Regulations Compliance Report

Printed on 08 Nov	ember 2019 at 12:23	n, England assessed by Stroma FSA 3:14	AP 2012 program, Ver	sion: 1.0.4.18	
Project Information	on:				
Assessed By:	Ross Boulton (STI	RO028068)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING			Total Floor Area: 7	8.88m²	
Site Reference :	B1 Stg 4 Issue		Plot Reference:	B1M-102-01	
Address :	U U	Type 1-19B, Wimbledon, London			
Client Details:	·				
Name:	Galliard Homes				
Address :					
This report cover	rs items included w	ithin the SAP calculations.			
•	ete report of regulat				
1a TER and DEF	ર				
	ting system: Mains g	U			
,	mains gas (c), mains	• • • • •			
-	oxide Emission Rate		14.85 kg/m ²		01/
1b TFEE and DF	Dioxide Emission Rat	e (DER)	9.44 kg/m²		OK
		\ \	35.4 kWh/m ²		
-	rgy Efficiency (TFEE nergy Efficiency (DFI		33.9 kWh/m²		
	lergy Efficiency (Dr I)	55.9 KWI/III-		ОК
2 Fabric U-value	es				
Element		Average	Highest		
External		0.15 (max. 0.30)	0.15 (max. 0.70)		ок
Floor		0.13 (max. 0.25)	0.13 (max. 0.70)		ОК
Roof		(no roof)			
Opening	6	1.35 (max. 2.00)	1.35 (max. 3.30)		ОК
2a Thermal brid	ging				
Thermal	bridging calculated u	sing user-specified y-value of 0.15			
3 Air permeabili	ty				
	bility at 50 pascals		5.00 (design valu	le)	
Maximum			10.0		OK
4 Heating efficie	ency				
Main Heati	ng system:	Community heating schemes - ma	ains gas		
Secondary	heating system:	None			
5 Cylinder insul	ation				
Hot water S		No cylinder			
6 Controls	, orago.				
Space heat	ting controls	Charging system linked to use of	community heating		
epade nou		programmer and at least two roor			ОК
Hot water of	controls:	No cylinder thermostat			
		No cylinder			

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7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.77	
Maximum	1.5	OK
MVHR efficiency:	87%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	6.79m ²	
Windows facing: North East	2m ²	
Windows facing: North East	2.05m ²	
Windows facing: North East	2.92m ²	
Windows facing: North East	1.77m ²	
Ventilation rate:	3.00	
Blinds/curtains:	Light-coloured curtain or r	oller blind
	Closed 100% of daylight h	nours

10 Key features

Community heating, heat from boilers – mains gas Photovoltaic array

Predicted Energy Assessment

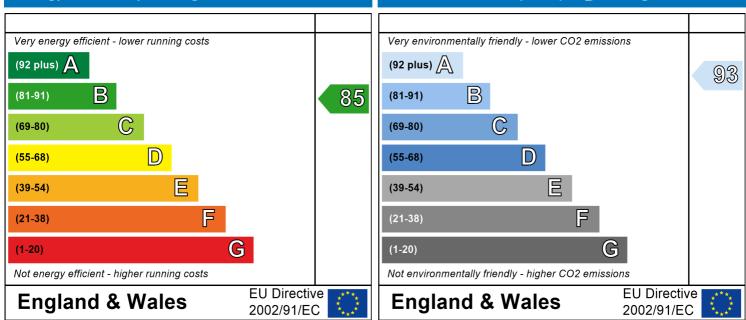
B1M-102-01 Flat Type 1-19B Wimbledon London Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 01 December 2018 Ross Boulton 78.88 m²

Environmental Impact (CO₂) Rating

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.



SAP Input

Property Details: B	IM-102-01							
Address:			• •	-19B, Wimbledon,	London			
Located in:		England						
Region:		Thames	svalley					
UPRN:								
Date of assessm			ember 2018					
Date of certifica			ember 2019					
Assessment type			elling design stag	ge				
Transaction type	2:	New dw						
Tenure type:		Unknow						
Related party di			ted party					
Thermal Mass Pa			ve Value Low					
Water use <= 1	25 litres/perso	5	True					
PCDF Version:		451						
Property description	۰							
	1.	Flat						
Dwelling type: Detachment:		riat						
Year Completed:		2019						
Floor Location:		Floor	area:					
				S	torey height	:		
Floor 0		78.881	m²		2.6 m			
Living area: Front of dwelling f	aces:	28.775 South	m ² (fraction 0.3)	65)				
Opening types:								
Name:	Source:	T۱	/pe:	Glazing:		Argon:	Fram	е.
NW_2.6_2.61 x 1	Manufacturer	5	ndows	•	0.05, soft coat	No	1 I diff	
SW_1.02_1.96 x 1	Manufacturer		ndows		0.05, soft coat	No		
SW_0.8_2.56 x 1	Manufacturer		ndows		0.05, soft coat	No		
SW_0.8_2.56 x 1 SW_1.14_2.56 x 1	Manufacturer		ndows		0.05, soft coat	No		
SW_0.69_2.56 x 1	Manufacturer		ndows		0.05, soft coat	No		
3W_0.07_2.30 X 1	Manufacturer	VVI	nuows	1000-L, LII – V	5.05, son coat	NO		
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. o	f Openings
NW_2.6_2.61 x 1	16mm or m	ore	0.8	0.5	1.35	6.79	1	
SW_1.02_1.96 x 1	16mm or m	ore	0.8	0.5	1.35	2	1	
SW_0.8_2.56 x 1	16mm or m	ore	0.8	0.5	1.35	2.05	1	
SW_1.14_2.56 x 1	16mm or m	ore	0.8	0.5	1.35	2.92	1	
SW_0.69_2.56 x 1	16mm or m	ore	0.8	0.5	1.35	1.77	1	
Name:	Type-Name:	1 c	ocation:	Orient:		Width:	Heigl	nt.
NW_2.6_2.61 x 1	Type Nume.	Wa		South East		2.6	2.61	
SW_1.02_1.96 x 1		Wa		North East		1.02	1.96	
SW_0.8_2.56 x 1		Wa		North East		0.8	2.56	
SW_0.0_2.30 x 1 SW_1.14_2.56 x 1		Wa		North East		1.14	2.56	
SW_0.69_2.56 x 1		Wa		North East		0.69	2.56	
300_0.09_2.50 X 1		VVd		NOTITEAS		0.09	2.50	
Overshading:		Average	e or unknown					
Opaque Elements:								
5.	Gross area: C)penings:	Net area:	U-value:	Ru value:	Curtain	wall:	Kappa:
External Elements	40.057	15 50		0.15	0	F -1-		N1 / A
Wall	40.057	15.53	24.53	0.15	0	False		N/A
Floor	12.776			0.13				N/A
nternal Elements Party Elements								

SAP Input

Thermal bridges:	
Thermal bridges:	No information on thermal bridging $(y=0.15)$ $(y=0.15)$
Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 3 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test: Main heating system:	0 0 0 2 5
Main heating system:	Community heating schemes Heat source: Community CHP heat from boilers – mains gas, heat fraction 0.666, efficiency 50.4 Heat source: Community boilers heat from boilers – mains gas, heat fraction 0.334, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow
Main heating Control:	
Main heating Control:	Charging system linked to use of community heating, programmer and at least two room thermostats Control code: 2312
Secondary heating system:	
Secondary heating system:	None
Water heating:	
Water heating:	From main heating system Water code: 901 Fuel :heat from boilers – mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	Standard Tariff Yes No conservatory 100% Dense urban English No <u>Photovoltaic 1</u> Installed Peak power: 0.253
Assess Zero Carbon Home:	Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West No

				User D	etails:						
Assessor Name:	Ross Boult	on		:	Stroma	a Num	ber:		STRO	028068	
Software Name:	Stroma FS	AP 2012		:	Softwa	re Ver	sion:		Versio	n: 1.0.4.18	
			Pr	operty A	Address:	B1M-10)2-01				
Address :	B1M-102-01	, Flat Type	e 1-19E	3, Wimb	oledon, L	ondon.					
1. Overall dwelling dimen	sions:										
Ground floor				Area	· · ·	(1a) x	Av. Hei	i ght(m) 6	(2a) =	Volume(m³) 205.09	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.	(1n)	78	8.88	(4)			4		_
Dwelling volume							+(3c)+(3d)+(3e)+	.(3n) =	205.09	(5)
2. Ventilation rate:									-		_
	main heating	secc hea	ondary	/	other		total			m ³ per hour	
Number of chimneys] + [0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0] + [0	1+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fan	s					- F	0	x 1	10 =	0	(7a)
Number of passive vents						Γ	0	x 1	10 =	0	(7b)
Number of flueless gas fire	es					Г	0	x 4	40 =	0	(7c)
									Air ch	anges per ho	ur
Infiltration due to chimney	s flues and fa	uns - (6a)+((6b)+(7a	a)+(7b)+(7	(c) =	Г					-
If a pressurisation test has be	-					ontinue fro	0 om (9) to (÷ (5) =	0	(8)
Number of storeys in the								,		0	(9)
Additional infiltration								[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or	timber frar	me or (0.35 for	masonr	y constru	uction			0	(11)
if both types of wall are pre deducting areas of opening			ding to a	the greate	er wall area	a (after					
If suspended wooden flo) or 0.1	l (seale	d). else (enter 0				0	(12)
If no draught lobby, ente	,	```		(- / ,					0	(13)
Percentage of windows			ped						·	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, q	50, expresse	d in cubic ı	metres	s per ho	ur per so	quare me	etre of e	nvelope	area	5	(17)
If based on air permeabilit	y value, then	(18) = [(17) ÷	- 20]+(8)), otherwis	se (18) = (*	16)				0.25	(18)
Air permeability value applies		n test has be	en done	e or a deg	ree air per	meability i	is being us	sed			-
Number of sides sheltered Shelter factor					(20) = 1 - [0 075 x (1	9)] =			2	(19)
Infiltration rate incorporatir	na shelter fact	or			(21) = (18)		•/]		-	0.85	(20)
Infiltration rate modified fo	•				(21) = (10)	x (20) -				0.21	(21)
<u> </u>	/ar Apr	· ·	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	· _ I		1				000			I	
	.9 4.4		3.8	3.8	3.7	4	4.3	4.5	4.7		
			I	-	·		-	-		l	
Wind Factor $(22a)m = (22)$	- I I	1.00		0.05	0.00	4	1.00	1 4 0	1 4 0		
(22a)m= 1.27 1.25 1.	23 1.1	1.08 0	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
	0.27	0.27	0.26	0.23	0.23	0.2	0.2	0.2	0.21	0.23	0.24	0.25		
		al ventila	-	rate for t	he appli	cable ca	ISE						0.5	(23a)
				endix N, (2	3b) = (23a	a) x Fmv (e	equation (N	N5)), other	rwise (23b) = (23a)			0.5	(23a) (23b)
			• • •	iency in %	, ,	, ,) (200)			0.5	=
			-	entilation	-					2b)m ± ('	23P) ^ [1 - (23c)	73.95	(23c)
(24a)m=		0.4	0.39	0.36	0.36	0.33	0.33	0.33	0.34	0.36	0.37	0.38]	(24a)
												0.00]	(2.00)
(24b)m=	r			entilation				0	0 = (22)	0	230)	0	1	(24b)
		-			-	-		-		0	0	0	J	(240)
,				ntilation o then (240	•	•				5 x (23h	.)			
(24c)m=	r í í	0	0		0 = (200)			0 = (22)	0	0	0	0	1	(24c)
		-	-	ole hous		-		n from l	-	-			J	. ,
,				m = (22k)						0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.4	0.4	0.39	0.36	0.36	0.33	0.33	0.33	0.34	0.36	0.37	0.38]	(25)
0.11.							1	1				1	1	
				paramete		Net Ar		Livel	10	AXU		k volu	- ^	Xk
ELEN	/IEN I	Gros area		Openin m		A,r		U-valı W/m2		A X U (W/ł	K)	k-value kJ/m²⊷		лк I/K
Windo	ws Type	e 1	. ,			6.79	x1/	[1/(1.35)+	0.04] =	8.7				(27)
Windo	ws Type	2				2		[1/(1.35)+	+ 0.04] =	2.56	=			(27)
	ws Type					2.05	_	[1/(1.35)+	L	2.63	=			(27)
	ws Type					2.92		- [1/(1.35)+	L	3.74	\exists			(27)
	ws Type						_	[1/(1.35)+	L		\dashv			
	ws type	50				1.77		r	I	2.27				(27)
Floor						12.77	6 ×	0.13		1.66088			\dashv	(28)
Walls		40.0		15.53	3	24.53	3 X	0.15	= [3.68				(29)
		lements				52.83								(31)
				effective wi nternal wali			lated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	n 3.2	
		s, W/K :			o una pun			(26)(30)	+ (32) =				25.23	(33)
		Cm = S(•							(30) + (32	2) + (32a).	(32e) =	1301.58	(34)
			,	⁻ = Cm ÷	- TFA) ir	n k.I/m²K				tive Value:	· · ·	()	100	(35)
				tails of the				ecisely the				able 1f	100	(00)
	-	ad of a de					,	,						
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	K						7.92	(36)
			are not kr	nown (36) =	= 0.05 x (3	1)								_
	abric he								(33) +	(36) =			33.16	(37)
Ventila	ation hea	at loss ca	alculated	d monthly				1	(38)m	= 0.33 × (25)m x (5)	1	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	10-1
(38)m=	27.15	26.79	26.43	24.64	24.28	22.48	22.48	22.12	23.2	24.28	25	25.71	J	(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		,	
(39)m=	60.31	59.95	59.59	57.79	57.43	55.63	55.63	55.27	56.35	57.43	58.15	58.87		_
										Average =	Sum(39)	₁₂ /12=	57.7	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.76	0.76	0.76	0.73	0.73	0.71	0.71	0.7	0.71	0.73	0.74	0.75		
Numb	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	0.73	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		44		(42)
Reduce	the annua	al average	hot water		5% if the c	welling is	designed	(25 x N) to achieve		se target o		18		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)		-				
(44)m=	101.4	97.71	94.02	90.34	86.65	82.96	82.96	86.65	90.34	94.02	97.71	101.4		
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x D)))))))))))))))))))			m(44) ₁₁₂ = ables 1b, 1		1106.17	(44)
(45)m=	150.37	131.52	135.71	118.32	113.53	97.97	90.78	104.17	105.42	122.85	134.1	145.63		
16 :								h		Total = Su	m(45) ₁₁₂ =	-	1450.36	(45)
	r		• ·	·				boxes (46)	. ,				I	
(46)m= Water	22.56 storage	19.73 IOSS:	20.36	17.75	17.03	14.69	13.62	15.63	15.81	18.43	20.12	21.84		(46)
	•		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	neating a	ind no ta	ınk in dw	velling, e	nter 110) litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage						- <i>(</i> -) -						I	
				oss facto	or is kno	wn (kvvi	n/day):					0		(48)
•			m Table									0		(49)
	•		•	e, kWh/ye cylinder l		or is not		(48) x (49)) =		1	10		(50)
,				om Tabl							0.	02		(51)
		-	ee secti	on 4.3										
		from Ta									1.	03		(52)
			m Table								0	.6		(53)
•			-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		03		(54)
	. ,	(54) in (5	,	for each	month			((56)m = (55) v (<i>1</i> 1)	m	1.	03		(55)
		1	1	1	1					i			l	(50)
(56)m= If cylinde	32.01 er contain:	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)i	32.01 m = (56)m	30.98 x [(50) – (32.01 [H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (30.98 H11) is fro	32.01 m Append	ix H	(56)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	v circuit	loss (ar		u om Table	<u> </u>	1	1					0		(58)
Primar	y circuit	loss cal	culated	for each	month (,	. ,	65 × (41)				-	I	x - /
•		· · · · · ·	· · · · · ·	i	· · · · · ·	· · · · · ·	r	ng and a	·	1	, 	i	l	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	h mont	= (61) n (61) ח	(60	D) ÷ 36	65 × (41)	m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating	calculate	d fo	or eacl	h month	(62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.65	181.44	190.99	171.8	1 168.81	1	51.46	146.06	159.45	158.91	178.13	187.6	200.9		(62)
Solar DH	IW input	calculated	using Ap	pendix G	or Appendi	×Н	(negati	ve quantity	v) (enter 'C)' if no sola	r contribu	tion to wate	er heating)		
(add ac	dditiona	al lines if	FGHR	S and/o	r WWHRS	S ap	oplies	, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter												
(64)m=	205.65	181.44	190.99	171.8	1 168.81	1	51.46	146.06	159.45	158.91	178.13	187.6	200.9		
					-				Out	put from w	ater heate	er (annual)	12	2101.2	(64)
Heat g	ains fro	m water	heating	, kWh/	month 0.2	5 ´	[0.85	× (45)m	+ (61)n	n] + 0.8 >	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	94.22	83.67	89.35	82.14	81.97	7	75.37	74.41	78.86	77.85	85.07	87.38	92.64		(65)
inclu	de (57)	m in calo	ulation	of (65)	m only if a	cylii	nder i	s in the c	dwelling	or hot w	ater is f	rom com	munity h	leating	
5. Int	ernal a	ains (see	e Table	5 and 5	ia):				-				•	-	
		ns (Table													
metabl	Jan	Feb	Mar	Api	May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	146.48	146.48	146.48	<u> </u>		1	46.48	146.48	146.48	146.48	146.48	146.48	146.48		(66)
l iahtin	n nains	i (calcula	L ted in A		L, equa			rl9a)a	lso see						
(67)m=	48.59	43.16	35.1	26.57		-	16.77	18.12	23.55	31.61	40.14	46.84	49.94	l	(67)
					ndix L, ec										
Appilai (68)m=	324.01	327.37	318.9	300.8		T	56.69	242.4	239.03	247.51	265.54	288.31	309.71		(68)
												200.51	503.71		(00)
		<u> </u>		52.09	ix L, equa	-	52.09	or L15a) 52.09			52.09	50.00	50.00	I	(69)
(69)m=	52.09	52.09	52.09		52.09		52.09	52.09	52.09	52.09	52.09	52.09	52.09		(09)
		ns gains	r			-	-	-		<u> </u>	<u> </u>	1 -	<u> </u>	I	(70)
(70)m=	0	0	0	0	0		0	0	0	0	0	0	0		(70)
		r	<u> </u>		lues) (Tal	1	,			r			1		
(71)m=	-97.65	-97.65	-97.65	-97.6	5 -97.65	-	97.65	-97.65	-97.65	-97.65	-97.65	-97.65	-97.65		(71)
Water	heating	gains (T	able 5)	_		-									
(72)m=	126.64	124.51	120.09	114.0	8 110.17	1	04.68	100.01	105.99	108.12	114.34	121.37	124.52		(72)
Total i	nterna	gains =		_	-		(66)	m + (67)m	+ (68)m	+ (69)m +	(70)m + (71)m + (72))m		
(73)m=	600.15	595.95	575	542.4	2 509.04	4	79.05	461.44	469.49	488.15	520.94	557.44	585.08		(73)
6. Sol	ar gain	s:													
Solar g	ains are	calculated	using sol	ar flux fro	m Table 6a	and	associ	iated equa	tions to co	onvert to th	ne applica		tion.		
Orienta		Access F		Are			Flu		-	g_	-	FF		Gains	
	_	Table 6d		m 			- Tai	ole 6a	ا 	able 6b	י 	able 6c		(W)	-
Northea	L	0.77	3	<	2	x	1	1.28	x	0.5	×	0.8	=	6.26	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	(2.05	x	1	1.28	x	0.5	×	0.8	=	6.41	(75)
Northea	ast <mark>0.9x</mark>	0.77		(2.92	x	1	1.28	x	0.5	x	0.8	=	9.13	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	(1.77	x	1	1.28	x	0.5	× [0.8	=	5.54	(75)
Northea	ast <mark>0.9x</mark>	0.77	2	(2	x	2	2.97	x	0.5	x	0.8	=	12.73	(75)

