216)
	80.1 80.1	80.1	80.1	85.51	87.36	88.1		(217)
Fuel for water heating, kWh/month							l	
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 183.95  165.11  177.61  164.38  167.62  1	56.91 150.54	167.08	168.43	170.83	171.61	178.01		
(219)111= 103.93 103.11 177.01 104.30 107.02 1	30.91 130.34		I = Sum(2		171.01	176.01	2022.09	(219)
Annual totals					Wh/yeaı	•	kWh/year	
Space heating fuel used, main system 1					-		3153.92	
Water heating fuel used							2022.09	
Electricity for pumps, fans and electric keep-hot						•		_
central heating pump:						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							313.34	(232)
Electricity generated by PVs							-1136.22	(233)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP	)					
	<b>Energy</b> kWh/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	681.25	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	436.77	(264)
Space and water heating	(261) + (262)	+ (263) + (	(264) =				1118.02	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	162.62	(268)
Energy saving/generation technologies Item 1				0.5	19	=	-589.7	(269)
			sum o	0.5°		=	-589.7 729.87	(269) (272)

El rating (section 14)

# **BRUKL Output Document**



Compliance with England Building Regulations Part L 2013

#### Project name

#### 16 Rochester Mews

As designed

Date: Tue Oct 07 10:57:10 2014

#### Administrative information

**Building Details** 

Address: Workshop Premises, 16 Rochester Mews,

LONDON, NW1 9JB

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.d.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.2.0

BRUKL compliance check version: v5.2.d.2

#### **Owner Details**

Name: Palmhurst Group Telephone number:

Address: , ,

#### **Certifier details**

Name: Neil Ingham

Telephone number: 07736 771584

Address: 7 Rosemary Way, Cleethorpes, DN35 0SR

#### Criterion 1: The calculated CO₂ emission rate for the building should not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	14
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m².annum	14
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m².annum	8.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

# Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building	Jabiic
Element	

Element	U <sub>a-Limit</sub>	Ua-Calc	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.23	0.23	Workshop - Zone 1_W_6
Floor	0.25	0.2	0.2	Workshop - Zone 1_S_3
Roof	0.25	0.13	0.13	Workshop - Zone 1_R_5
Windows***, roof windows, and rooflights	2.2	1.25	1.25	Workshop - Zone 1_G_7
Personnel doors	2.2	1	1	Workshop - Zone 1_D_11
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m²K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m²K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

#### 1- Gas heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0.86	-	0.65	-	-		
Standard value	0.86	N/A	0.55	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO							

#### 1- PoU

	Water heating efficiency	Storage loss factor [kWh/litre per day]		
This building	1	-		
Standard value	1	N/A		

#### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]						UD officionav			
ID of system type	Α	В	С	D	E	F	G	Н	1	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Workshop - Zone 1	0.6	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Workshop - Zone 1	76	-	-	1295

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Workshop - Zone 1	YES (+53.6%)	NO

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

#### EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

## **Technical Data Sheet (Actual vs. Notional Building)**

#### **Building Global Parameters**

	Actual	Notional
Area [m²]	213.9	213.9
External area [m²]	447.4	447.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	7
Average conductance [W/K]	170.35	150.88
Average U-value [W/m²K]	0.38	0.34
Alpha value* [%]	16.66	55.42

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

#### **Building Use**

#### % Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

#### 0 B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Inst.: Hospitals and Care Homes

C2 Residential Inst.: Residential schools

C2 Residential Inst.: Universities and colleges

C2A Secure Residential Inst.

Residential spaces

D1 Non-residential Inst.: Community/Day Centre

D1 Non-residential Inst.: Libraries, Museums, and Galleries

D1 Non-residential Inst.: Education

D1 Non-residential Inst.: Primary Health Care Building D1 Non-residential Inst.: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others - Stand alone utility block

#### Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.95	21.14
Cooling	0	0
Auxiliary	3.19	2.13
Lighting	4.36	15.31
Hot water	1.65	1.91
Equipment*	17.75	17.75
TOTAL**	25.15	40.49

<sup>\*</sup> Energy used by equipment does not count towards the total for calculating emissions.

#### Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

#### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	161.33	84.34
Primary energy* [kWh/m²]	47.7	80.1
Total emissions [kg/m²]	8.2	14

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

<sup>\*\*</sup> Total is net of any electrical energy displaced by CHP generators, if applicable.

H	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2		Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Flued radiant heater, [HS] Unitary radiant heater, [HFT] Natural Gas, [CFT] Natural Gas									
	Actual	39.5	121.8	15.9	0	3.2	0.69	0	0.86	0
	Notional	65.4	18.9	21.1	0	2.1	0.82	0		Andrews

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

# **Key Features**

The BCO can give particular attention to items with specifications that are better than typically expected.

#### **Building fabric**

Element	U <sub>i-Typ</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*	
Wall	0.23	0.23	Workshop - Zone 1_W_6	
Floor	0.2	0.2	Workshop - Zone 1_S_3	
Roof	0.15	0.13	Workshop - Zone 1_R_5	
Windows, roof windows, and rooflights	1.5	1.25	Workshop - Zone 1_G_7	
Personnel doors	1.5	1	Workshop - Zone 1_D_11	
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"	
High usage entrance doors	1.5	-	"No external high usage entrance doors"	
U⊦ <sub>Typ</sub> = Typical individual element U-values [W/(m²K)]			U <sub>I-Min</sub> = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.				

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3