Northeast 0.9x	0.77] ×	2.05	×	22.97	×	0.5	x	0.8	=	13.05	(75)
Northeast 0.9x	0.77] ^] x	2.92	x	22.97	x	0.5	x	0.8	 =	18.59	(75)
Northeast 0.9x	0.77] ×	1.77	x	22.97	×	0.5	x	0.8	=	11.27	(75)
Northeast 0.9x	0.77	」 】 x	2	x	41.38	x	0.5	x	0.8	=	22.94	(75)
Northeast 0.9x	0.77) x	2.05	x	41.38	x	0.5	x	0.8	=	23.51	(75)
Northeast 0.9x	0.77	x	2.92	x	41.38	x	0.5	x	0.8	=	33.49	(75)
Northeast 0.9x	0.77] ×	1.77	x	41.38	x	0.5	x	0.8	=	20.3	(75)
Northeast 0.9x	0.77	x	2	x	67.96	x	0.5	x	0.8	=	37.67	(75)
Northeast 0.9x	0.77	×	2.05	x	67.96	x	0.5	x	0.8	=	38.62	(75)
Northeast 0.9x	0.77	x	2.92	x	67.96	x	0.5	x	0.8	=	55.01	(75)
Northeast 0.9x	0.77	x	1.77	x	67.96	x	0.5	x	0.8	=	33.34	(75)
Northeast 0.9x	0.77	x	2	x	91.35	×	0.5	x	0.8	=	50.64	(75)
Northeast 0.9x	0.77	x	2.05	×	91.35	x	0.5	x	0.8	=	51.91	(75)
Northeast 0.9x	0.77	x	2.92	x	91.35	×	0.5	x	0.8	=	73.94	(75)
Northeast 0.9x	0.77	x	1.77	x	91.35	x	0.5	x	0.8	=	44.82	(75)
Northeast 0.9x	0.77	x	2	x	97.38	×	0.5	x	0.8	=	53.99	(75)
Northeast 0.9x	0.77	x	2.05	x	97.38	x	0.5	x	0.8	=	55.34	(75)
Northeast 0.9x	0.77	x	2.92	x	97.38	x	0.5	x	0.8	=	78.83	(75)
Northeast 0.9x	0.77	x	1.77	x	97.38	x	0.5	x	0.8	=	47.78	(75)
Northeast 0.9x	0.77	x	2	x	91.1	x	0.5	x	0.8	=	50.51	(75)
Northeast 0.9x	0.77	x	2.05	x	91.1	X	0.5	x	0.8	=	51.77	(75)
Northeast 0.9x	0.77	x	2.92	x	91.1	x	0.5	x	0.8	=	73.74	(75)
Northeast 0.9x	0.77	x	1.77	x	91.1	X	0.5	x	0.8	=	44.7	(75)
Northeast 0.9x	0.77	x	2	x	72.63	X	0.5	x	0.8	=	40.26	(75)
Northeast 0.9x	0.77	x	2.05	x	72.63	X	0.5	x	0.8	=	41.27	(75)
Northeast 0.9x	0.77	x	2.92	x	72.63	X	0.5	x	0.8	=	58.79	(75)
Northeast 0.9x	0.77	×	1.77	x	72.63	X	0.5	x	0.8	=	35.63	(75)
Northeast 0.9x	0.77	×	2	x	50.42	X	0.5	X	0.8	=	27.95	(75)
Northeast 0.9x	0.77	x	2.05	×	50.42	X	0.5	x	0.8	=	28.65	(75)
Northeast 0.9x	0.77	x	2.92	X	50.42	X	0.5	x	0.8	=	40.81	(75)
Northeast 0.9x	0.77	x	1.77	X	50.42	X	0.5	x	0.8	=	24.74	(75)
Northeast 0.9x	0.77	x	2	×	28.07	X	0.5	x	0.8	=	15.56	(75)
Northeast 0.9x	0.77	×	2.05	X	28.07	X	0.5	x	0.8	=	15.95	(75)
Northeast 0.9x	0.77	×	2.92	X	28.07	X	0.5	x	0.8	=	22.72	(75)
Northeast 0.9x	0.77	×	1.77	X	28.07	X	0.5	x	0.8	=	13.77	(75)
Northeast 0.9x	0.77	×	2	X	14.2	X	0.5	x	0.8	=	7.87	(75)
Northeast 0.9x	0.77	×	2.05	×	14.2	X	0.5	x	0.8	=	8.07	(75)
Northeast 0.9x	0.77	×	2.92	×	14.2	X	0.5	X	0.8	=	11.49	(75)
Northeast 0.9x	0.77	×	1.77	×	14.2	X	0.5	X	0.8	=	6.97	(75)
Northeast 0.9x	0.77	×	2	×	9.21	×	0.5	x	0.8	=	5.11	(75)
Northeast 0.9x	0.77	×	2.05	x	9.21	X	0.5	x	0.8	=	5.24	(75)

	. –								1 F		_			-		
Northea	L	0.77	×	2.9	92	x	<u></u>	9.21	×	0.5	×	0.8		= [7.46	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	1.7	77	x	ę	9.21	×	0.5	x	0.8		=	4.52	(75)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	3	6.79	×	0.5	x	0.8		= [48.57	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	6	2.67	×	0.5	x	0.8		= [82.73	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	8	5.75	x	0.5	x	0.8		- [113.19	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	10	06.25	x	0.5	x	0.8		= [140.25	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	1.	19.01) × [0.5	x	0.8		= [157.09	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	1.	18.15	×	0.5	x	0.8		= [155.96	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	1.	13.91	x	0.5	x	0.8		- [150.36	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	10	04.39	x	0.5	x	0.8		= [137.79	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	9	2.85	x	0.5	x	0.8		= [122.56	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	6	9.27	x	0.5	x	0.8		= [91.43	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	4	4.07	x	0.5	x	0.8		= [58.17	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.7	79	x	3	1.49	x	0.5	x	0.8		= [41.56	(77)
Solar g	ains in	watts, ca	alculated	for eac	h mont	h		_	(83)m	= Sum(74)m .	(82)m		-			
(83)m=	75.9	138.37	213.44	304.89	378.4	3	91.89	371.07	313.	75 244.72	159.43	92.57	63.89	9		(83)
Total g	ains – ii	nternal a	ind sola	⁻ (84)m =	= (73)m	1 + (ð	83)m	, watts								
(84)m=	676.05	734.32	788.44	847.31	887.44	· 8 [.]	70.95	832.51	783.	24 732.87	680.37	650.01	648.9	7		(84)
7. Me	an inter	nal temp	erature	(heating	seaso	n)										
Temp	erature	during h	eating p	eriods ir	n the liv	/ing	area f	from Tab	ole 9,	Th1 (°C)				Γ	21	(85)
		-	• •			-			ole 9,	Th1 (°C)					21	(85)
		during h tor for ga Feb	• •	living are		m (s			1		Oct	Nov	De	[c	21	(85)
	tion fac	tor for g	ains for		ea, h1,i	m (s	ee Ta	ble 9a)	ole 9, Au 0.3	ıg Sep	Oct 0.73	Nov	De 0.91		21	(85)
Utilisa (86)m=	ution fac Jan 0.9	tor for ga Feb 0.87	ains for Mar 0.81	living are Apr 0.7	ea, h1,ı May 0.56	m (s	ee Ta Jun ^{0.4}	ble 9a) Jul _{0.29}	Au 0.3	ıg Sep 2 0.5		_			21	
Utilisa (86)m= Mean	ition fac Jan 0.9 interna	tor for ga Feb 0.87	ains for Mar 0.81 ature in	living are Apr 0.7 living are	ea, h1,i May 0.56 ea T1 (m (s /	ee Ta Jun ^{0.4} w ste	ble 9a) Jul 0.29 ps 3 to 7	Au 0.32 7 in Ta	ig Sep 2 0.5 able 9c)	0.73	0.85	0.91		21	(86)
Utilisa (86)m= Mean (87)m=	ition fac Jan 0.9 interna 19.96	Feb 0.87 l temper 20.14	ains for Mar 0.81 ature in 20.41	living are Apr 0.7 living are 20.72	ea, h1,i May 0.56 ea T1 (20.9	m (s /	ee Ta Jun 0.4 w ste 20.98	ble 9a) Jul 0.29 ps 3 to 7 20.99	Au 0.3 7 in Ta 20.9	ig Sep 2 0.5 able 9c) 19 20.95		0.85			21	
Utilisa (86)m= Mean (87)m= Temp	ition fac Jan 0.9 interna 19.96 erature	tor for ga Feb 0.87 I temper 20.14 during h	ains for Mar 0.81 ature in 20.41	living are Apr 0.7 living are 20.72 periods in	ea, h1,i May 0.56 ea T1 (20.9 n rest c	m (s / follo 2 vf dw	ee Ta Jun 0.4 ww ste 20.98 velling	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta	Au 0.3 7 in Ta 20.9 able 9	Ig Sep 2 0.5 able 9c) 9 20.95 , Th2 (°C)	0.73	0.85	0.91 19.94	1	21	(86) (87)
Utilisa (86)m= Mean (87)m=	ition fac Jan 0.9 interna 19.96	Feb 0.87 l temper 20.14	ains for Mar 0.81 ature in 20.41	living are Apr 0.7 living are 20.72	ea, h1,i May 0.56 ea T1 (20.9	m (s / follo 2 vf dw	ee Ta Jun 0.4 w ste 20.98	ble 9a) Jul 0.29 ps 3 to 7 20.99	Au 0.3 7 in Ta 20.9	Ig Sep 2 0.5 able 9c) 9 20.95 , Th2 (°C)	0.73	0.85	0.91	1	21	(86)
Utilisa (86)m= Mean (87)m= Temp (88)m=	ition fac Jan 0.9 interna 19.96 erature 20.28	tor for ga Feb 0.87 I temper 20.14 during h	ains for Mar 0.81 ature in 20.41 eating p 20.29	living are Apr 0.7 living are 20.72 periods in 20.31	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32	m (s / follo 2 vf dw 2	ee Ta Jun 0.4 ww ste 20.98 velling 20.34	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34	Au 0.33 7 in Ta 20.9 able 9 20.3	Ig Sep 2 0.5 able 9c) 9 20.95 , Th2 (°C)	0.73	0.85	0.91 19.94	1	21	(86) (87)
Utilisa (86)m= Mean (87)m= Temp (88)m=	ition fac Jan 0.9 interna 19.96 erature 20.28	tor for ga Feb 0.87 I temper 20.14 during h 20.29	ains for Mar 0.81 ature in 20.41 eating p 20.29	living are Apr 0.7 living are 20.72 periods in 20.31	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32	m (s / follo 2 of dw 2 , h2,	ee Ta Jun 0.4 ww ste 20.98 velling 20.34	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34	Au 0.33 7 in Ta 20.9 able 9 20.3	Ig Sep 2 0.5 able 9c) 9 20.95 , Th2 (°C) 34 20.33	0.73	0.85	0.91 19.94	1	21	(86) (87)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	ition fac Jan 0.9 interna 19.96 erature 20.28 ition fac 0.89	tor for ga Feb 0.87 I temper 20.14 during h 20.29 tor for ga 0.85	ains for Mar 0.81 ature in 20.41 eating p 20.29 ains for 0.79	living are Apr 0.7 living are 20.72 periods in 20.31 rest of d 0.67	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32 welling 0.52	m (s / ifollo 2 f dw 2 , h2,	ee Ta Jun 0.4 ww ste 20.98 velling 20.34 ,m (se 0.36	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34 ee Table 0.25	Au 0.33 7 in Ta 20.9 able 9 20.3 9a) 0.24	Ig Sep 2 0.5 able 9c) 20.95 9 20.95 1, Th2 (°C) 34 8 0.46	0.73 20.73 20.32 0.7	0.85 20.33 20.31	0.91 19.94 20.3	1	21	(86) (87) (88)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	ition fac Jan 0.9 interna 19.96 erature 20.28 ition fac 0.89	tor for ga Feb 0.87 I temper 20.14 during h 20.29 tor for ga 0.85	ains for Mar 0.81 ature in 20.41 eating p 20.29 ains for 0.79	living are Apr 0.7 living are 20.72 periods in 20.31 rest of d 0.67	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32 welling 0.52	m (s / follo 2 f dw 2 , h2,	ee Ta Jun 0.4 ww ste 20.98 velling 20.34 ,m (se 0.36	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34 ee Table 0.25	Au 0.33 7 in Ta 20.9 able 9 20.3 9a) 0.24	Ig Sep 2 0.5 able 9c) 20.95 9 20.95 7 Th2 (°C) 24 20.33 8 0.46 to 7 in Tabl	0.73 20.73 20.32 0.7	0.85 20.33 20.31 0.84	0.91 19.94 20.3	4	21	(86) (87) (88)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	ition fac Jan 0.9 interna 19.96 erature 20.28 ition fac 0.89 interna	tor for ga Feb 0.87 I temper 20.14 during h 20.29 tor for ga 0.85	ains for Mar 0.81 ature in 20.41 eating p 20.29 ains for 0.79 ature in	living are Apr 0.7 living are 20.72 periods in 20.31 rest of d 0.67 the rest	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32 welling 0.52 of dwe	m (s / follo 2 f dw 2 , h2,	ee Ta Jun 0.4 ww ste 20.98 velling 20.34 ,m (se 0.36 T2 (fo	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34 ee Table 0.25 ollow ste	Au 0.3: 7 in Ti 20.9 20.3 9a) 0.2: 20.3	Ig Sep 2 0.5 able 9c) 99 20.95 , Th2 (°C) 94 20.33 8 0.46 to 7 in Tabl 93 20.28	0.73 20.73 20.32 0.7 e 9c) 19.99	0.85 20.33 20.31 0.84	0.91 19.94 20.3 0.9	4	21	(86) (87) (88) (89)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	ition fac Jan 0.9 interna 19.96 erature 20.28 ition fac 0.89 interna 18.89	tor for ga Feb 0.87 I temper 20.14 during h 20.29 tor for ga 0.85 I temper 19.15	ains for Mar 0.81 ature in 20.41 eating p 20.29 ains for 0.79 ature in 19.53	living are Apr 0.7 living are 20.72 periods in 20.31 rest of d 0.67 the rest 19.97	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32 welling 0.52 of dwe 20.2	(s) (f) (f) (f) (f) (f) (f) (f) (f) (f) (f	ee Ta Jun 0.4 ww ste 20.98 velling 20.34 ,m (se 0.36 T2 (fo 20.32	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34 ee Table 0.25 ollow ste 20.33	Au 0.33 7 in Ta 20.9 20.3 9a) 0.24 9a) 0.24 20.3	Ig Sep 2 0.5 able 9c) 9 9 20.95 7 Th2 (°C) 94 20.33 8 0.46 103 20.28	0.73 20.73 20.32 0.7 e 9c) 19.99	0.85 20.33 20.31 0.84 19.44	0.91 19.94 20.3 0.9	4		(86) (87) (88) (89) (90)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	interna 18.89 interna	tor for ga Feb 0.87 I temper 20.14 during h 20.29 tor for ga 0.85 I temper 19.15	ains for Mar 0.81 ature in 20.41 eating p 20.29 ains for 0.79 ature in 19.53	living are Apr 0.7 living are 20.72 eriods ir 20.31 rest of d 0.67 the rest 19.97	ea, h1,i May 0.56 ea T1 (20.9 n rest o 20.32 welling 0.52 of dwe 20.2	follo 2 if dw 2 if dw 2 if dw 2 2 if dw 2 2 if dw 2 2 if dw 2 2 if dw 2 2 if dw 2 2 if dw 2 2 if dw 2 if ollo 2 if ollo if ollo i i ollo i i ollo i i ollo i i ollo i	ee Ta Jun 0.4 ww ste 20.98 velling 20.34 ,m (se 0.36 T2 (fc 20.32 g) = fl	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34 ee Table 0.25 ollow ste 20.33	Au 0.3: 20.9 0.20 0.20 9a) 0.20 9a) 0.20 9a) 0.20 20.3 + (1 -	Ig Sep 2 0.5 able 9c) 20.95 9 20.95 4 20.33 8 0.46 10 7 in Tabl 13 20.28 6 f	0.73 20.73 20.32 0.7 e 9c) 19.99 LA = Liv	0.85 20.33 20.31 0.84 19.44 ring area ÷ (•	0.91 19.94 20.3 0.9 18.85 4) =			(86) (87) (88) (89) (90) (91)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	interna 19.96 erature 20.28 ition fac 0.89 interna 18.89 interna 19.28	tor for ga Feb 0.87 I temper 20.14 during h 20.29 tor for ga 0.85 I temper 19.15	ains for Mar 0.81 ature in 20.41 reating p 20.29 ains for 0.79 ature in 19.53 ature (fo 19.85	living are Apr 0.7 living are 20.72 periods in 20.31 rest of d 0.67 the rest 19.97 or the wh 20.24	ea, h1,i May 0.56 ea T1 (20.9 n rest c 20.32 welling 0.52 of dwe 20.2	follo 2 follo 2 f dw 2 , h2, 0 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ee Ta Jun 0.4 ww ste 20.98 velling 20.34 ,m (se 0.36 T2 (fo 20.32 g) = fl 20.56	ble 9a) Jul 0.29 ps 3 to 7 20.99 from Ta 20.34 ee Table 0.25 ollow ste 20.33	Au 0.33 7 in Ta 20.9 able 9 20.3 9a) 0.23 9a) 0.23 9a) 20.3 + (1 - 20.5	Ig Sep 2 0.5 able 9c) 99 20.95 , Th2 (°C) 94 20.33 8 0.46 103 20.28 6 f - fLA) × T2 7	0.73 20.73 20.32 0.7 e 9c) 19.99 LA = Liv 20.26	0.85 20.33 20.31 0.84 19.44 ring area ÷ (•	0.91 19.94 20.3 0.9			(86) (87) (88) (89) (90)
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Utilisa	ition fac	tor for g	ains, hm	1:		_	_				_	_	
(94)m=	0.87	0.84	0.78	0.67	0.53	0.37	0.26	0.29	0.47	0.69	0.82	0.88	(94)

Useful g	gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m= 5	588.74	615.02	614.05	568.12	471.3	325.15	219.75	228.83	346.72	472.54	535.81	571.17		(95)
	-	-	ernal tem	r <u> </u>	e from Ta						r		1	
(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)
	903.41	e for me 876.08	an intern 795.56	al temp	502.78	_m , W = 331.4	=[(39)m : 221.08	x [(93)m 230.74	- (96)m 361.82	554.76	736.66	887.43	1	(97)
)m – (95			007.43		(01)
· –	234.12	175.43	135.04	62.84	23.43	0	0.02	0	0	61.17	144.61	235.3		
				ļ				Tota	l per year	(kWh/yeai) = Sum(9	8)15,912 =	1071.92	(98)
Space I	heating	g requir	ement in	kWh/m²	/year								13.59	(99)
9b. Ener	rgy req	luiremer	nts – Coi	mmunity	heating	scheme	1							
This part Fraction											unity scł	neme.	0	(301)
Fraction	of spa	ace heat	from co	mmunit	v svstem	1 – (301	1) =						1	(302)
The comm								allows for	CHP and u	up to four	other heat	sources; t		
<i>includes be</i> Fraction			-		aste heat f	rom powei	r stations.	See Appe	ndix C.				0.67	(303a)
Fraction				•	source 2								0.33	(303b)
Fraction	of tota	al space	heat fro	m Comr	nunity C	HP				(3	02) x (303	a) =	0.67	(304a)
Fraction	of tota	al space	heat fro	m comr	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.33	(304b)
Factor fo	or cont	rol and	charging	methoc	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribut	tion los	s factor	(Table 1	2c) for (commun	ity heatir	ng syste	m					1.05	(306)
Space h	neating	9											kWh/yea	r
Annual s	space	heating	requiren	nent									1071.92	
Space h	eat fro	m Com	munity C	HP					(98) x (30	04a) x (30	5) x (306) :	=	749.6	(307a)
Space h	eat fro	m heat	source 2	2					(98) x (30	04b) x (30	5) x (306) :	=	375.92	(307b)
Efficienc	cy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space h	eating	require	ment fro	m secor	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water h Annual v			equirem	ent									2101.2	7
If DHW f	from co	ommuni	ty schen	ne:									2101.2	_
Water he											5) x (306) :		1469.37	(310a)
Water he	eat fro	m heat s	source 2						(64) x (30	03b) x (30	5) x (306) :	-	736.89	(310b)
Electricit	ty used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	(310a)((310e)] =	33.32	(313)
Cooling	Syster	n Energ	y Efficie	ncy Rati	0								0	(314)
Space co	ooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricit mechani								outside					240.83	(330a)
warm air	r heatii	ng syste	m fans		-								0	(330b)
		5,29	-										L	` ´

pump for solar water heating						0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a)	+ (330b)	+ (330g) =		240.83	(331)
Energy for lighting (calculated in Appe	endix L)					343.23	(332)
Electricity generated by PVs (Append	lix M) (negative quantity)					-208.31	(333)
Electricity generated by wind turbine	(Appendix M) (negative qua	antity)				0	(334)
10b. Fuel costs – Community heatin	g scheme						
	Fuel kWh/year			Price e 12)		Fuel Cost £/year	
Space heating from CHP	(307a) x		Э	.35 × 0.0	01 =	25.11	(340a)
Space heating from heat source 2	(307b) x		4	.79 × 0.0	01 =	18.01	(340b)
Water heating from CHP	(310a) x		3	.35 × 0.0	01 =	49.22	(342a)
Water heating from heat source 2	(310b) x		4	.79 × 0.0	01 =	35.3	(342b)
Pumps and fans	(331)		Fuel	Price	01 =	42.29	(349)
Energy for lighting	(332)			0 × 0.0	01 =	60.27	(350)
Additional standing charges (Table 12	2)					88	(351)
Energy saving/generation technologie	es = (340a)(342e) + (345)(3	354) =				318.2	(355)
11b. SAP rating - Community heatin	g scheme						
Energy cost deflator (Table 12)						0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =	=				1.05	(357)
SAP rating (section12)						85.33	(358)
12b. CO2 Emissions – Community he	eating scheme						
Electrical efficiency of CHP unit						32	(361)
Heat efficiency of CHP unit						50.4	(362)
		Energy kWh/year		Emission fac kg CO2/kWh		nissions CO2/year	
Space heating from CHP) (3	307a) × 100 ÷ (362) =	1487.29	x	0.22		321.26	(363)
less credit emissions for electricity -	(307a) × (361) ÷ (362) =	475.93	x	0.52		-247.01	(364)
Water heated by CHP (310a) × 100 ÷ (362) =	2915.41	x	0.22		629.73	(365)
less credit emissions for electricity	(310a) × (361) ÷ (362) =	932.93	x	0.52		-484.19	(366)
Efficiency of heat source 2 (%)	If there is CHP using	two fuels repeat (3	63) to (3	66) for the secon	id fuel	95	(367b)
CO2 associated with heat source 2	[(307b)+([310b)] x 100 ÷ (367	'b) x	0.22	=	253.02	(368)
Electrical energy for heat distribution	[(313) x		0.52	=	17.29	(372)
Total CO2 associated with community	y systems (363)(366) + (368)(372)		=	490.09	(373)
CO2 associated with space heating (s	secondary) ((309) x		0	=	0	(374)

CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22	= 0 (375)
Total CO2 associated with space and water heating (373) + (374) + (375) =	490.09 (376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 =	124.99 (378)
CO2 associated with electricity for lighting (332))) x 0.52 =	178.14 (379)
Energy saving/generation technologies (333) to (334) as applicable Item 1 0.52 x 0.01 =	-108.11 (380)
Total CO2, kg/year sum of (376)(382) =	685.11 (383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	8.69 (384)
El rating (section 14)	92.59 (385)
13b. Primary Energy – Community heating scheme	
Electrical efficiency of CHP unit	32 (361)
Heat efficiency of CHP unit	50.4 (362)
Energy Primary kWh/year factor	P.Energy kWh/year
Space heating from CHP) (307a) × 100 ÷ (362) = 1487.29 X 1.22	1814.5 (363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$ 475.93 × 3.07	-1461.12 (364)
Water heated by CHP (310a) × 100 ÷ (362) = 2915.41 × 1.22	3556.8 (365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$ 932.93 × 3.07	-2864.1 (366)
Efficiency of heat source 2 (%) If there is CHP using two fuels repeat (363) to (366) for the second fue	95 (367b)
Energy associated with heat source 2 [(307b)+(310b)] x 100 ÷ (367b) x 1.22 =	1429.09 (368)
Electrical energy for heat distribution [(313) x	102.29 (372)
Total Energy associated with community systems (363)(366) + (368)(372)	2577.46 (373)
if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C)	2577.46 (373)
Energy associated with space heating (secondary) (309) x 0	= 0 (374)
Energy associated with water from immersion heater or instantaneous heater(312) x 1.22	= 0 (375)
Total Energy associated with space and water heating (373) + (374) + (375) =	2577.46 (376)
Energy associated with space cooling (315) x 3.07	= 0 (377)
Energy associated with electricity for pumps and fans within dwelling (331)) x 3.07 =	739.34 (378)
Energy associated with electricity for lighting (332))) x 3.07	1053.71 (379)
Energy saving/generation technologies Item 1 3.07 × 0.01 =	-639.5 (380)

			User D	etails:						
Assessor Name: Software Name:	Ross Boulto Stroma FS/			Stroma Softwa					028068 n: 1.0.4.18	
			Property A	Address:	B1M-10)2-01				
Address :		, Flat Type 1-1	9B, Wiml	oledon, L	ondon					
1. Overall dwelling dimen	sions:		_							
Ground floor				a(m²) 8.88	(1a) x	Av. Hei	i ght(m) 6	(2a) =	205.09	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(⁻	1d)+(1e)+(1	n) 7	8.88	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	205.09	(5)
2. Ventilation rate:				- 11		4 - 4 - 1				
Number of chimneys	main heating	seconda heating	iry +	0 0] = [total 0		40 =	m ³ per hour	(6a)
Number of open flues	0	+ 0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fan	S				Γ	3	x 1	0 =	30	(7a)
Number of passive vents						0	x 1	0 =	0	(7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys					continue fro	30 om (9) to (÷ (5) =	0.15	(8)
Number of storeys in the	e dwelling (ns))							0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the val	ue corresponding				uction			0	(11)
If suspended wooden flo	oor, enter 0.2	(unsealed) or (0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	nter 0							0	(13)
Percentage of windows	and doors dra	aught stripped							0	(14)
Window infiltration				0.25 - [0.2		1			0	(15)
Infiltration rate				(8) + (10) ·					0	(16)
Air permeability value, q If based on air permeabilit	•		•	•	•	etre of e	nvelope	area	5	(17)
Air permeability value applies						is heina us	sed		0.4	(18)
Number of sides sheltered				, ee an per	incus inty i	o boing ac			2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	ng shelter fact	or		(21) = (18)	x (20) =				0.34	(21)
Infiltration rate modified fo	r monthly wind	d speed								
Jan Feb M	/lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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 Factor $(22a)m = (22)$)m ÷ 4									
(22a)m= 1.27 1.25 1.	23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltra	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
	<i>ate effec</i> echanica		-	rate for t	he appli	cable ca	se							(23a)
				endix N. (2	(23a) = (23a	a) x Fmv (e	equation (1	N5)), othei	wise (23b) = (23a)			0	(23a) (23b)
			0 11		, ,	, ,	• •	n Table 4h)	,) = (200)			0	=
			-	-	-			HR) (24a		2b)m + ('	23h) v [*	1 _ (23c)	0	(23c)
(24a)m=								0	0	0	0	1 - (230)	 	(24a)
		-	_	-	-	÷	Ţ	I MV) (24b	-	÷	ů	Ŭ		()
(24b)m=								0	0 = (22)	0	230)	0	1	(24b)
		-	_	•	-	-	_	on from c	-	Ŭ		Ů		(- · · ·
,					•	•		c) = (22b		5 × (23b)			
(24c)m=	<u> </u>	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous	e positiv	/e input '	ventilatio	on from l	oft				1	
,								0.5 + [(2		0.5]			_	
(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)	-			_	
(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
	IENT	Gros		Openin		Net Ar	ea	U-valı	re	AXU		k-value	e A	Xk
		area	(m²)	. m		A ,r	n²	W/m2	K	(W/I	<)	kJ/m²∙l	K k.	l/K
Windo	ws Type	e 1				6.79	x1	/[1/(1.4)+	0.04] =	9				(27)
Windo	ws Type	2				2	x1	/[1/(1.4)+	0.04] =	2.65				(27)
Windo	ws Type	93				2.05	x1	/[1/(1.4)+	0.04] =	2.72				(27)
Windo	ws Type	9 4				2.92	x1	/[1/(1.4)+	0.04] =	3.87				(27)
Windo	ws Type	e 5				1.77	x1	/[1/(1.4)+	0.04] =	2.35				(27)
Floor						12.77	6 X	0.13		1.66088	3			(28)
Walls		40.0	6	15.5	3	24.53	x	0.18	= [4.41	i T		\dashv	(29)
Total a	area of e	lements	, m²			52.83	3		I					(31)
* for win	ndows and	roof wind	ows, use e			alue calcul		g formula 1,	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	1 3.2	
				nternal wal	ls and par	titions		(00) (00)	. (22)				r	
	heat los		•	U)				(26)(30)		(2.2) (2.4			26.66	(33)
	apacity		. ,							.(30) + (32		(32e) =	1301.58	(34)
		•		^{>} = Cm ÷	,					tive Value:			250	(35)
	ign assess used instei				construct	ion are not	t known pr	recisely the	e indicative	values of	IMP in Ta	able 1t		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						2.64	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			29.31	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			i	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	40.08	39.84	39.6	38.49	38.28	37.31	37.31	37.13	37.68	38.28	38.7	39.14		(38)
Heat ti	ransfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	69.39	69.15	68.91	67.79	67.58	66.61	66.61	66.43	66.99	67.58	68.01	68.45		
										Average =	Sum(39)1	12 /12=	67.79	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		
Numbe	ar of day	s in mo	nth (Tab	le 12)	1	1			,	Average =	Sum(40)1	.12 /12=	0.86	(40)
Numbe	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)
								I						
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.	<u>2.</u> 9)	44		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.18		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for e	ach month	,		Table 1c x	-						
(44)m=	101.4	97.71	94.02	90.34	86.65	82.96	82.96	86.65	90.34	94.02	97.71	101.4		
											m(44) ₁₁₂ =		1106.17	(44)
Energy o	content of	hot water	used - ca	lculated m	onthly = 4.	190 x Vd,r	m x nm x L	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	150.37	131.52	135.71	118.32	113.53	97.97	90.78	104.17	105.42	122.85	134.1	145.63		_
lf instant	taneous w	ater heati	ng at poin	t of use (no	hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1450.36	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		1				1	1						
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-		ank in dw	-			. ,			47)			
	nse i no storage		not wate	er (this ir	iciudes i	nstantar	ieous co	ombi boil	ers) ente	er u in (47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):)		(48)
Tempe	erature f	actor fro	m Table	2b							()		(49)
Energy	/ lost fro	m water	. storage	e, kWh/ye	ear			(48) x (49)) =)		(50)
,				cylinder										
		-		rom Tabl	e 2 (kW	h/litre/da	ay)				(0		(51)
	•	eating s from Ta		011 4.5)		(52)
		actor fro		2b								у С		(53)
Energy	/ lost fro	m water	· storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =)		(54)
		(54) in (5	-	, ,								с С		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	nage, (57)	m = (56)m	x [(50) – ((5 [H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
		•				59)m = ((58) ÷ 30	65 × (41)	m					
(mod	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	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	loss ca	alculated	for eac	ch n	nonth (61)m =	(60)) ÷ 36	65 × (41)	m						_	
(61)m=	0	0	0		0	0		0	0	0		0	0	0	0		(61)
Total h	eat req	uired for	water	hea	ating ca	alculated	l fo	r eacl	n month	(62)m	ו = (0.85 × ((45)m +	- (46)m +	(57)m +	(59)m + (61)m	
(62)m=	127.82	111.79	115.36	; ,	100.57	96.5	8	3.27	77.16	88.5	5	89.6	104.42	113.99	123.78]	(62)
Solar DH	- W input	calculated	using Ap	pen	ndix G or	Appendix	Η ((negativ	ve quantity) (ente	r '0' i	if no sola	r contribu	ution to wate	er heating)	-	
(add a	dditiona	al lines if	FGHR	Sa	nd/or V	VWHRS	ap	plies,	, see Ap	pendi	x G)					
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0		(63)
Output	from w	ater hea	ter														
(64)m=	127.82	111.79	115.36	; ,	100.57	96.5	8	3.27	77.16	88.5	5	89.6	104.42	113.99	123.78]	
										С	utpu	ut from wa	ater heat	er (annual)	112	1232.81	(64)
Heat g	ains fro	m water	heating	g, k	Wh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m]	+0.8×	(46)n	n + (57)m	+ (59)m	n]	
(65)m=	31.95	27.95	28.84	Τ	25.14	24.12	2	0.82	19.29	22.14	4	22.4	26.11	28.5	30.95]	(65)
inclu	de (57)	m in calo	ulatior	n of	(65)m	only if c	ylir	nder is	s in the c	dwellir	ng c	or hot w	ater is	from com	munity ł	neating	
5. Int	ernal a	ains (see	e Table	5 a	and 5a):	-				-				-	-	
		ns (Table			ſ												
metab	Jan	Feb	Mar		Apr	May		Jun	Jul	Au	a	Sep	Oct	Nov	Dec]	
(66)m=	122.06	122.06	122.06		122.06	122.06	_	22.06	122.06	122.0	-	122.06	122.06		122.06	1	(66)
Liahtin	u a aains	(calcula	ted in A	- App	endix l	equat	ion	190	riga) a	lso se	e T	able 5				1	
(67)m=	19.76	17.55	14.27	<u> </u>	10.81	8.08		6.82	7.37	9.58	- 1	12.86	16.32	19.05	20.31	1	(67)
		ains (calc														J	
(68)m=	217.09	219.34	213.66	-	201.58	186.32		71.98	162.41	160.1		165.83	177.91	193.17	207.51	1	(68)
				_										100.17	207.01	1	(/
(69)m=	35.21	s (calcula 35.21	35.21	<u> </u>	35.21	L, equal 35.21	_	5.21	35.21	, also 35.2	_	35.21	35.21	35.21	35.21	1	(69)
						55.21	J	5.21	55.21	55.2	'	55.21	55.21	33.21	55.21	J	(00)
-		ins gains	r i i i i i i i i i i i i i i i i i i i	5a	-	0				-						1	(70)
(70)m=	0	0	0		0	0		0	0	0		0	0	0	0	J	(70)
		vaporatic	<u> </u>	-		, ,								-	r	1	
(71)m=	-97.65	-97.65	-97.65		-97.65	-97.65	-6	97.65	-97.65	-97.6	5	-97.65	-97.65	-97.65	-97.65	J	(71)
		ı gains (T	· · · · ·	<u></u>			_									1	
(72)m=	42.95	41.59	38.76		34.92	32.43	2	8.91	25.93	29.7		31.11	35.09	39.58	41.59		(72)
Total i	nterna	l gains =	:					(66)	m + (67)m	+ (68)	m +	(69)m + ((70)m + (71)m + (72))m	•	
(73)m=	339.42	338.1	326.32	2 (306.92	286.45	20	67.34	255.32	259.	1	269.42	288.95	311.42	329.03		(73)
	lar gain																
•			-	lar fl		Table 6a a	and			tions to	con	overt to th	e applica	able orienta	tion.		
Orienta		Access F Table 6d			Area m ²			Flu	x ole 6a			g_ able 6b	-	FF Fable 6c		Gains (W)	
				-	111-			- 1 ai			10					(**)	-
Northea	L	0.77		×Ĺ	2		x	1	1.28	×		0.63	X	0.7	=	6.9	(75)
Northea	L.	0.77		×Ĺ	2.0	5	x	1	1.28	x		0.63	×	0.7	=	7.07	(75)
Northea	ast <mark>0.9x</mark>	0.77		× [2.9	2	x	1	1.28	x		0.63	x	0.7	=	10.07	(75)
Northea	ast <mark>0.9</mark> x	0.77		× [1.7	7	x	1	1.28	x		0.63	x	0.7	=	6.1	(75)
Northea	ast <mark>0.9x</mark>	0.77		×	2		x	2	2.97	x		0.63	x	0.7	=	14.04	(75)

Northeast 0.9x 0.77 x 2.05 x 22.97 x 0.63 x 0.7 = Northeast 0.9x 0.77 x 2.92 x 22.97 x 0.63 x 0.7 =	14.39 (75) 20.5 (75)
	. ,
Northeast 0.9x 0.77 x 2.92 x 41.38 x 0.63 x 0.7 = Northeast 0.9x 0.77 x 1.77 x 41.38 x 0.63 x 0.7 =	36.93 (75) 22.38 (75)
Northeast $0.9x$ 0.77 x 2 x 67.96 x 0.63 x 0.7 =	41.54 (75)
Northeast 0.9x 0.77 x 2.05 x 67.96 x 0.63 x 0.7 =	42.57 (75)
Northeast 0.9x 0.77 x 2.03 x 07.96 x 0.63 x 0.7 =	60.64 (75)
Northeast 0.9x 0.77 x 1.77 x 67.96 x 0.63 x 0.7 =	36.76 (75)
Northeast $0.9x$ 0.77 x 2 x 91.35 x 0.63 x 0.7 =	55.83 (75)
Northeast 0.9x 0.77 x 2.05 x 91.35 x 0.63 x 0.7 =	57.23 (75)
Northeast 0.9x 0.77 x 2.92 x 91.35 x 0.63 x 0.7 =	81.52 (75)
Northeast 0.9x 0.77 x 1.77 x 91.35 x 0.63 x 0.7 =	49.41 (75)
Northeast 0.9x 0.77 x 2 x 97.38 x 0.63 x 0.77 =	59.52 (75)
Northeast 0.9x 0.77 x 2.05 x 97.38 x 0.63 x 0.77 =	61.01 (75)
Northeast 0.9x 0.77 x 2.92 x 97.38 x 0.63 x 0.77 =	86.9 (75)
Northeast 0.9x 0.77 x 1.77 x 97.38 x 0.63 x 0.77 =	52.68 (75)
Northeast 0.9x 0.77 x 2 x 91.1 x 0.63 x 0.77 =	55.68 (75)
Northeast 0.9x 0.77 x 2.05 x 91.1 x 0.63 x 0.7 =	57.08 (75)
Northeast 0.9x 0.77 x 2.92 x 91.1 x 0.63 x 0.7 =	81.3 (75)
Northeast 0.9x 0.77 x 1.77 x 91.1 x 0.63 x 0.7 =	49.28 (75)
Northeast 0.9x 0.77 x 2 x 72.63 x 0.63 x 0.77 =	44.39 (75)
Northeast 0.9x 0.77 x 2.05 x 72.63 x 0.63 x 0.7 =	45.5 (75)
Northeast 0.9x 0.77 x 2.92 x 72.63 x 0.63 x 0.7 =	64.81 (75)
Northeast 0.9x 0.77 x 1.77 x 72.63 x 0.63 x 0.7 =	39.29 (75)
Northeast 0.9x 0.77 x 2 x 50.42 x 0.63 x 0.7 =	30.82 (75)
Northeast 0.9x 0.77 x 2.05 x 50.42 x 0.63 x 0.7 =	31.59 (75)
Northeast 0.9x 0.77 x 2.92 x 50.42 x 0.63 x 0.7 =	44.99 (75)
Northeast 0.9x 0.77 x 1.77 x 50.42 x 0.63 x 0.7 =	27.27 (75)
Northeast 0.9x 0.77 x 2 x 28.07 x 0.63 x 0.77 =	17.16 (75)
Northeast 0.9x 0.77 x 2.05 x 28.07 x 0.63 x 0.7 =	17.58 (75)
Northeast 0.9x 0.77 x 2.92 x 28.07 x 0.63 x 0.7 =	25.05 (75)
Northeast 0.9x 0.77 x 1.77 x 28.07 x 0.63 x 0.7 =	15.18 (75)
Northeast 0.9x 0.77 x 2 x 14.2 x 0.63 x 0.77 =	8.68 (75)
Northeast 0.9x 0.77 x 2.05 x 14.2 x 0.63 x 0.7 =	8.89 (75)
Northeast 0.9x 0.77 x 2.92 x 14.2 x 0.63 x 0.7 =	12.67 (75)
Northeast 0.9x 0.77 x 1.77 x 14.2 x 0.63 x 0.7 =	7.68 (75)
Northeast 0.9x 0.77 x 2 x 9.21 x 0.63 x 0.7 =	5.63 (75)
Northeast 0.9x 0.77 x 2.05 x 9.21 x 0.63 x 0.7 =	5.77 (75)

Northeast 0.9x														
0.54	0.77	x	2.9	2	x	ę	9.21	x	0.63	x	0.7	=	8.22	(75)
Northeast 0.9x	0.77	x	1.7	7	x	ę	9.21) × [0.63	×	0.7	=	4.98	(75)
Southeast 0.9x	0.54	x	6.7	9	x	3	6.79) × [0.63	x	0.7	=	53.55	(77)
Southeast 0.9x	0.54	x	6.7	9	x	6	2.67	×	0.63	x	0.7	=	91.21	(77)
Southeast 0.9x	0.54	x	6.7	9	x	8	5.75) × [0.63	x	0.7	=	124.79	(77)
Southeast 0.9x	0.54	x	6.7	9	x	10	06.25) × [0.63	x	0.7	=	154.63	(77)
Southeast 0.9x	0.54	x	6.7	9	x	1.	19.01	×	0.63	x	0.7	=	173.19	(77)
Southeast 0.9x	0.54	x	6.7	9	x	1'	18.15) × [0.63	x	0.7	=	171.94	(77)
Southeast 0.9x	0.54	x	6.7	9	x	1.	13.91	×	0.63	x	0.7	=	165.77	(77)
Southeast 0.9x	0.54	x	6.7	9	x	1(04.39) × [0.63	×	0.7	=	151.92	(77)
Southeast 0.9x	0.54	x	6.7	9	x	9	2.85) × [0.63	×	0.7	=	135.12	(77)
Southeast 0.9x	0.54	x	6.7	9	x	6	9.27) × [0.63	×	0.7	=	100.8	(77)
Southeast 0.9x	0.54	x	6.7	9	x	4	4.07] × [0.63	×	0.7	=	64.13	(77)
Southeast 0.9x	0.54	x	6.7	9	x	3	1.49) × [0.63	×	0.7	=	45.82	(77)
Solar gains in	1 1			n month	-			(83)m :	= Sum(74)m .	(82)m			-	
(83)m= 83.68	152.55	235.32	336.14	417.18		32.06	409.11	345.9	91 269.8	175.77	102.06	70.44		(83)
Total gains –		r	. ,	. ,	Ţ								-	(0.4)
(84)m= 423.1	490.65	561.64	643.06	703.63	6	99.4	664.43	605.0	01 539.22	464.72	413.48	399.47		(84)
7. Mean inte	rnal temp	erature ((heating	seasor	า)									
Temperature	e during h	eating pe	eriods ir	the livi	ing	area f	from Tab	ble 9, i	Th1 (°C)				21	(85)
									()					`
Utilisation fa	<u> </u>	ains for li	iving are	a, h1,n	n (se	ee Ta	ble 9a)	1						
Utilisation fa	ctor for ga	ains for li Mar	ving are Apr	a, h1,n May	T	ee Ta Jun	ble 9a) Jul	Au		Oct	Nov	Dec		
	<u> </u>		. 1				,	Au 0.5		Oct 0.97	Nov 1	Dec 1		(86)
Jan	Feb 1	Mar 0.99	Apr 0.95	May 0.81		Jun 0.6	Jul 0.44	0.5	g Sep 0.79					
(86)m= 1	Feb 1	Mar 0.99	Apr 0.95	May 0.81	ollo	Jun 0.6	Jul 0.44	0.5	g Sep 0.79					
(86)m= 1 Mean interna	Feb 1 al tempera 20.22	Mar 0.99 ature in I 20.44	Apr 0.95 iving are 20.73	May 0.81 ea T1 (f 20.93	follo 2	Jun 0.6 w ste 20.99	Jul 0.44 ps 3 to 7 21	0.5 7 in Ta 21	g Sep 0.79 able 9c) 20.95	0.97	1	1		(86)
(86)m= 1 Mean interna (87)m= 20.08	Feb 1 al tempera 20.22	Mar 0.99 ature in I 20.44	Apr 0.95 iving are 20.73	May 0.81 ea T1 (f 20.93	follo 2 f dw	Jun 0.6 w ste 20.99	Jul 0.44 ps 3 to 7 21	0.5 7 in Ta 21	g Sep 0.79 able 9c) 20.95 Th2 (°C)	0.97	1	1		(86)
(86)m= 1 Mean interna (87)m= (87)m= 20.08 Temperature (88)m= (88)m= 20.18	Feb1al tempera20.22e during h20.19	Mar 0.99 ature in l 20.44 eating pe 20.19	Apr 0.95 iving are 20.73 eriods in 20.2	May 0.81 20.93 rest of 20.2	f dw	Jun 0.6 w ste 0.99 velling 0.21	Jul 0.44 ps 3 to 7 21 from Ta 20.21	0.5 7 in Ta 21 able 9, 20.2	g Sep 0.79 able 9c) 20.95 Th2 (°C)	0.97 20.69	1 20.33	1 20.06		(86) (87)
(86)m= Jan (86)m= 1 Mean interna (87)m= 20.08 Temperature	Feb1al tempera20.22e during h20.19	Mar 0.99 ature in l 20.44 eating pe 20.19	Apr 0.95 iving are 20.73 eriods in 20.2	May 0.81 20.93 rest of 20.2	follo 2 f dw 2 h2,	Jun 0.6 w ste 0.99 velling 0.21	Jul 0.44 ps 3 to 7 21 from Ta 20.21	0.5 7 in Ta 21 able 9, 20.2	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21	0.97 20.69	1 20.33	1 20.06		(86) (87)
$\begin{array}{ c c c }\hline & Jan \\ \hline & \\ (86)m= & 1 \\ \hline & \\ Mean interna \\ (87)m= & 20.08 \\ \hline & \\ Temperature \\ (88)m= & 20.18 \\ \hline & \\ Utilisation fa \\ (89)m= & 1 \\ \hline \end{array}$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93	May 0.81 ea T1 (f 20.93 n rest of 20.2 velling, 0.76	follo 2 dw 2 h2,	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21	0.97 20.69 20.2 0.96	1 20.33 20.2	1 20.06 20.2		(86) (87) (88)
$\begin{array}{c c} & Jan \\ \hline \\ (86)m= & 1 \\ \hline \\ Mean interna \\ (87)m= & 20.08 \\ \hline \\ Temperature \\ (88)m= & 20.18 \\ \hline \\ Utilisation fa \\ (89)m= & 1 \\ \hline \\ Mean interna \\ \hline \end{array}$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t	Apr 0.95 iving are 20.73 eriods ir 20.2 est of dv 0.93 he rest of	May 0.81 20.93 1 rest of 20.2 velling, 0.76 of dwell	follo 2 dw 2 h2, (Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36 ollow ste	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 1	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 0.72 2 0.72 3 7 in Tabl	0.97 20.69 20.2 0.96 e 9c)	1 20.33 20.2 1	1 20.06 20.2 1		(86) (87) (88) (89)
$\begin{array}{ c c c }\hline & Jan \\ \hline & \\ (86)m= & 1 \\ \hline & \\ Mean interna \\ (87)m= & 20.08 \\ \hline & \\ Temperature \\ (88)m= & 20.18 \\ \hline & \\ Utilisation fa \\ (89)m= & 1 \\ \hline \end{array}$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93	May 0.81 ea T1 (f 20.93 n rest of 20.2 velling, 0.76	follo 2 dw 2 h2, (Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 0.72 3 0.7	0.97 20.69 20.2 0.96 e 9c) 19.95	1 20.33 20.2 1 19.6	1 20.06 20.2 1 19.32		(86) (87) (88) (89) (90)
$\begin{array}{c c} & Jan \\ \hline \\ (86)m= & 1 \\ \hline \\ Mean internal \\ (87)m= & 20.08 \\ \hline \\ Temperature \\ (88)m= & 20.18 \\ \hline \\ (88)m= & 20.18 \\ \hline \\ Utilisation fa \\ (89)m= & 1 \\ \hline \\ Mean internal \\ (90)m= & 19.33 \\ \hline \end{array}$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera 19.48	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest of 19.99	May 0.81 20.93 rest of 20.2 welling, 0.76 of dwell 20.16	i 2 i dw i </td <td>Jun 0.6 w ste 0.99 relling 0.21 m (se 0.53 T2 (fo 20.21</td> <td>Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36 ollow ste 20.21</td> <td>0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 t 20.2</td> <td>g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 0.72 3 0.72 3 0.72 3 0.72 3 0.72 4 0.72 5 0.</td> <td>0.97 20.69 20.2 0.96 e 9c) 19.95</td> <td>1 20.33 20.2 1</td> <td>1 20.06 20.2 1 19.32</td> <td></td> <td>(86) (87) (88) (89)</td>	Jun 0.6 w ste 0.99 relling 0.21 m (se 0.53 T2 (fo 20.21	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36 ollow ste 20.21	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 t 20.2	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 0.72 3 0.72 3 0.72 3 0.72 3 0.72 4 0.72 5 0.	0.97 20.69 20.2 0.96 e 9c) 19.95	1 20.33 20.2 1	1 20.06 20.2 1 19.32		(86) (87) (88) (89)
$\begin{array}{c c} & Jan \\ \hline \\ (86)m= & 1 \\ \hline \\ Mean interna \\ (87)m= & 20.08 \\ \hline \\ Temperature \\ (88)m= & 20.18 \\ \hline \\ Utilisation fa \\ (89)m= & 1 \\ \hline \\ Mean interna \\ (90)m= & 19.33 \\ \hline \\ Mean interna \\ \hline \\ Mean interna \\ \hline \\ Mean interna \\ \hline \\ \end{array}$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera 19.48	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest of 19.99	May 0.81 20.93 1 rest of 20.2 velling, 0.76 of dwell 20.16 ole dwe	iollo 2 dw 2 h2, 1 ing 2 elling	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36 ollow ste 20.21 _A x T1	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 1 20.2 + (1 –	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 20.21 2 20.21 3 Th2 (°C) 2 20.21 4 Th2 (°C) 2 20.21 5 Th2 (°C) 4 Th2 (°C) 5 Th2 (°C) 6 Th2 (°C) 7 Th2 (°	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv	1 20.33 20.2 1 19.6 ing area ÷ (4	1 20.06 20.2 1 19.32 +) =		(86) (87) (88) (89) (90) (91)
$\begin{array}{c c} & Jan \\ \hline \\ (86)m= & 1 \\ \hline \\ Mean interna \\ (87)m= & 20.08 \\ \hline \\ Temperature \\ (88)m= & 20.18 \\ \hline \\ Utilisation fa \\ (89)m= & 1 \\ \hline \\ Mean interna \\ (90)m= & 19.33 \\ \hline \\ Mean interna \\ (92)m= & 19.61 \\ \hline \end{array}$	Feb 1 al temperation 20.22 ad temperation ctor for gate 1 al temperation 19.48 al temperation 19.75	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest of 19.99 r the wh 20.26	May 0.81 20.93 1 rest of 20.2 welling, 0.76 of dwell 20.16 ole dwe 20.44	iollo 2 dw 2 h2, 1 ling 2 elling	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36 ollow ste 20.21 A × T1 20.5	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 9a) 0.42 + (1 – 20.5	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 0.72 3 0.72 3 0.72 3 0.72 4 0.72 5 20.47	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22	1 20.33 20.2 1 19.6	1 20.06 20.2 1 19.32		(86) (87) (88) (89) (90)
$\begin{array}{c c} & Jan \\ \hline \\ (86)m= & 1 \\ \hline \\ Mean interna \\ (87)m= & 20.08 \\ \hline \\ Temperature \\ (88)m= & 20.18 \\ \hline \\ Utilisation fa \\ (89)m= & 1 \\ \hline \\ Mean interna \\ (90)m= & 19.33 \\ \hline \\ Mean interna \\ (92)m= & 19.61 \\ \hline \\ Apply adjust \\ \end{array}$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera 19.48 al tempera 19.75 ment to th	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7 ature (for 19.97 ne mean	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest 19.99 r the wh 20.26 internal	May 0.81 20.93 1 rest of 20.2 velling, 0.76 of dwell 20.16 of dwell 20.16 ole dwe 20.44 tempe	iollo 2 dw 2 dw 2 dw 2 c dw c dw	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5 ure fro	Jul 0.44 ps 3 to 7 21 from Ta 20.21 e Table 0.36 ollow ste 20.21 _A × T1 20.5 m Table	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 t 20.2 + (1 – 20.5 e 4e, w	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 20.21 2 20.21 3 7 in Tabl 2 20.19 f fLA) × T2 3 20.47 /here approx	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22 opriate	1 20.33 20.2 1 19.6 ing area ÷ (4 19.87	1 20.06 20.2 1 19.32 +) = 19.59		(86) (87) (88) (89) (90) (91) (92)
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera 19.48 al tempera 19.75 ment to th 19.75	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7 ature (for 19.97 ne mean 19.97	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest of 19.99 r the wh 20.26	May 0.81 20.93 1 rest of 20.2 welling, 0.76 of dwell 20.16 ole dwe 20.44	iollo 2 dw 2 dw 2 dw 2 c dw c dw	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5	Jul 0.44 ps 3 to 7 21 from Ta 20.21 ee Table 0.36 ollow ste 20.21 A × T1 20.5	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 9a) 0.42 + (1 – 20.5	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 20.21 2 20.21 3 7 in Tabl 2 20.19 f fLA) × T2 3 20.47 /here approx	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22	1 20.33 20.2 1 19.6 ing area ÷ (4	1 20.06 20.2 1 19.32 +) =		(86) (87) (88) (89) (90) (91)
$\begin{bmatrix} Jan \\ (86)m = 1 \\ 1 \\ Mean interna \\ (87)m = 20.08 \\ Temperature \\ (88)m = 20.18 \\ Utilisation fa \\ (89)m = 1 \\ Mean interna \\ (90)m = 19.33 \\ Mean interna \\ (90)m = 19.33 \\ Mean interna \\ (90)m = 19.61 \\ Apply adjust \\ (93)m = 19.61 \\ 8. Space heat \\ (93)m = 19.61 \\ 10000000000000000000000000000000000$	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera 19.48 al tempera 19.75 ment to th 19.75 ating required	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7 he mean 19.97 irement	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest of 19.99 r the wh 20.26 internal 20.26	May 0.81 20.93 0 rest of 20.2 velling, 0.76 of dwell 20.16 ole dwe 20.44 tempe 20.44	iollo 2 dw 2 dw 2 dw 2 c dw 2 c ling 2 ling 2 c ling ling 2 c ling 2 c ling ling ling ling ling ling ling ling	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5 ure fro 20.5	Jul 0.44 ps 3 to 7 21 from Ta 20.21 e Table 0.36 ollow ste 20.21 A × T1 20.5 m Table 20.5	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 1 20.2 + (1 – 20.5 4 4 e, w 20.5	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 20.21 2 20.21 2 20.21 2 20.21 4 0.72 5 0.72 5 0.72 6 0.72 1 0.72	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22 ppriate 20.22	1 20.33 20.2 1 19.6 ing area ÷ (4 19.87 19.87	1 20.06 20.2 1 19.32 1) = 19.59 19.59		(86) (87) (88) (89) (90) (91) (92)
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Feb 1 al tempera 20.22 during h 20.19 ctor for ga 1 al tempera 19.48 al tempera 19.75 ment to th 19.75 ating requ mean inte	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7 ature (for 19.97 ne mean 19.97 ne mean 19.97	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest 19.99 r the wh 20.26 internal 20.26	May 0.81 20.93 1 rest of 20.2 welling, 0.76 of dwell 20.16 ole dwe 20.44 tempe 20.44 tempe	iollo 2 dw 2 dw 2 dw 2 c dw 2 c ling 2 ling 2 c ling ling 2 c ling 2 c ling ling ling ling ling ling ling ling	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5 ure fro 20.5	Jul 0.44 ps 3 to 7 21 from Ta 20.21 e Table 0.36 ollow ste 20.21 A × T1 20.5 m Table 20.5	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 1 20.2 + (1 – 20.5 4 4 e, w 20.5	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 20.21 2 20.21 2 20.21 2 20.21 4 0.72 5 0.72 5 0.72 6 0.72 1 0.72	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22 ppriate 20.22	1 20.33 20.2 1 19.6 ing area ÷ (4 19.87 19.87	1 20.06 20.2 1 19.32 1) = 19.59 19.59		(86) (87) (88) (89) (90) (91) (92)
$\begin{bmatrix} Jan \\ (86)m = 1 \end{bmatrix}$ Mean internation (87)m = 20.08 Temperature (88)m = 20.18 Utilisation fa (89)m = 1 Mean internation (90)m = 19.33 Mean internation (90)m = 19.61 Apply adjust (93)m = 19.61 8. Space heat Set Ti to the	Feb 1 al tempera 20.22 during h 20.19 ctor for ga 1 al tempera 19.48 al tempera 19.75 ment to th 19.75 ating requ mean inte	Mar 0.99 ature in l 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7 ature (for 19.97 ne mean 19.97 ne mean 19.97	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest 19.99 r the wh 20.26 internal 20.26	May 0.81 20.93 1 rest of 20.2 welling, 0.76 of dwell 20.16 ole dwe 20.44 tempe 20.44 tempe	ing ing ing ing ing ing ing ing	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5 ure fro 20.5	Jul 0.44 ps 3 to 7 21 from Ta 20.21 e Table 0.36 ollow ste 20.21 A × T1 20.5 m Table 20.5	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 eps 3 1 20.2 + (1 – 20.5 4 4e, w 20.5	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 0.72 3 0.72 3 0.72 3 0.72 4 0.72 5 20.47 6 20.47 7 here approximately a series of the ser	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22 ppriate 20.22	1 20.33 20.2 1 19.6 ing area ÷ (4 19.87 19.87 (76)m and	1 20.06 20.2 1 19.32 1) = 19.59 19.59		(86) (87) (88) (89) (90) (91) (92)
$\begin{bmatrix} Jan \\ (86)m = 1 \\ 1 \\ Mean interna \\ (87)m = 20.08 \\ Temperature \\ (88)m = 20.18 \\ 0.08 \\ 1 \\ 1 \\ 0.08 $	Feb 1 al tempera 20.22 e during h 20.19 ctor for ga 1 al tempera 19.48 al tempera 19.75 ment to th 19.75 ating required n factor fo Feb	Mar 0.99 ature in I 20.44 eating pe 20.19 ains for r 0.98 ature in t 19.7 ature (for 19.97 ne mean 19.97 irement ernal ten r gains u Mar ains, hm:	Apr 0.95 iving are 20.73 eriods in 20.2 est of dv 0.93 he rest of 19.99 r the wh 20.26 internal 20.26 internal 20.26	May 0.81 20.93 1 rest of 20.2 welling, 0.76 of dwell 20.16 of dwell 20.44 temper 20.44 temper 20.44	ing ing ing ing ing ing ing ing	Jun 0.6 w ste 0.99 velling 0.21 m (se 0.53 T2 (fo 0.21 g) = fl 20.5 re fro 20.5 at ste	Jul 0.44 ps 3 to 7 21 from Ta 20.21 re Table 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.35 0.36 0.	0.5 7 in Ta 21 able 9, 20.2 9a) 0.42 9a) 0.42 9a) 0.42 9a) 0.42 9a) 0.42 20.5 4e, w 20.5	g Sep 0.79 able 9c) 20.95 Th2 (°C) 2 20.21 2 20.21 2 0.72 3 0.72 3 0.72 3 0.72 4 0.72 5 20.47 6 20.47 7 here approximately a series of the ser	0.97 20.69 20.2 0.96 e 9c) 19.95 LA = Liv 20.22 ppriate 20.22 t Ti,m=	1 20.33 20.2 1 19.6 ing area ÷ (4 19.87 19.87 (76)m and	1 20.06 20.2 1 19.32 19.59 19.59 19.59 d re-ca		(86) (87) (88) (89) (90) (91) (92)

0.78

0.56

0.39

0.45

0.75

0.96

1

1

0.93

(94)m=

1

0.99

0.98

(94)

Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m									
(95)m=	422.3	488.16	552.03	597.5	548.04	388.58	259.48	271.62	402.72	447.87	411.55	398.93		(95)
Month	nly aver	age exte	rnal tem	perature	from T	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 rat	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1061.99	1026.54	928.28	770.14	590.58	392.72	259.84	272.46	426.5	650.09	868.1	1053.42		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4	1)m			
(98)m=	475.93	361.79	279.93	124.3	31.65	0	0	0	0	150.45	328.72	486.93		
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	2239.71	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								28.39	(99)
8c. S	pace co	oling rec	luiremen	nt										
Calcu	lated fo	r June, J	luly and	August.	See Ta	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rat	e Lm (ca	lculated	using 25	5°C inter	rnal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	626.15	492.92	504.88	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.97	0.99	0.98	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	(101)m	1								
(102)m=	0	0	0	0	0	609.58	488	496.21	0	0	0	0		(102)
Gains	s (solar	gains ca	culated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	930.49	886.97	817.32	0	0	0	0		(103)
•						dwelling,	continue	ous (kW	(h) = 0.0	24 x [(10)3)m – (כ[102)m	x (41)m	
		zero if (104)m <	3 × (98)m o	231.05	296.83	238.91	0	0	0	0		
(104)m=	0	0	0	0	0	231.05	290.03	236.91	-	-	-		700 70	
Cooler	d fractio	n								= Sum(cooled	,	= 1) _	766.79 1	(104) (105)
		actor (Ta	able 10b)					10 -	coolea	area - (-	•) – I	1	(100)
(106)m=	<u> </u>		0	0	0	0.25	0.25	0.25	0	0	0	0		
									Tota	I = Sum((104)	=	0	(106)
Space	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)r	n		(I	-	
(107)m=	0	0	0	0	0	57.76	74.21	59.73	0	0	0	0		
									Total	= Sum(107)	=	191.7	(107)
Space	cooling	requirer	nent in k	Wh/m²/۱	/ear				(107)) ÷ (4) =			2.43	(108)
•		rgy Effici				ider spec	cial cond	litions, se	. ,	.,		l		
Fabri	c Energ	y Efficier	псу						(99)	+ (108) =	=		30.82	(109)
Targe	et Fabri	c Energ	v Efficie	ency (TF	EE)							l	35.45	(109)
9.		9	,		,							l		

			User D	Details:						
Assessor Name: Software Name:	Ross Boult Stroma FS	-		Strom Softwa					028068 on: 1.0.4.18	
			Property	Address	: B1M-1(02-01				
Address :		, Flat Type 1-	19B, Wim	bledon, L	ondon					
1. Overall dwelling dimer	nsions:			()						
Ground floor				a(m²) 78.88	(1a) x	Av. He	2.6	(2a) =	Volume(m ³) 205.09	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 7	78.88	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	205.09	(5)
2. Ventilation rate:	_			4					<u> </u>	
Number of chimneys	main heating	second heating + 0	ary 3 +	other 0] = [total	X 4	40 =	m ³ per hour	(6a)
Number of open flues	0	+ 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	IS					3	x ′	10 =	30	(7a)
Number of passive vents						0	x /	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
					L			Air ch	anges per ho	
Lefflore Constant and the second	. ()		· (7 -) · (7 -) · ((7 -)	-					-
Infiltration due to chimney If a pressurisation test has be					continue fr	30 om (9) to (÷ (5) =	0.15	(8)
Number of storeys in th						(0) (0)	,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	esent, use the va gs); if equal user	lue corresponding 0.35	to the great	ter wall are	a (after	uction			0	(11)
If suspended wooden fl			0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows Window infiltration	and doors dra	aught stripped		0.25 - [0.2	x (14) - 1	001 =			0	(14)
Infiltration rate				(8) + (10)		-	+ (15) =		0	(15) (16)
Air permeability value, o	50. expresse	d in cubic met	res per ho					area	5	(17)
If based on air permeabilit							•		0.4	(18)
Air permeability value applies	if a pressurisatio	on test has been c	lone or a de	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered	ł			(20) - 1	[0 075 v (1	0)1			2	(19)
Shelter factor	na oboltor foo	tor		(20) = 1 - (21) = (18)		9)] =			0.85	(20)
Infiltration rate incorporati	-			(21) = (10))				0.34	(21)
Infiltration rate modified fo	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
	i · _i	÷ 1		I Aug	000				I	
Monthly average wind spectrum (22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
				1			I	I	l	
Wind Factor (22a)m = (22)m ÷ 4								1	
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m			-	_	
	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	-			-		- 	
				endix N, (2	(23a) – (23a	a) v Emv (e	acuation (N	(15)) other	wice (23h) - (232)			0	(23a)
				ciency in %) – (200)			0	(23b)
			-	-	-					2 -)	001-)	(00 s)	0	(23c)
a) II (24a)m=	r			entilation				TR) (248	0 m = (22)	20)m + (. 0	23D) × [1 - (230)) ÷ 100]]	(24a)
		-		-	-	-		-	-	-	ů	0	J	(240)
,			1	entilation	1		, <u>, ,</u>	r , ,	, <u>,</u>	r í	, <u> </u>		1	(24b)
(24b)m=		0	0		0	0	0	0	0	0	0	0		(240)
,				ntilation of the	•	•				5 v (23h				
(24c)m=	<u>, , , , , , , , , , , , , , , , , , , </u>		0		$\frac{3}{0} = (200)$			$\frac{0}{0} = \frac{221}{0}$	0	0	0	0	1	(24c)
		-	÷	l ° Iole hous	÷	÷		·	-	Ŭ	Ū	Ů	J	()
,)m = (22						0.5]				
(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(24d)
Effe	ctive air	change	rate - ei	nter (24a) or (24t	o) or (24	c) or (24	d) in box	(25)				1	
(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(25)
0.11.							1	1				1	1	
				paramet		Not An		11					- ^	V I.
ELEN	/IEN I	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·l		X k /K
Windo	ws Type	e 1				6.79	×1/	[1/(1.35)+	- 0.04] =	8.7				(27)
Windo	ws Type	2				2		[1/(1.35)+	- 0.04] =	2.56				(27)
	ws Type					2.05		[1/(1.35)+	- 0.04] =	2.63	\exists			(27)
	ws Type					2.92		[1/(1.35)+	L I	3.74	=			(27)
	ws Type					1.77	=	[1/(1.35)+	- L	2.27				(27)
Floor	wo rype	,0						r						`
						12.77		0.13		1.66088				(28)
Walls		40.0		15.5	3	24.53	3 ×	0.15	=	3.68				(29)
		elements				52.83			<i></i>					(31)
				effective wi nternal wal			ated using	tormula 1,	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	1 3.2	
		s, W/K :						(26)(30)	+ (32) =				25.23	(33)
		Cm = S(•	,					((28)	(30) + (32	2) + (32a).	(32e) =	1301.58	(34)
			. ,	P = Cm +	- TFA) ir	ו kJ/m²K			Indica	tive Value:	: Low		100	(35)
		•	•	etails of the				ecisely the	indicative	values of	TMP in Ta	able 1f		()
can be ι	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) ca	culated	using Ap	pendix ł	K						7.92	(36)
			are not kr	10wn (36) =	= 0.05 x (3	1)			(00)	(00)				—
	abric he									(36) =			33.16	(37)
Ventila		i	i	d monthly	í					= 0.33 × (1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	40.08	39.84	39.6	38.49	38.28	37.31	37.31	37.13	37.68	38.28	38.7	39.14	J	(38)
	r	coefficier	· · · · · · · · · · · · · · · · · · ·						· ,	= (37) + (3	·		1	
(39)m=	73.24	73	72.76	71.64	71.43	70.46	70.46	70.28	70.84	71.43	71.86	72.3		
										Average =	Sum(39)1	₁₂ /12=	71.64	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.93	0.93	0.92	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.91	0.92		
Numbe	ar of day	/s in mo	nth (Tab	le 1a)				•	,	Average =	Sum(40) ₁ .	12 /12=	0.91	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum	ed occu	ipancy,	N								2.	44		(42)
	A > 13. A £ 13.		+ 1.76 x	: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
			ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		92	.18		(43)
Reduce	the annua	al average	hot water	usage by		welling is	designed	to achieve		se target o				. ,
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea		Vd,m = fa	ctor from	Table 1c x	-						
(44)m=	101.4	97.71	94.02	90.34	86.65	82.96	82.96	86.65	90.34	94.02	97.71	101.4		
F						100					m(44) ₁₁₂ =		1106.17	(44)
					-			OTm / 3600		·			I	
(45)m=	150.37	131.52	135.71	118.32	113.53	97.97	90.78	104.17	105.42	122.85	134.1	145.63	4 4 5 0 0 0	
lf instant	taneous v	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1450.36	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
· · ·	storage	loss:	[Į	[[1	ļ	I	1				
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
		-			/elling, e			. ,						
	ise if no storage		hot wate	er (this ir	ICLUDES I	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
		actor fro				,	• •					0		(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =			0		(50)
				•	loss fact									
		age loss neating s			le 2 (kW	h/litre/da	ay)					0		(51)
	•	from Ta		011 4.5								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	55)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
	•						. ,	65 × (41)						
•		· · · · · ·	· · · · · ·	I	· · · · · ·	· · · · · ·		ng and a	· ·	· · · · · ·	, 	_	I	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for ea	ch	month ((61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacł	h month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	127.82	111.79	115.3	6	100.57	96.5	8	3.27	77.16	88.55	89.6	104.42	113.99	123.78		(62)
Solar DH	-IW input	calculated	using A	ppe	endix G or	Appendix	:Н(negativ	ve quantity) (enter '	0' if no sola	r contribu	tion to wate	er heating)	•	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ар	plies,	, see Ap	pendix	G)				_	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter													
(64)m=	127.82	111.79	115.3	6	100.57	96.5	8	3.27	77.16	88.55	89.6	104.42	113.99	123.78		
										Ou	put from w	ater heate	er (annual)	12	1232.81	(64)
Heat g	ains fro	m water	heatin	ıg,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	n] + 0.8 x	x [(46)m	ı + (57)m	+ (59)m]	
(65)m=	31.95	27.95	28.84	ı	25.14	24.12	2	0.82	19.29	22.14	22.4	26.11	28.5	30.95		(65)
inclu	de (57)	m in calo	ulatio	n o	f (65)m	only if c	ylin	nder is	s in the c	dwelling	or hot w	vater is f	rom com	munity h	eating	
5. Int	ernal g	ains (see	e Table	2 5	and 5a):				-					, i i i i i i i i i i i i i i i i i i i	
	Ŭ															
Melabo	Jan Jan	ns (Table Feb	, 5), W Ma		S Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
(66)m=	122.06	122.06	122.0	-	122.06	122.06		22.06	122.06	122.06	122.06	122.06	122.06	122.06		(66)
		(calcula													i	
(67)m=	9 9anis 19.44	17.26	14.04	<u> </u>	10.63	2, equat	<u> </u>	6.71	∟9a), a 7.25	9.42	12.64	16.05	18.74	19.98	1	(67)
													10.74	10.00	l	(0.)
		<u>,</u>	r	-			r			·		r —	402.47	007.54	1	(69)
(68)m=	217.09	219.34	213.6	_	201.58	186.32		71.98	162.41	160.15	165.83	177.91	193.17	207.51	İ	(68)
		<u> </u>		-i							ee Table	I			1	(00)
(69)m=	35.21	35.21	35.21		35.21	35.21	3	5.21	35.21	35.21	35.21	35.21	35.21	35.21	l	(69)
Pumps	and fa	ns gains	(Table	e 5a	a)										1	
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0	j	(70)
Losses	s e.g. ev	/aporatic	on (neg	gati	ve valu	es) (Tab	le t	5)						-		
(71)m=	-97.65	-97.65	-97.6	5	-97.65	-97.65	-9	97.65	-97.65	-97.65	-97.65	-97.65	-97.65	-97.65		(71)
Water	heating	gains (T	able 5	5)									-	-	_	
(72)m=	42.95	41.59	38.76	3	34.92	32.43	2	8.91	25.93	29.75	31.11	35.09	39.58	41.59		(72)
Total i	nternal	gains =						(66)	m + (67)m	ı + (68)m	+ (69)m +	(70)m + (71)m + (72))m		
(73)m=	339.09	337.81	326.0	8	306.74	286.31	26	67.22	255.2	258.95	269.21	288.68	311.11	328.7		(73)
6. Sol	ar gain	s:	•													
Solar g	ains are	calculated	using so	olar	flux from	Table 6a	and	associ	ated equa	tions to c	onvert to th	ne applica	ble orientat	tion.		
Orienta		Access F			Area			Flu			g_	_	FF		Gains	
		Table 6d			m²			Tat	ole 6a		Table 6b	T	able 6c		(W)	
Northea	ast <mark>0.9x</mark>	0.77		x	2		× [1	1.28	x	0.5	x	0.8	=	6.26	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	2.0)5	× [1	1.28	x	0.5	x	0.8	=	6.41	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	2.9	92	× [1	1.28	x	0.5	×	0.8	=	9.13	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	1.7	7	× [1	1.28	x	0.5	× [0.8	=	5.54	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	2		×	2	2.97	x	0.5	× [0.8	=	12.73	(75)

Northeast 0.9x	0.77	x	2.05	x	22.97	×	0.5	x	0.8	=	13.05	(75)
Northeast 0.9x	0.77	x	2.92	x	22.97	×	0.5	x	0.8	=	18.59	(75)
Northeast 0.9x	0.77	x	1.77	x	22.97	×	0.5	x	0.8	=	11.27	(75)
Northeast 0.9x	0.77	x	2	x	41.38	×	0.5	x	0.8	=	22.94	(75)
Northeast 0.9x	0.77	x	2.05	x	41.38	×	0.5	x	0.8	=	23.51	(75)
Northeast 0.9x	0.77	x	2.92	x	41.38	x	0.5	x	0.8	=	33.49	(75)
Northeast 0.9x	0.77	x	1.77	×	41.38	×	0.5	x	0.8	=	20.3	(75)
Northeast 0.9x	0.77	x	2	x	67.96	×	0.5	x	0.8	=	37.67	(75)
Northeast 0.9x	0.77	x	2.05	x	67.96	x	0.5	x	0.8	=	38.62	(75)
Northeast 0.9x	0.77	x	2.92	×	67.96	×	0.5	x	0.8	=	55.01	(75)
Northeast 0.9x	0.77	x	1.77	×	67.96	×	0.5	x	0.8	=	33.34	(75)
Northeast 0.9x	0.77	x	2	x	91.35	×	0.5	x	0.8	=	50.64	(75)
Northeast 0.9x	0.77	x	2.05	x	91.35	×	0.5	x	0.8	=	51.91	(75)
Northeast 0.9x	0.77	x	2.92	x	91.35	x	0.5	x	0.8	=	73.94	(75)
Northeast 0.9x	0.77	x	1.77	x	91.35	x	0.5	x	0.8	=	44.82	(75)
Northeast 0.9x	0.77	x	2	x	97.38	x	0.5	x	0.8	=	53.99	(75)
Northeast 0.9x	0.77	x	2.05	x	97.38	×	0.5	x	0.8	=	55.34	(75)
Northeast 0.9x	0.77	x	2.92	x	97.38	×	0.5	x	0.8	=	78.83	(75)
Northeast 0.9x	0.77	x	1.77	x	97.38	×	0.5	x	0.8	=	47.78	(75)
Northeast 0.9x	0.77	x	2	x	91.1	×	0.5	x	0.8	=	50.51	(75)
Northeast 0.9x	0.77	x	2.05	x	91.1	x	0.5	x	0.8	=	51.77	(75)
Northeast 0.9x	0.77	x	2.92	x	91.1	x	0.5	x	0.8	=	73.74	(75)
Northeast 0.9x	0.77	x	1.77	x	91.1	×	0.5	x	0.8	=	44.7	(75)
Northeast 0.9x	0.77	x	2	×	72.63	x	0.5	x	0.8	=	40.26	(75)
Northeast 0.9x	0.77	x	2.05	x	72.63	x	0.5	x	0.8	=	41.27	(75)
Northeast 0.9x	0.77	x	2.92	x	72.63	×	0.5	x	0.8	=	58.79	(75)
Northeast 0.9x	0.77	x	1.77	x	72.63	×	0.5	x	0.8	=	35.63	(75)
Northeast 0.9x	0.77	x	2	x	50.42	×	0.5	x	0.8	=	27.95	(75)
Northeast 0.9x	0.77	×	2.05	x	50.42	×	0.5	x	0.8	=	28.65	(75)
Northeast 0.9x	0.77	x	2.92	X	50.42	×	0.5	x	0.8	=	40.81	(75)
Northeast 0.9x	0.77	x	1.77	X	50.42	×	0.5	x	0.8	=	24.74	(75)
Northeast 0.9x	0.77	x	2	×	28.07	×	0.5	x	0.8	=	15.56	(75)
Northeast 0.9x	0.77	X	2.05	X	28.07	X	0.5	x	0.8	=	15.95	(75)
Northeast 0.9x	0.77	X	2.92	X	28.07	×	0.5	x	0.8	=	22.72	(75)
Northeast 0.9x	0.77	X	1.77	X	28.07	X	0.5	x	0.8	=	13.77	(75)
Northeast 0.9x	0.77	X	2	X	14.2	×	0.5	x	0.8	=	7.87	(75)
Northeast 0.9x	0.77	×	2.05	×	14.2	X	0.5	x	0.8	=	8.07	(75)
Northeast 0.9x	0.77	×	2.92	X	14.2	X	0.5	x	0.8	=	11.49	(75)
Northeast 0.9x	0.77	X	1.77	×	14.2	X	0.5	x	0.8	=	6.97	(75)
Northeast 0.9x	0.77	X	2	×	9.21	X	0.5	x	0.8	=	5.11	(75)
Northeast 0.9x	0.77	×	2.05	X	9.21	×	0.5	x	0.8	=	5.24	(75)

Northeast C	0.9x 0.77	x	2.9	2	x	9	9.21	x	C	.5	x	0.8	=	7.46	(75)
Northeast C	0.9x 0.77	x	1.7	7	x	9	9.21	x	C	.5	x	0.8	=	4.52	(75)
Southeast 0	0.9x 0.54	x	6.7	9	x	3	6.79	x	C	.5	x	0.8	=	48.57	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	6	2.67	x	C	.5	x	0.8	=	82.73	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	8	5.75	x	C	.5	x	0.8	=	113.19	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	10	06.25	x	C	.5	×	0.8	=	140.25	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	1	19.01	x	C	.5	×	0.8	=	157.09	(77)
Southeast c	0.9x 0.54	x	6.7	9	x	1	18.15	x	C	.5	×	0.8	=	155.96	(77)
Southeast c	0.9x 0.54	x	6.7	9	x	1	13.91	x	C	.5	×	0.8	=	150.36	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	10	04.39	x	C	.5	×	0.8	= =	137.79	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	9	2.85	x	C	.5		0.8	=	122.56	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	6	9.27	x	C	.5		0.8	=	91.43	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	4	4.07	x	C	.5		0.8	=	58.17	(77)
Southeast 0	0.9x 0.54	x	6.7	9	x	3	31.49	x	C	.5		0.8	=	41.56	(77)
Solar gain	s in watts, ca	lculated	for each	n month	า			(83)m	= Sum	(74)m	(82)m				
, The second sec	5.9 138.37	213.44	304.89	378.4	-	91.89	371.07	313.		44.72	159.43	92.57	63.89	7	(83)
· · /	s – internal a														
	4.99 476.18	539.52	611.63	664.71	<u>,</u>	, 59.12	626.27	572.	.69 5	13.92	448.11	403.67	392.58	7	(84)
7 Mooni	Internel temp	oroturo (booting	00000	-			ļ				-			
	internal temp		Ŭ		<i>.</i>		(Th 4 (• • •					
•	ture during h	• •			-			bie 9,	ini (-C)				21	(85)
Utilisatior	n factor for ga	ains for li	ving are	ea, h1,m	<u>1 (s</u>	ee Ta	ble 9a)							-	
J	an Feb	Mar	Apr	May		Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(86)m= 0.	97 0.96	0.93	0.86	0.75		0.6	0.46	0.5	2 (0.73	0.9	0.96	0.98		(86)
Mean inte	ernal tempera	ature in l	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	' in T	able 9	c)					
	.99 19.24	19.64	20.16	20.59	1	20.86	20.95	20.9		0.72	20.16	19.49	18.95	7	(87)
	I						((***)					
· · · · · · · · · · · · · · · · · · ·	ture during h	20.15	20.16	20.16	-	20.17	20.17	20.		(10)	20.16	20.16	20.15	7	(88)
					-				10 2	.0.17	20.10	20.10	20.15		(00)
Utilisatior	n factor for ga	ains for r	est of dy	welling,	h2,	,m (se	e Table	9a)				-		_	
(89)m= 0.	97 0.95	0.92	0.85	0.72	(0.54	0.39	0.4	4 (0.68	0.88	0.95	0.97		(89)
Mean inte	ernal tempera	ature in t	he rest	of dwell	ling	T2 (f	ollow ste	eps 3	to 7 ir	n Table	e 9c)				
(90)m= 18	.28 18.53	18.93	19.44	19.84	2	20.08	20.15	20. ⁻	14 1	9.97	19.45	18.79	18.25	7	(90)
		I	I		-					fl	LA = Liv	ing area ÷ (4	4) =	0.36	(91)
•• • •	1.4) (· · · ·		d A \	To]
	ernal tempera	<u> </u>			-		r	<u> </u>	<u> </u>					7	
	.54 18.79	19.19	19.71	20.12		20.37	20.44	20.4		0.25	19.71	19.05	18.51		(92)
	ustment to th	i	1		-		i			<u> </u>	•			-	
(93)m= 18	.54 18.79	19.19	19.71	20.12	2	20.37	20.44	20.4	43 2	0.25	19.71	19.05	18.51		(93)
8. Space	heating requ	iirement													
0 · · · T' · ·	4						on 11 of	Tobl			ь т :	(76) m on		aulata	
	the mean inte				nea	alsie	-p ii u	Iapi	e 90, s	so that	t 11,m=	(76)m an	d re-ca	iculate	
	ation factor fo				nea						t 11,m=	:(70)m an	d re-cal		
the utilisa					-	Jun	Jul	A		Sep	Oct	Nov	d re-cal	-	
the utilisa	ation factor fo	or gains u Mar	ising Ta Apr	ble 9a	-		r							-	

				-									_
(94)m=	0.96	0.94	0.91	0.83	0.71	0.55	0.41	0.46	0.69	0.87	0.94	0.97	(94)
													•

Useful ga	ins, hmGm	, W = (94	4)m x (84	4)m									
(95)m= 398	.77 448.69	489.09	509.45	474.51	365.33	258.68	265.85	353.73	390.6	380.9	379.26		(95)
Monthly a	verage exte	ernal tem	iperature	e 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= 1043	3.05 1013.62	923.11	774.24	601.32	406.25	270.76	283.21	435.44	650.84	858.49	1034.47		(97)
Space he	ating requir	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 479	.35 379.64	322.91	190.64	94.34	0	0	0	0	193.62	343.86	487.48		
	-						Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	2491.85	(98)
Space he	ating requir	ement in	kWh/m²	/year								31.59	(99)
8c. Space	cooling red	quiremer	nt										
Calculate	d for June,	July and	August.	See Tal	ble 10b								
Ja	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss	rate Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m= () 0	0	0	0	662.34	521.41	534.14	0	0	0	0		(100)
Utilisation	factor for lo	oss hm		-				-		-			
(101)m= () 0	0	0	0	0.85	0.9	0.87	0	0	0	0		(101)
Useful los	s, hmLm (V	Vatts) = ((100)m x	(101)m				-		-			
(102)m= () 0	0	0	0	562.82	468.12	466.98	0	0	0	0		(102)
Gains (so	lar gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		-			
(103)m= () 0	0	0	0	881.22	840.24	777.54	0	0	0	0		(103)
•	oling require n to zero if				lwelling,	continue	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m	
(104)m= (0	0	0	229.25	276.86	231.05	0	0	0	0		
	I							Total	= Sum(104)	=	737.15	(104)
Cooled fra	ction							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermitten	cy factor (T	able 10b)										
(106)m= () 0	0	0	0	0.25	0.25	0.25	0	0	0	0		
								Tota	l = Sum((104)	=	0	(106)
· ·	ling require	ment for	month =	(104)m	<u>`</u>	× (106)r	n			-			_
(107)m= () 0	0	0	0	57.31	69.21	57.76	0	0	0	0		_
								Total	= Sum(107)	=	184.29	(107)
Space coo	ling require	ment in k	kWh/m²/y	/ear				(107)) ÷ (4) =			2.34	(108)
8f. Fabric B	Energy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric En	ergy Efficie	ncy						(99) -	+ (108) =	=		33.93	(109)

			User D	etails:						
Assessor Name: Software Name:	Ross Boult Stroma FS			Stroma Softwa					028068 on: 1.0.4.18	
			Property			02-01				
Address :		, Flat Type 1	-19B, Wim	bledon, L	ondon					
1. Overall dwelling dimer	isions:		_	()						
Ground floor				a(m²) ′8.88	(1a) x	Av. He i	ight(m) 6	(2a) =	Volume(m³) 205.09	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+	(1n) 7	'8.88	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	205.09	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main heating	second heatin + 0 + 0		0 0] = [total 0 0		40 = 20 =	m ³ per hour](6a)](6b)
Number of intermittent fan				-		0	× ^	10 =	-](7a)
	5							10 =	0]
Number of passive vents						0			0	(7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney. If a pressurisation test has be					continue fro	0 om (9) to (÷ (5) =	0	(8)
Number of storeys in the						- (-) - (-7		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	esent, use the val gs); if equal user	ue correspondin 0.35	g to the great	er wall are	a (after	uction			0](11)
If suspended wooden flo			r 0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente			al						0	(13)
Percentage of windows Window infiltration	and doors dra	aught strippe	u	0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15) (16)
Air permeability value, c	150. expresse	d in cubic me	etres per ho					area	0	(17)
If based on air permeabilit			•						0.25	(18)
Air permeability value applies	if a pressurisatio	n test has been	done or a de	gree air pei	rmeability	is being us	sed			
Number of sides sheltered	1								2	(19)
Shelter factor				(20) = 1 -		9)] =			0.85	(20)
Infiltration rate incorporation	•			(21) = (18)) x (20) =				0.21	(21)
Infiltration rate modified fo		· · ·							I	
	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe				1					I	
(22)m= 5.1 5 4	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.9	5 0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m			-	_	
	0.27	0.27	0.26	0.23	0.23	0.2	0.2	0.2	0.21	0.23	0.24	0.25		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							(23a)
				endix N, (2	3h) - (23a	a) x Emv (e	equation (N	(15)) other	wise (23h) – (23a)			0.5	
			• • • •	iency in %	, ,	, ,) = (200)			0.5	(23b)
			-	-	-))))))	00h) [/	1 (00a)	73.95	(23c)
a) II (24a)m=	r		0.39	ontilation	0.36	0.33		1R) (24a	0.34	20)m + (. 0.36	230) × [0.37	0.38) ÷ 100]]	(24a)
												0.30	J	(240)
,			· · · · · ·	entilation			, <u> </u>	r í	, <u>,</u>	, ,	,		1	(24b)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0	J	(240)
,				ntilation o then (24o	•	•				5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (221	•	•				0.51				
(24d)m=	<u> </u>						0			0.0	0	0	1	(24d)
		-		nter (24a		-		_		Ů	<u> </u>	Ů	J	~ /
(25)m=	0.4	0.4	0.39	0.36	0.36	0.33	0.33	0.33	0.34	0.36	0.37	0.38	1	(25)
(20)	0.1	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00		()
3. He	at losse	s and he	eat loss	paramete	ər:									
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-valu∉ kJ/m²⋅l		X k /K
Windo	ws Type	e 1				6.79	/ ا ک	[1/(1.35)+	- 0.04] =	8.7				(27)
Windo	ws Type	2				2	×1/	[1/(1.35)+	- 0.04] =	2.56				(27)
Windo	ws Type	e 3				2.05		[1/(1.35)+	- 0.04] =	2.63	=			(27)
Windo	ws Type	e 4				2.92		[1/(1.35)+	- 0.04] =	3.74				(27)
Windo	ws Type	e 5				1.77		[1/(1.35)+	- 0.04] =	2.27	=			(27)
Floor						12.77	6 x	0.13		1.66088	 [(28)
Walls		40.0	16	15.5	3	24.53		0.15		3.68			\dashv	(29)
	area of e	elements		10.0	3			0.15	[5.00	L			
* for win	ndows and	roof wind	ows, use e	effective wi				formula 1,	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	(31)
		as on both ss, W/K :		nternal wal	is and part	titions		(26)(30)	+ (32) -				05.00	
		Cm = S(•	0)				(20)(00)		(20) + (2)	2) L (22a)	(220) -	25.23	(33)
			,			1/m21/				.(30) + (32		(32e) =	1301.58	(34)
		•	•	= Cm ÷				onicoly the		tive Value:		oblo 1f	100	(35)
	•	ad of a de			construct	ion ale noi	t known pr	ecisely life	: Indicative	values of				
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						7.92	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			33.16	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y		·		(38)m	= 0.33 × (25)m x (5)	•	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	27.15	26.79	26.43	24.64	24.28	22.48	22.48	22.12	23.2	24.28	25	25.71]	(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	60.31	59.95	59.59	57.79	57.43	55.63	55.63	55.27	56.35	57.43	58.15	58.87		_
										Average =	Sum(39)1	12 /12=	57.7	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.76	0.76	0.76	0.73	0.73	0.71	0.71	0.7	0.71	0.73	0.74	0.75		
Numb			nth (Tab					I	,	Average =	Sum(40)1.	12 /12=	0.73	(40)
NUMBE	Jan	Feb	nth (Tab 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)
(,	01	20			01	00				01		01		(,
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		44		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.18		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					l	
(44)m=	101.4	97.71	94.02	90.34	86.65	82.96	82.96	86.65	90.34	94.02	97.71	101.4		
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1106.17	(44)
(45)m=	150.37	131.52	135.71	118.32	113.53	97.97	90.78	104.17	105.42	122.85	134.1	145.63		
If in a take								haven (40		Total = Su	m(45) ₁₁₂ =		1450.36	(45)
		i	· ·					boxes (46	, , , 				I	(40)
(46)m= Water	22.56 storage	19.73 IOSS:	20.36	17.75	17.03	14.69	13.62	15.63	15.81	18.43	20.12	21.84		(46)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110) litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
			m Table				"day).					0		(40)
•				, kWh/ye	ear			(48) x (49)) =			10		(50)
			-	cylinder		or is not		(-/ (-)	, ,		L '	10		(00)
		-		rom Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
		leating s from Ta	ee secti	on 4.3								00		(52)
			m Table	2b								03 .6		(52) (53)
				e, kWh/ye	ear			(47) x (51)) x (52) x (53) =				(54)
•••		(54) in (5	-	,	Jul			() (0	, ~ (0_) ~ (,		03 03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (L H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (. ,	65 × (41)						
		1	· · · · · ·	r	i	1	i	ng and a	· ·	i	, 		I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)m + (45)m + (57)m + (59)m + (61)m$ (62)m 203.65 181.44 190.99 171.81 188.81 151.46 146.06 199.45 158.91 178.13 187.6 200.9 (62) Solar DEW hput calculated using Appendix G or Appendix H (negative quantity) (netter U if no solar contribution to water heating) (63)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Combi	loss ca	lculated	for eac	h mont	n (61)m =	(60	D) ÷ 30	65 × (41))m					_		
(62)m 205.85 181.44 190.99 171.81 188.81 151.46 148.08 158.81 178.13 187.6 200.9 (62) Salar DHW mput calculated using Appendix G or Appendix H (engative quantity) (enter V if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63) Gam 0 <	(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63) (63) 0	Total h	eat req	uired for	water h	neating	calculate	d fo	or eac	h month	(62)m	= 0.85 ×	(45)m +	- (46)m +	(57)m +	(59)m + (61)m		
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63) (64)m= 0 <td< td=""><td>(62)m=</td><td>205.65</td><td>181.44</td><td>190.99</td><td>171.8</td><td>1 168.81</td><td>1</td><td>51.46</td><td>146.06</td><td>159.45</td><td>158.91</td><td>178.13</td><td>187.6</td><td>200.9</td><td></td><td>(62)</td></td<>	(62)m=	205.65	181.44	190.99	171.8	1 168.81	1	51.46	146.06	159.45	158.91	178.13	187.6	200.9		(62)	
(63)m: 0 <td>Solar DH</td> <td>IW input</td> <td>calculated</td> <td>using Ap</td> <td>pendix G</td> <td>or Appendi</td> <td>хH</td> <td>(negati</td> <td>ve quantity</td> <td>v) (enter</td> <td>0' if no sola</td> <td>r contribu</td> <td>ution to wate</td> <td>er heating)</td> <td>-</td> <td></td>	Solar DH	IW input	calculated	using Ap	pendix G	or Appendi	хH	(negati	ve quantity	v) (enter	0' if no sola	r contribu	ution to wate	er heating)	-		
Output from water heater (64)me Cutput from water heating Cutput from water heating (annual) $= 2$ 2101.2 (64) Heat gains from water heating, kWh/month 0.25 ' [0.65 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65) Instruct from water heating, kWh/month 0.25 ' [0.65 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65) Instruct from water heating, kWh/month 0.25 ' [0.65 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65) Instruct from water heating, kWh/month 0.25 ' [0.65 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65) Instruct from water heating, kWh/month 0.25 ' [0.65 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (66) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (66) Lighting gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (66) (66)m 3 22.1 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 (66) (66)m 4 (62)m + (62)m + (62)m + (70)m + (71)m + (72)m (70)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <th co<="" td=""><td>(add a</td><td>dditiona</td><td>al lines if</td><td>FGHR</td><td>S and/o</td><td>WWHR</td><td>S aj</td><td>pplies</td><td>, see Ap</td><td>pendix</td><td>G)</td><td></td><td></td><td></td><td></td><td></td></th>	<td>(add a</td> <td>dditiona</td> <td>al lines if</td> <td>FGHR</td> <td>S and/o</td> <td>WWHR</td> <td>S aj</td> <td>pplies</td> <td>, see Ap</td> <td>pendix</td> <td>G)</td> <td></td> <td></td> <td></td> <td></td> <td></td>	(add a	dditiona	al lines if	FGHR	S and/o	WWHR	S aj	pplies	, see Ap	pendix	G)					
	(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)	
Under transmission Quput from water heating, kWh/month 0.25 $^{\circ}$ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m (66)m= 94.22 83.67 89.35 82.14 81.97 75.37 74.41 78.86 77.85 85.07 87.38 92.64 (65) include (57)m in caculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. 1 1 Aug Sep Oct Nov Dec (66) 5. Internal gains (see Table 5 and 52): Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66) (66)m= 122.06 <td>Output</td> <td>from w</td> <td>ater hea</td> <td>ter</td> <td></td>	Output	from w	ater hea	ter													
Heat gains from water heating, kWh/month 0.25 ' [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (66)m = $\frac{94.22}{83.67}$ 89.35 82.14 81.97 75.37 74.41 78.86 77.85 85.07 87.38 92.64 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts $\frac{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{122.06 122.06 122.06 122.06 122.06 122.06 122.06 122.06 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m 19.44 17.26 14.04 10.63 7.94 6.71 7.25 9.42 12.64 16.05 18.74 19.98 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m 217.09 219.34 [213.66 201.58 186.32 171.98 162.41 160.15 166.83 177.91 193.17 207.51 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 (99) Pumps and fans gains (Table 5a) (70)m \sqrt{70}m \sqrt{70} \sqrt$	(64)m=	205.65	181.44	190.99	171.8	1 168.81	1	51.46	146.06	159.45	158.91	178.13	187.6	200.9		_	
(66)m= 94.22 83.67 89.35 82.14 81.97 75.37 74.41 78.86 77.85 80.07 67.38 92.64 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Wats (66)m= 122.06										Ou	tput from w	ater heat	er (annual)	112	2101.2	(64)	
Include (67)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts (66)m= 122.06 <td>Heat g</td> <td>ains fro</td> <td>m water</td> <td>heating</td> <td>g, kWh/</td> <td>month 0.2</td> <td>25 ´</td> <td>[0.85</td> <td>× (45)m</td> <td>+ (61)</td> <td>m] + 0.8 x</td> <td>x [(46)n</td> <td>n + (57)m</td> <td>+ (59)m</td> <td>]</td> <td></td>	Heat g	ains fro	m water	heating	g, kWh/	month 0.2	25 ´	[0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)n	n + (57)m	+ (59)m]		
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts (66)m= 122.06 12	(65)m=	94.22	83.67	89.35	82.14	81.97	7	75.37	74.41	78.86	77.85	85.07	87.38	92.64		(65)	
	inclu	de (57)	m in calo	culation	of (65)	m only if o	cyli	nder i	s in the o	dwelling	g or hot w	ater is	from com	munity h	eating		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	5. Int	ernal g	ains (see	e Table	5 and 5	a):											
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Metabo	olic dair	ns (Table	e 5). Wa	atts												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 19.44 17.26 14.04 10.63 7.94 6.71 7.25 9.42 12.64 16.05 18.74 19.98 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 217.09 219.34 213.66 201.58 186.32 171.98 162.41 160.15 165.83 177.91 193.17 207.51 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= $35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 35.21 (69)$ Pumps and fans gains (Table 5a) (70)m= $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 $						May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	(66)m=	122.06	122.06	122.06	122.0	6 122.06	1	22.06	122.06	122.06	122.06	122.06	122.06	122.06		(66)	
	Lightin	g gains	(calcula	ted in A	Appendi	x L, equa	tior	n L9 o	r L9a), a	lso see	Table 5		-		1		
$ \begin{array}{c} (68) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (70) \\ ($	(67)m=		r <u> </u>		1		1		, 1			16.05	18.74	19.98]	(67)	
$ \begin{array}{c} (68) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (69) \\ (70) \\ ($	Appliar	nces ga	ins (calc	ulated	in Appe	ndix L, ec	lua	tion L	13 or L1	3a), als	o see Ta	ble 5	- I		1		
$\begin{array}{c} (69)_{\text{me}} = \overline{55.21} & 35.21$	(68)m=	-	<u>,</u>	· · · · ·			T			,			193.17	207.51		(68)	
$\begin{array}{c} (69)_{\text{me}} = \overline{55.21} & 35.21$	Cookin	a aains	s (calcula	ted in A	Append	x L. equa	tion	n L15	u or L15a`	. also s	see Table	• 5			l		
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0	(69)m=		<u>`</u>		<u> </u>		-		· · · · · ·				35.21	35.21		(69)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Pumps	and fa	ns dains	ı (Table	5a)		-				1	1			1		
Losses e.g. evaporation (negative values) (Table 5) (71)m= $-97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 -97.65 (71)$ Water heating gains (Table 5) (72)m= $126.64 \ 124.51 \ 120.09 \ 114.08 \ 110.17 \ 104.68 \ 100.01 \ 105.99 \ 108.12 \ 114.34 \ 121.37 \ 124.52 $ (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= $422.78 \ 420.73 \ 407.41 \ 385.9 \ 364.06 \ 342.99 \ 329.28 \ 335.19 \ 346.21 \ 367.93 \ 392.89 \ 411.62 $ (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area M ² Table 6a Table 6b Table 6b (W) Northeast 0.9x 0.77 x 2 x 11.28 x 0.5 x 0.8 = 6.26 (75) Northeast 0.9x 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75)	-		1	r		0	Г	0	0	0	0	0	0	0		(70)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			I vaporatio	n (nea:	_L	Lues) (Tal	L ble	5)				I			1		
Water heating gains (Table 5) (72)m= 126.64 124.51 120.09 114.08 110.17 104.68 100.01 105.99 108.12 114.34 121.37 124.52 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 422.78 420.73 407.41 385.9 364.06 342.99 329.28 335.19 346.21 367.93 392.89 411.62 (73) 6. Solar gains Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 2.05 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast 0.9x 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast 0.9x 0.77 x 2.92	ĺ		<u> </u>	<u> </u>			-	,	-97.65	-97.65	-97.65	-97.65	-97.65	-97.65]	(71)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													1		I		
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$ (73)m= 422.78 420.73 407.41 385.9 364.06 342.99 329.28 335.19 346.21 367.93 392.89 411.62 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_{-} FF Gains Table 6d m ² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 2.05 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast 0.9x 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast 0.9x 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 =			<u>, , ,</u>	, <u> </u>		3 110 17	1	04 68	100.01	105 99	108 12	114.34	121.37	124 52		(72)	
(73) m= 422.78 420.73 407.41 385.9 364.06 342.99 329.28 335.19 346.21 367.93 392.89 411.62 (73) 6. Solar gains Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area m ² Flux g_ FF Gains (W) Northeast $0.9x$ 0.77 x 2 x 11.28 x 0.5 x 0.8 $=$ 6.26 (75) Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 $=$ 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 $=$ 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 $=$ 9.13 (75) Northeast $0.9x$ 0.77 <t< td=""><td></td><td></td><td>_</td><td></td><td></td><td></td><td>1.</td><td></td><td></td><td></td><td></td><td>_</td><td></td><td>_</td><td>l</td><td>(/</td></t<>			_				1.					_		_	l	(/	
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g FF Gains Table 6d m^2 Table 6a Table 6b Table 6c (W) Northeast $0.9x$ 0.77 x 2 x 11.28 x 0.5 x 0.8 = 6.26 (75) Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast 0.9x 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75)			· · · · ·	· · · · · ·	385 0	364.06	3	. ,	r , ,	· ,		1		,]	(73)	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.Orientation:Access Factor Table 6dArea m²Flux Table 6a g_{-} Table 6bFF Table 6cGains (W)Northeast $0.9x$ 0.77 x 2 x 11.28 x 0.5 x 0.8 $=$ 6.26 (75) Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 $=$ 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 $=$ 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 $=$ 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 $=$ 5.54 (75)	. ,				000.0	004.00	1	12.00	020.20	000.10	040.21	007.00	002.00	411.02		(
Table 6d m^2 Table 6aTable 6bTable 6bTable 6c(W)Northeast $0.9x$ 0.77 x 2 x 11.28 x 0.5 x 0.8 $=$ 6.26 (75)Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 $=$ 6.26 (75)Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 $=$ 6.41 (75)Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 $=$ 9.13 (75)Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 $=$ 5.54 (75)		Ŭ		using sol	ar flux fro	m Table 6a	anc	l assoc	iated equa	tions to a	convert to th	ne applica	able orienta	tion.			
Table 6d m^2 Table 6aTable 6bTable 6bTable 6c(W)Northeast $0.9x$ 0.77 x 2 x 11.28 x 0.5 x 0.8 $=$ 6.26 (75)Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 $=$ 6.26 (75)Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 $=$ 6.41 (75)Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 $=$ 9.13 (75)Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 $=$ 5.54 (75)	Orienta	ation:	Access F	actor	Are	a		Flu	x		q		FF		Gains		
Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75)												-	Table 6c				
Northeast $0.9x$ 0.77 x 2.05 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 6.41 (75) Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75)	Northea	ast <mark>0.9x</mark>	0.77	,	< 🗌	2	x	1	1.28	x	0.5	×	0.8	=	6.26	(75)	
Northeast $0.9x$ 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 9.13 (75) Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75)	Northea	ast 0.9x	0.77	;	<	2.05	x	1	1.28	x	0.5		0.8	=		(75)	
Northeast $0.9x$ 0.77 x 1.77 x 11.28 x 0.5 x 0.8 = 5.54 (75)	Northea	ast <mark>0.9x</mark>		;										=		4	
	Northea	ast <mark>0.9x</mark>		;				<u> </u>		×		⊾ □ [=		-	
	Northea	ast <mark>0.9x</mark>	0.77	;	<	2	x	<u> </u>	2.97	x	0.5		0.8	=	12.73	(75)	

Northeast 0.9x	0.77	×	2.05	×	22.97	×	0.5	x	0.8	=	13.05	(75)
Northeast 0.9x	0.77] x	2.92	×	22.97	×	0.5	x	0.8	=	18.59	(75)
Northeast 0.9x	0.77	x	1.77	×	22.97	×	0.5	x	0.8	=	11.27	(75)
Northeast 0.9x	0.77	x	2	×	41.38	×	0.5	x	0.8	=	22.94	(75)
Northeast 0.9x	0.77	x	2.05	×	41.38	×	0.5	x	0.8	=	23.51	(75)
Northeast 0.9x	0.77	x	2.92	×	41.38	×	0.5	x	0.8	=	33.49	(75)
Northeast 0.9x	0.77	x	1.77	×	41.38	×	0.5	x	0.8	=	20.3	(75)
Northeast 0.9x	0.77	x	2	×	67.96	×	0.5	x	0.8	=	37.67	(75)
Northeast 0.9x	0.77	x	2.05	×	67.96	x	0.5	x	0.8	=	38.62	(75)
Northeast 0.9x	0.77	x	2.92	×	67.96	×	0.5	x	0.8	=	55.01	(75)
Northeast 0.9x	0.77	x	1.77	×	67.96	x	0.5	x	0.8	=	33.34	(75)
Northeast 0.9x	0.77	x	2	×	91.35	×	0.5	x	0.8	=	50.64	(75)
Northeast 0.9x	0.77	x	2.05	×	91.35	×	0.5	x	0.8	=	51.91	(75)
Northeast 0.9x	0.77	x	2.92	×	91.35	×	0.5	x	0.8	=	73.94	(75)
Northeast 0.9x	0.77	x	1.77	×	91.35	×	0.5	x	0.8	=	44.82	(75)
Northeast 0.9x	0.77	x	2	×	97.38	×	0.5	x	0.8	=	53.99	(75)
Northeast 0.9x	0.77	x	2.05	×	97.38	×	0.5	x	0.8	=	55.34	(75)
Northeast 0.9x	0.77	x	2.92	×	97.38	x	0.5	x	0.8	=	78.83	(75)
Northeast 0.9x	0.77	x	1.77	×	97.38	×	0.5	x	0.8	=	47.78	(75)
Northeast 0.9x	0.77	x	2	×	91.1	×	0.5	x	0.8	=	50.51	(75)
Northeast 0.9x	0.77	x	2.05	×	91.1	×	0.5	x	0.8	=	51.77	(75)
Northeast 0.9x	0.77	x	2.92	x	91.1	x	0.5	x	0.8	=	73.74	(75)
Northeast 0.9x	0.77	x	1.77	×	91.1	×	0.5	x	0.8	=	44.7	(75)
Northeast 0.9x	0.77	x	2	×	72.63	×	0.5	x	0.8	=	40.26	(75)
Northeast 0.9x	0.77	x	2.05	×	72.63	×	0.5	x	0.8	=	41.27	(75)
Northeast 0.9x	0.77	x	2.92	×	72.63	×	0.5	x	0.8	=	58.79	(75)
Northeast 0.9x	0.77	x	1.77	×	72.63	x	0.5	x	0.8	=	35.63	(75)
Northeast 0.9x	0.77	x	2	×	50.42	×	0.5	x	0.8	=	27.95	(75)
Northeast 0.9x	0.77	x	2.05	×	50.42	×	0.5	x	0.8	=	28.65	(75)
Northeast 0.9x	0.77	x	2.92	×	50.42	×	0.5	x	0.8	=	40.81	(75)
Northeast 0.9x	0.77	x	1.77	×	50.42	x	0.5	x	0.8	=	24.74	(75)
Northeast 0.9x	0.77	x	2	×	28.07	×	0.5	x	0.8	=	15.56	(75)
Northeast 0.9x	0.77	x	2.05	×	28.07	×	0.5	x	0.8	=	15.95	(75)
Northeast 0.9x	0.77	x	2.92	×	28.07	×	0.5	x	0.8	=	22.72	(75)
Northeast 0.9x	0.77	×	1.77	×	28.07	×	0.5	x	0.8	=	13.77	(75)
Northeast 0.9x	0.77	x	2	×	14.2	×	0.5	X	0.8	=	7.87	(75)
Northeast 0.9x	0.77	×	2.05	×	14.2	×	0.5	x	0.8	=	8.07	(75)
Northeast 0.9x	0.77	×	2.92	×	14.2	×	0.5	x	0.8	=	11.49	(75)
Northeast 0.9x	0.77	×	1.77	×	14.2	×	0.5	x	0.8	=	6.97	(75)
Northeast 0.9x	0.77	×	2	×	9.21	×	0.5	x	0.8	=	5.11	(75)
Northeast 0.9x	0.77	x	2.05	×	9.21	×	0.5	x	0.8	=	5.24	(75)

Northea	ast <mark>0.9x</mark>	0.77	x	2.	92	x		9.21	x		0.5	×	0.8		=	7.46	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1.	77	x	9	9.21	x		0.5	x	0.8		=	4.52	(75)
Southea	ast <mark>0.9x</mark>	0.54	x	6.	79	x	3	86.79	x		0.5	x	0.8		=	48.57	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.	79	x	6	62.67	x		0.5	×	0.8		=	82.73	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.	79	x	8	35.75	x		0.5	×	0.8		=	113.19	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.	79	x	1	06.25	x		0.5	x	0.8		=	140.25	(77)
Southea	ast <mark>0.9x</mark>	0.54	×	6.	79	x	1	19.01	x		0.5	x	0.8		=	157.09	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.	79	x	1	18.15	x		0.5	×	0.8		=	155.96	(77)
Southea	ast <mark>0.9x</mark>	0.54	x	6.	79	x	1	13.91	x		0.5	×	0.8		=	150.36	(77)
Southea	ast <mark>0.9x</mark> [0.54	×	6.	79	x	1	04.39	x		0.5	x	0.8		=	137.79	(77)
Southea	ast <mark>0.9x</mark>	0.54	×	6.	79	x	g	2.85	x		0.5	x	0.8		=	122.56	(77)
Southea	ast <mark>0.9x</mark>	0.54	×	6.	79	x	6	69.27	x		0.5	x	0.8		=	91.43	(77)
Southea	ast <mark>0.9x</mark> [0.54	×	6.	79	x	4	4.07	x		0.5	x	0.8		=	58.17	(77)
Southea	ast <mark>0.9x</mark>	0.54	×	6.	79	x	3	31.49	x		0.5	×	0.8		=	41.56	(77)
Solar g	ains in	watts, ca	alculate	d for eac	h mont	h		_	(83)m	= Su	m(74)m	.(82)m					
(83)m=	75.9	138.37	213.44	304.89	378.4	3	91.89	371.07	313	.75	244.72	159.43	3 92.57	63.8	39		(83)
Total g	ains – ir	nternal a	ind sola	r (84)m	= (73)n) + (83)m	, watts					-				
(84)m=	498.68	559.1	620.85	690.79	742.46	6 7	34.88	700.35	648	.93	590.93	527.36	6 485.46	475.	.51		(84)
7. Me	an inter	nal temp	perature	(heating	n seasc	n)										·	
		during h				ĺ.	area	from Tal	ole 9.	Th1	(°C)					21	(85)
		tor for g	•			-			,		()						
•	Jan	Feb	Mar	Apr	May	T	Jun	Jul		ug	Sep	Oct	Nov	D	20		
(86)m=	0.95	0.93	0.88	0.78	0.64		0.47	0.34	0.3	<u> </u>	0.6	0.83	0.93	0.9			(86)
					I										•		
		l temper		1	1				1			00.57	00.05	10	0	l	(87)
(87)m=	19.61	19.83	20.17	20.58	20.84	2	20.96	20.99	20.9	99	20.91	20.57	20.05	19.	0		(07)
Temp		during h		1	1	-		i	able 9), Th	2 (°C)					I	
(88)m=	20.28	20.29	20.29	20.31	20.32	2	20.34	20.34	20.3	34	20.33	20.32	20.31	20.	3		(88)
Utilisa	ation fac	tor for g	ains for	rest of c	lwelling	, h2	,m (se	e Table	9a)								
(89)m=	0.95	0.92	0.87	0.76	0.6		0.42	0.29	0.3	3	0.55	0.8	0.92	0.9	5		(89)
Mean	interna	l temper	ature in	the rest	of dwe	lling	T2 (f	ollow ste	eps 3	to 7	in Table	e 9c)					
(90)m=	18.4	18.72	19.21	19.79	20.14	<u> </u>	20.3	20.33	20.3		20.23	, 19.79	19.06	18.3	39		(90)
				1	1	-		1	1		fL	A = Liv	ving area ÷ (4	4) =		0.36	(91)
Moon	internal	l temper	atura (f	or the w	ole dw	ollin	a) – fl	∧ _V ⊤1	<u>т (1</u>	_ fl A	\) ∨ T2]
(92)m=	18.84	19.13	19.56	20.08	20.39		<u>9) – 11</u> 20.54	20.57	20.		20.48	20.07	19.42	18.8	33		(92)
		nent to t												10.0	50		
(93)m=	18.84	19.13	19.56	20.08	20.39	_	20.54	20.57	20.		20.48	20.07	1	18.8	33		(93)
		ting requ			1				I								
					re obta	ined	l at st	ep 11 of	Tabl	e 9h	so that	Ti m-	=(76)m an	d re-	calc	ulate	
		factor fo		•						,	, co mat	,			2010		
	Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug	Sep	Oct	Nov	D	әс		
1.14:1:	the sector of	tor for a						•	•		· .		-			I	

Utilisa	tion fac	tor for g	ains, hm	:									
(94)m=	0.93	0.9	0.85	0.75	0.61	0.44	0.31	0.35	0.56	0.79	0.9	0.94	(94)

03010	il gains,	hmGm	, VV = (94	4)M X (84	4)m									
(95)m=	464.72	505.82	530.08	519.75	451.25	320.31	218.57	226.99	333.21	417.65	437.23	446.56		(95)
Month	nly aver	age exte	rnal tem	perature	e 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)
	r	1	1	· · ·	i	i	=[(39)m x		1	Ē			I	(07)
(97)m=	876.96	853.02	778.25	646.14	499.23	330.61	220.89	230.44	359.51	544.16	716.38	861.32		(97)
Space (98)m=	e neatin 306.71	233.32	184.63	91 91	10ntn, к 35.7	/vn/mon	th = 0.02	4 X [(97)m – (95 0	94.12	1)m 200.99	308.58		
(30)11-	300.71	200.02	104.05	51	55.7	0	0	-			r) = Sum(9		1455.05	(98)
Space	o hoatin	ig require	oment in	k\//h/m²	2/vear			1010	i por your	(ittering)cal) = 00m(0	0,15,912 -	1400.00	(99)
		• •			•	oobomo							16.45	(00)
		quiremer ed for sr					ater heat	ing prov	vided by	a comm	unity sch	omo		
•		•		• •		-	heating (•••	•		unity Sci	leme.	0	(301)
Fractio	on of spa	ace heat	from co	mmunity	v system	1 – (30	1) =						1	(302)
The con	nmunity se	cheme ma	y obtain he	eat from se	everal sou	rces. The j	procedure a	allows for	CHP and	up to four	other heat	sources; ti	he latter	
			-		aste heat f	rom powe	r stations.	See Appe	ndix C.				0.07	
		at from C											0.67	(303a)
		mmunity											0.33	(303b)
Fractio	on of tota	al space	heat fro	m Comn	nunity C	HP				(3	02) x (303	a) =	0.67	(304a)
Fractio	on of tota	al space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.33	(304b)
Factor	for cont	trol and	charging	method	(Table)	1 - (2)) 1 -				tom			1	(305)
			onarging	method		4C(3)) 10	r commu	inity hea	ating sys	lem			1	(/
						. ,,	ng syster		ating sys	lem			1.05	(306)
Distrib		ss factor				. ,,			ating sys	lem				(306)
Distrib Space	ution los heatin	ss factor	(Table 1	I2c) for a		. ,,			ating sys	lem			1.05	(306)
Distrib Space Annua	ution los heatin I space	ss factor g	(Table 1 requiren	12c) for a		. ,,					5) x (306) =	=	1.05 kWh/ye	(306)
Distrib Space Annua Space	ution los heating I space heat fro	ss factor g heating	(Table 1 requirem munity C	12c) for o nent CHP		. ,,			(98) x (30	04a) x (30	5) x (306) = 5) x (306) =		1.05 kWh/ye 1455.05	(306) ar
Distrib Space Annua Space Space	ution los heating I space heat fro heat fro	ss factor g heating om Comi om heat	(Table 1 requiren munity C source 2	12c) for o nent HP	commun	ity heati		m	(98) x (30 (98) x (30	04a) x (30: 04b) x (30:	5) x (306) =		1.05 kWh/ye 1455.05 1017.52	(306) ar (307a)
Distrib Space Annua Space Space Efficier	ution los heating I space heat fro heat fro	ss factor g heating om Comi om heat econdar	(Table 1 requiren munity C source 2 y/supple	12c) for o nent HP 2 mentary	beating	ity heati	ng syster	m om Table	(98) x (36 (98) x (36 (98) a (36 (98) x (36) (98) x (36) x (36) (98) x (36) (98) x (36) x	04a) x (30: 04b) x (30:	5) x (306) = E E)		1.05 kWh/ye 1455.05 1017.52 510.29	(306) ar (307a) (307b)
Distribu Space Annua Space Space Efficier Space	ution los heating l space heat fro heat fro ncy of so heating	ss factor g heating om Comi om heat econdar g require	(Table 1 requiren munity C source 2 y/supple	12c) for o nent HP 2 mentary	beating	ity heati	ng systei in % (fro	m om Table	(98) x (36 (98) x (36 (98) a (36 (98) x (36) (98) x (36) x (36) (98) x (36) (98) x (36) x	04a) x (30 04b) x (30 xppendix	5) x (306) = E E)		1.05 kWh/ye 1455.05 1017.52 510.29 0	(306) ar (307a) (307b) (308
Distribu Space Annua Space Space Efficier Space Water	ution los heating l space heat fro heat fro heating heating	ss factor g heating om Comi om heat econdar g require	(Table 1 requirem munity C source 2 y/supple ment fro	I2c) for o nent HP mentary m secon	beating	ity heati	ng systei in % (fro	m om Table	(98) x (36 (98) x (36 (98) a (36 (98) x (36) (98) x (36) x (36) (98) x (36) (98) x (36) x	04a) x (30 04b) x (30 xppendix	5) x (306) = E E)		1.05 kWh/ye 1455.05 1017.52 510.29 0	(306) ar (307a) (307b) (308
Distribu Space Annua Space Space Efficier Space Water Annua If DHW	ution los heating l space heat fro heat fro heating heating l water l	ss factor g heating om Comi om heat econdar g require g heating i	(Table 1 requirem munity C source 2 y/supple ment fro requirem ty schem	I2c) for o nent HP mentary m secon nent	beating	ity heati	ng systei in % (fro	m om Table	(98) x (30 (98) x (30 e 4a or A (98) x (30	04a) x (30 04b) x (30 oppendix 01) x 100	5) x (306) = E) ÷ (308) =	=	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2	(306) ar (307a) (307b) (308 (309)
Distribu Space Annua Space Space Efficier Space Water Annua If DHW Water	ution los heating l space heat fro heat fro ncy of so heating l water l / from c heat fro	ss factor g heating om Com om heat econdar g require g heating r communi om Comr	(Table 1 requirem munity C source 2 y/supple ment fro requirem ty schem nunity C	I2c) for o nent CHP mentary m secon nent ne: HP	beating	ity heati	ng systei in % (fro	m om Table	(98) x (3) (98) x (3) e 4a or A (98) x (3) (98) x (3)	04a) x (30 04b) x (30 oppendix 01) x 100 03a) x (30	5) x (306) = E) ÷ (308) = 5) x (306) =	=	1.05 kWh/ye 1455.05 1017.52 510.29 0 0	(306) ar (307a) (307b) (308 (309)
Distribu Space Annua Space Space Efficier Space Water Annua If DHW Water Water	ution los heating I space heat fro heat fro ncy of so heating I water I / from c heat fro heat fro	ss factor g heating om Com om heat econdar g require g heating r communi om Comr	(Table 1 requirem munity C source 2 y/supple ment from requirem ty schem nunity C source 2	I2c) for o nent CHP mentary m secon nent ne: HP	beating	ity heati	ng systei in % (fro	m om Table	(98) x (3) (98) x (3) e 4a or A (98) x (3) (98) x (3)	04a) x (30 04b) x (30 oppendix 01) x 100 03a) x (30	5) x (306) = E) ÷ (308) =	=	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2	(306) ar (307a) (307b) (308 (309)
Distribu Space Annua Space Space Efficier Space Water Annua If DHW Water Water	ution los heating I space heat fro heat fro ncy of so heating I water I / from c heat fro heat fro	ss factor g heating om Com om heat econdar g require g heating r communi om Comr	(Table 1 requirem munity C source 2 y/supple ment from requirem ty schem nunity C source 2	I2c) for o nent CHP mentary m secon nent ne: HP	beating	ity heati	ng systei in % (fro	m om Table æm	(98) x (3) (98) x (3) e 4a or A (98) x (3) (64) x (3) (64) x (3)	04a) x (30 04b) x (30 ppendix 01) x 100 03a) x (30 03b) x (30	5) x (306) = E) ÷ (308) = 5) x (306) =	= =	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2 1469.37	(306) ar (307a) (307b) (308 (309)
Distribu Space Annua Space Space Efficier Space Water Mater Water Electric	ution los heating l space heat fro heat fro noy of so heating l water l / from c heat fro heat fro city use	ss factor g heating om Com om heat econdar g require g heating r communi om Comr	(Table 1 requirem munity C source 2 y/supple ment from requirem ty schem nunity C source 2 at distribu	I2c) for o nent HP 2 mentary m secon ent ne: HP	heating dary/su	ity heati	ng systei in % (fro	m om Table æm	(98) x (3) (98) x (3) e 4a or A (98) x (3) (64) x (3) (64) x (3)	04a) x (30 04b) x (30 ppendix 01) x 100 03a) x (30 03b) x (30	5) x (306) = E) ÷ (308) = 5) x (306) = 5) x (306) =	= =	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2 1469.37 736.89	(306) ar (307a) (307b) (308 (309) (310a) (310b)
Distribu Space Annua Space Space Efficier Space Water Mater Water Electric Cooling	ution los heating l space heat fro heat fro noy of so heating heating l water l / from c heat fro city used g Systel	ss factor g heating om Comi om heat econdar g require g heating i om Comr om heat s d for hea	(Table 1 requirem munity C source 2 y/supple ment fro requirem ty schem nunity C source 2 at distribu y Efficiel	I2c) for o nent HP mentary m secon nent he: HP ution ncy Rati	heating dary/su	system	ng systei in % (fro tary syst	m om Table æm	(98) x (3) (98) x (3) e 4a or A (98) x (3) (64) x (3) (64) x (3)	04a) x (30 04b) x (30 ppendix 01) x 100 - 03a) x (30 03b) x (30 (307e) +	5) x (306) = E) ÷ (308) = 5) x (306) = 5) x (306) =	= =	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2 1469.37 736.89 37.34	(306) ar (307a) (307b) (308 (309) (309) (310a) (310b) (313)
Distribu Space Annua Space Space Efficier Space Water Mater Water Electric Space Electric	ution los heating l space heat fro heat fro ncy of so heating heating l water l / from c heat fro city used g Systed cooling city for p	ss factor g heating om Comi om heat econdar g require g heating i om Comr om heat s d for hea m Energ i (if there oumps a	(Table 1 requirem munity C source 2 y/supple ment from requirem ty schem nunity C source 2 at distribu y Efficien is a fixe nd fans	I2c) for o nent HP mentary m secon ent he: HP ution ncy Ration within dv	beating dary/sup o g systen velling (⁻	system oplemen	in % (fro tary syst	m om Table æm 0.01	(98) x (3) (98) x (3) e 4a or A (98) x (3) (64) x (3) x [(307a) = (107) ÷	04a) x (30 04b) x (30 ppendix 01) x 100 - 03a) x (30 03b) x (30 (307e) +	5) x (306) = E) ÷ (308) = 5) x (306) = 5) x (306) =	= =	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2 1469.37 736.89 37.34 0	(306) ar (307a) (307b) (308 (309) (309) (310a) (313) (314)
Distribu Space Annua Space Space Efficier Space Mater Annua If DHW Water Electric Space Electric mecha	ution los heating l space heat fro heat fro ncy of so heating heating l water l / from c heat fro city used g Systel cooling city for p	ss factor g heating om Comi om heat econdar g require g heating i om Comr om heat s d for hea m Energ i (if there oumps a	(Table 1 requirem munity C source 2 y/supple ment from requirem ty schem nunity C source 2 at distribu y Efficien is a fixe nd fans - balance	I2c) for o nent HP mentary m secon ent ne: HP ution ncy Rati d cooling within dv	beating dary/sup o g systen velling (⁻	system oplemen	ng syster in % (fro tary syst enter 0) :	m om Table æm 0.01	(98) x (3) (98) x (3) e 4a or A (98) x (3) (64) x (3) x [(307a) = (107) ÷	04a) x (30 04b) x (30 ppendix 01) x 100 - 03a) x (30 03b) x (30 (307e) +	5) x (306) = E) ÷ (308) = 5) x (306) = 5) x (306) =	= =	1.05 kWh/ye 1455.05 1017.52 510.29 0 0 2101.2 1469.37 736.89 37.34 0 0	(306) ar (307a) (307b) (307b) (308 (309) (310a) (310b) (313) (314) (315)

pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	o) + (330g) =	240.83	(331)
Energy for lighting (calculated in Appendix L)			343.23	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-208.31	(333)
Electricity generated by wind turbine (Appendix M) (negative quarter	ntity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
Electrical efficiency of CHP unit			32	(361)
Heat efficiency of CHP unit			50.4	(362)
	Energy kWh/year	Emission facto kg CO2/kWh	r Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2018.88 ×	0.22	436.08	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	646.04 ×	0.52	-335.3	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2915.41 ×	0.22	629.73	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	932.93 ×	0.52	-484.19	(366)
Efficiency of heat source 2 (%) If there is CHP using t	two fuels repeat (363) to	(366) for the second f	uel 95	(367b)
CO2 associated with heat source 2 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	= 283.57	(368)
Electrical energy for heat distribution [(313) x	0.52	= 19.38	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372	2)	= 549.27	(373)
CO2 associated with space heating (secondary) (3	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		549.27	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	= 124.99	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	= 178.14	(379)
Energy saving/generation technologies (333) to (334) as applicate Item 1		0.52 × 0.01 =	-108.11	(380)
Total CO2, kg/year sum of (376)(382) =			744.28	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			9.44	(384)
El rating (section 14)			91.95	(385)

			User D	etails:						
Assessor Name: Software Name:	Ross Boult Stroma FS/			Stroma Softwa					028068 on: 1.0.4.18	
			Property.			02-01				
Address :		, Flat Type 1-	19B, Wiml	oledon, L	ondon					
1. Overall dwelling dimer	isions:		_	()						
Ground floor			-	a(m²) 8.88	(1a) x	Av. He i	ight(m) 6	(2a) =	Volume(m ³) 205.09	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 7	8.88	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	205.09	(5)
2. Ventilation rate:									<u> </u>	
Number of chimneys Number of open flues	main heating	second heating + 0 + 0		0 0] = [total 0 0		40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	s					3	x^	10 =	30](7a)
	•							10 =		
Number of passive vents						0			0	(7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney: If a pressurisation test has be					continue fre	30 om (9) to (÷ (5) =	0.15	(8)
Number of storeys in the	e dwelling (ns)							0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	esent, use the val gs); if equal user (ue corresponding 0.35	to the great	er wall are	a (after	uction			0	(11)
If suspended wooden flo			0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors dra	aught stripped		0.05 10.0		0.01			0	(14)
Window infiltration				0.25 - [0.2 (8) + (10)			(45)		0	(15)
Infiltration rate Air permeability value, c		d in oubic mot	roo por bo					oroo	0	(16)
If based on air permeabilit				•	•		nvelope	alea	5	(17) (18)
Air permeability value applies						is being us	sed		0.4	
Number of sides sheltered				· ·		Ū			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fact	tor		(21) = (18)) x (20) =				0.34	(21)
Infiltration rate modified fo	r monthly win	d speed								
Jan Feb M	Var Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table	e 7								
(22)m= 5.1 5 4	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22)$)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m	-				
.	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	Se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(23b)
			• • • •		, ,	, ,		n Table 4h		, , ,			0	(23c)
			-	-	-			HR) (24a		2b)m + (;	23b) x [*	1 – (23c)	-	(200)
(24a)m=	r	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mech	ı anical ve	entilation	u without	heat rec	coverv (I	u MV) (24b)m = (22	2b)m + (2	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	nouse ex	tract ver	ntilation of	r positiv	ve input v	ventilatio	on from c	outside				1	
,					•	•		c) = (22k		5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,								on from l		_				
	r ,	r .	<u>, </u>	r È	ŕ	<u>`</u>	<u> </u>	0.5 + [(2	, <u> </u>	-			1	(0.41)
(24d)m=		0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24d)
	r	· · · ·	·	· · · ·	, <u> </u>	<u> </u>	<u>, ,</u>	ld) in boy	<u> </u>	0.57	0.57	0.50	1	(05)
(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. He	at losse	es and he	eat loss	paramet	er:									
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²∙l		X k J/K
Windo	ws Type	e 1				6.79	x1	/[1/(1.4)+	0.04] =	9				(27)
Windo	ws Type	e 2				2		/[1/(1.4)+	0.04] =	2.65				(27)
Windo	ws Type	e 3				2.05		/[1/(1.4)+	0.04] =	2.72				(27)
Windo	ws Type	e 4				2.92		/[1/(1.4)+	0.04] =	3.87				(27)
Windo	ws Type	e 5				1.77		/[1/(1.4)+	0.04] =	2.35	=			(27)
Floor						12.77	6 ×	0.13		1.66088][(28)
Walls		40.0)6	15.5	3	24.53	3 X	0.18		4.41	= i		\dashv	(29)
Total a	area of e	elements	, m²	L]	52.83		L	(L			(31)
* for wir	ndows and	l roof wind	ows, use e	effective wi nternal wal		alue calcul		g formula 1	/[(1/U-valı	ıe)+0.04] a	ns given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.66	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	1301.58	(34)
Therm	al mass	parame	ter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
	•	sments wh ead of a de			construct	ion are noi	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						2.64	(36)
			are not kr	nown (36) =	= 0.05 x (3	1)								_
	abric he								(33) +	(36) =			29.31	(37)
Ventila		1	· · · · · ·	d monthly	í					= 0.33 × (1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	40.08	39.84	39.6	38.49	38.28	37.31	37.31	37.13	37.68	38.28	38.7	39.14		(38)
	r	coefficie	· · · · · · · · · · · · · · · · · · ·						- · ·	= (37) + (3			1	
(39)m=	69.39	69.15	68.91	67.79	67.58	66.61	66.61	66.43	66.99	67.58	68.01	68.45	07.70	
										Average =	oum(39)₁	12 / TZ=	67.79	(39)

Heat lo	oss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		
Numb	er of day	us in mo	nth (Tab	le 1a)	1	1		•	/	Average =	Sum(40) ₁ .	12 /12=	0.86	(40)
- turno	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)
			1											
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				(1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (1	TFA -13.		44		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.18		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	101.4	97.71	94.02	90.34	86.65	82.96	82.96	86.65	90.34	94.02	97.71	101.4		—
Energy	content of	hot water	used - cal	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x L	DTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1106.17	(44)
(45)m=	150.37	131.52	135.71	118.32	113.53	97.97	90.78	104.17	105.42	122.85	134.1	145.63		
If inoton	tanaqua u	votor hooti	ng ot poin	t of upp (n	bot wata	, otorogo)	ontor 0 in	hoven (46		Total = Su	m(45) ₁₁₂ =		1450.36	(45)
	r	i	• ·	· · ·			i	boxes (46)		40.40	00.40	04.04		(46)
(46)m= Water	22.56 storage	19.73 IOSS:	20.36	17.75	17.03	14.69	13.62	15.63	15.81	18.43	20.12	21.84		(46)
	-) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	munity h	neating a	and no ta	ank in dw	velling, e	nter 110) litres in	(47)						
			hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss facto	or is kno	wn (kWł	n/dav).				1	39		(48)
			m Table				"day).					54		(49)
				e, kWh/ye	ear			(48) x (49)) =			75		(50)
b) If n	nanufact	urer's de	eclared	cylinder	oss fact									()
		-		rom Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
		from Ta	ee secti ble 2a	on 4.3								0		(52)
			m Table	2b								0		(53)
Energ	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	55)								0.	75		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)r	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylind	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Prima	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•				,	,	• •	65 × (41)						
			r	ı —	1	1		ng and a	· ·	i	, 			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for ea	ch	month (61)m =	(60)) ÷ 36	65 × (41)	m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0	(0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)n	า =	0.85 × ((45)m ·	+ (46)m -	+ (57)	m +	(59)m + (61)m	
(62)m=	196.97	173.6	182.3	1	163.41	160.12	14	43.06	137.38	150.7	77	150.51	169.4	5 179.19	192	2.22		(62)
Solar DH	IW input	calculated	using A	ppe	endix G or	Appendix	:Н((negativ	ve quantity) (ente	r '0'	if no sola	r contrib	ution to wa	ter hea	ating)	I.	
(add a	dditiona	l lines if	FGHR	Sa	and/or V	VWHRS	ap	plies,	see Ap	pendi	хG	S)						
(63)m=	0	0	0		0	0		0	0	0		0	0	0	(0		(63)
Output	from w	ater hea	ter															
(64)m=	196.97	173.6	182.3	1	163.41	160.12	14	43.06	137.38	150.7	77	150.51	169.4	5 179.19	192	2.22		
		•								C	Dutp	out from wa	ater hea	ter (annual	112		1998.98	(64)
Heat g	ains fro	m water	heatir	ıg,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61	l)m) + 0.8 x	((46)r	n + (57)n	n + (5	59)m]	
(65)m=	87.27	77.4	82.4	Т	75.41	75.02	6	8.65	67.46	71.9	1	71.12	78.12	80.66	85	5.7		(65)
inclu	Ide (57)	m in calo	ulatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwellin	ng (or hot w	ater is	from cor	nmun	nity h	eating	
	. ,	ains (see			. ,	-					Ū					,		
	Ŭ	ns (Table																
metab	Jan	Feb	 Ma		Apr	May		Jun	Jul	Au	a	Sep	Oct	Nov)ec	l	
(66)m=	122.06	122.06	122.0	-	122.06	122.06		22.06	122.06	122.0	<u> </u>	122.06	122.06		_	2.06		(66)
Liahtin	n dains	ı (calcula	L ted in	 Ani	pendix	equat	ion	19 01	· 9a) a	lso se	e T	Table 5					1	
(67)m=	19.76	17.55	14.27	<u> </u>	10.81	8.08	i —	6.82	7.37	9.58	- 1	12.86	16.32	19.05	20	.31	I	(67)
		ins (calc					L										l	
(68)m=	217.09	219.34	213.6	-	201.58	186.32	r –	71.98	162.41	160.1	_	165.83	177.9	193.17	207	7.51	1	(68)
				_										100.17	207	.01	i	(00)
	35.21	calcula 35.21	35.21	-i	35.21	L, equal 35.21	_	5.21	35.21	, aiso 35.2	_	35.21	э 35.21	35.21	25	.21	1	(69)
(69)m=		1				55.21	3	0.21	33.21	35.2	1	55.21	35.21	35.21	35	.21	i	(03)
•		ns gains	È	9 5a	,		_	-				•			<u> </u>		1	(70)
(70)m=	3	3	3		3	3		3	3	3		3	3	3		3	i	(70)
		/aporatio	r	- T			r –										1	(= .)
(71)m=	-97.65	-97.65	-97.6	5	-97.65	-97.65	-6	97.65	-97.65	-97.6	65	-97.65	-97.65	-97.65	-97	7.65	l	(71)
		gains (T		ŕ									r				1	
(72)m=	117.3	115.17	110.7	5	104.74	100.84	9	5.34	90.67	96.6	6	98.78	105.01	112.03	115	5.18	l	(72)
Total i	nternal	gains =	:					(66)	m + (67)m	+ (68)	m +	- (69)m + ((70)m +	(71)m + (72	2)m			
(73)m=	416.77	414.68	401.3	1	379.74	357.86	3	36.77	323.07	329.0)1	340.09	361.86	386.87	405	5.62		(73)
	lar gain																	
-			-	olar		Table 6a	and			tions to) COI	nvert to th	e applic	able orienta	ation.			
Orienta		Access F Table 6d			Area m ²			Flu	x ble 6a		т	g_ able 6b		FF Table 6c			Gains	
	_	able ou									10		_				(W)	_
Northea	L	0.77		x	2		x	1	1.28	×		0.63	x	0.7		=	6.9	(75)
Northea	L	0.77		x	2.0	5	x	1	1.28	x		0.63	x	0.7		=	7.07	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	2.9	2	x	1	1.28	×		0.63	×	0.7		=	10.07	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	1	1.28	x		0.63	x	0.7		=	6.1	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	2		x	2	2.97	×		0.63	x	0.7		=	14.04	(75)

Northeast 0.9x	0.77	x	2.05	×	22.97	×	0.63	x	0.7	=	14.39	(75)
Northeast 0.9x	0.77	」 】 ×	2.92	x	22.97] x	0.63	x	0.7	=	20.5	(75)
Northeast 0.9x	0.77	」 】 ×	1.77	x	22.97	x	0.63	x	0.7	=	12.42](75)
Northeast 0.9x	0.77] x	2	x	41.38	x	0.63	x	0.7	=	25.29	(75)
Northeast 0.9x	0.77	」 】 ×	2.05	x	41.38	x	0.63	x	0.7	=	25.92](75)
Northeast 0.9x	0.77	x	2.92	x	41.38	x	0.63	x	0.7	=	36.93	(75)
Northeast 0.9x	0.77] x	1.77	x	41.38	×	0.63	x	0.7	=	22.38	(75)
Northeast 0.9x	0.77] x	2	x	67.96	x	0.63	x	0.7	=	41.54	(75)
Northeast 0.9x	0.77	×	2.05	x	67.96	×	0.63	x	0.7	=	42.57	(75)
Northeast 0.9x	0.77	×	2.92	x	67.96	x	0.63	x	0.7	=	60.64	(75)
Northeast 0.9x	0.77	x	1.77	×	67.96	×	0.63	x	0.7	=	36.76	(75)
Northeast 0.9x	0.77	x	2	x	91.35	×	0.63	x	0.7	=	55.83	(75)
Northeast 0.9x	0.77	x	2.05	x	91.35	×	0.63	x	0.7	=	57.23	(75)
Northeast 0.9x	0.77	x	2.92	x	91.35	x	0.63	x	0.7	=	81.52	(75)
Northeast 0.9x	0.77	x	1.77	x	91.35	x	0.63	x	0.7	=	49.41	(75)
Northeast 0.9x	0.77	x	2	×	97.38	×	0.63	x	0.7	=	59.52	(75)
Northeast 0.9x	0.77	x	2.05	x	97.38	x	0.63	x	0.7	=	61.01	(75)
Northeast 0.9x	0.77	×	2.92	x	97.38	×	0.63	x	0.7	=	86.9	(75)
Northeast 0.9x	0.77	x	1.77	x	97.38	x	0.63	x	0.7	=	52.68	(75)
Northeast 0.9x	0.77	x	2	x	91.1	×	0.63	x	0.7	=	55.68	(75)
Northeast 0.9x	0.77	x	2.05	x	91.1	×	0.63	x	0.7	=	57.08	(75)
Northeast 0.9x	0.77	x	2.92	x	91.1	×	0.63	x	0.7	=	81.3	(75)
Northeast 0.9x	0.77	x	1.77	x	91.1	×	0.63	x	0.7	=	49.28	(75)
Northeast 0.9x	0.77	×	2	x	72.63	x	0.63	x	0.7	=	44.39	(75)
Northeast 0.9x	0.77	x	2.05	x	72.63	x	0.63	x	0.7	=	45.5	(75)
Northeast 0.9x	0.77	x	2.92	x	72.63	×	0.63	x	0.7	=	64.81	(75)
Northeast 0.9x	0.77	×	1.77	x	72.63	×	0.63	x	0.7	=	39.29	(75)
Northeast 0.9x	0.77	x	2	x	50.42	x	0.63	x	0.7	=	30.82	(75)
Northeast 0.9x	0.77	×	2.05	x	50.42	×	0.63	x	0.7	=	31.59	(75)
Northeast 0.9x	0.77	×	2.92	x	50.42	×	0.63	x	0.7	=	44.99	(75)
Northeast 0.9x	0.77	×	1.77	x	50.42	×	0.63	x	0.7	=	27.27	(75)
Northeast 0.9x	0.77	×	2	x	28.07	×	0.63	x	0.7	=	17.16	(75)
Northeast 0.9x	0.77	×	2.05	x	28.07	×	0.63	x	0.7	=	17.58	(75)
Northeast 0.9x	0.77	×	2.92	x	28.07	×	0.63	x	0.7	=	25.05	(75)
Northeast 0.9x	0.77	×	1.77	x	28.07	×	0.63	x	0.7	=	15.18	(75)
Northeast 0.9x	0.77	×	2	×	14.2	×	0.63	x	0.7	=	8.68	(75)
Northeast 0.9x	0.77	×	2.05	×	14.2	×	0.63	x	0.7	=	8.89	(75)
Northeast 0.9x	0.77	×	2.92	×	14.2	×	0.63	x	0.7	=	12.67	(75)
Northeast 0.9x	0.77	×	1.77	×	14.2	×	0.63	X	0.7	=	7.68	(75)
Northeast 0.9x	0.77	×	2	×	9.21	×	0.63	x	0.7	=	5.63	(75)
Northeast 0.9x	0.77	×	2.05	×	9.21	×	0.63	X	0.7	=	5.77	(75)

Northeast 0.9x														
	0.77	x	2.9	2	x	9	9.21	x	0.63	x	0.7	=	8.22	(75)
Northeast 0.9x	0.77	×	1.7	7	x		9.21	x	0.63	x	0.7	_ =	4.98	(75)
Southeast 0.9x	0.54	x	6.7	9	x	3	6.79	x	0.63	×	0.7	=	53.55	(77)
Southeast 0.9x	0.54	x	6.7	9	x	6	2.67	x	0.63	x	0.7	=	91.21	(77)
Southeast 0.9x	0.54	x	6.7	9	x	8	5.75	x	0.63	x	0.7	=	124.79	(77)
Southeast 0.9x	0.54	x	6.7	9	x	10	06.25	x	0.63	x	0.7	=	154.63	(77)
Southeast 0.9x	0.54	x	6.7	9	x	1	19.01	×	0.63	x	0.7	=	173.19	(77)
Southeast 0.9x	0.54	x	6.7	9	x	1	18.15	x	0.63	×	0.7	=	171.94	(77)
Southeast 0.9x	0.54	×	6.7	9	x	1.	13.91	x	0.63	×	0.7	=	165.77	(77)
Southeast 0.9x	0.54	x	6.7	9	x	10	04.39	×	0.63	x	0.7	=	151.92	(77)
Southeast 0.9x	0.54	x	6.7	9	x	9	2.85	x	0.63	×	0.7	=	135.12	(77)
Southeast 0.9x	0.54	×	6.7	9	x	6	9.27	x	0.63	×	0.7	=	100.8	(77)
Southeast 0.9x	0.54	×	6.7	9	x	4	4.07	x [0.63	x	0.7	=	64.13	(77)
Southeast 0.9x	0.54	x	6.7	9	x	3	1.49	x	0.63	×	0.7	=	45.82	(77)
-								_						
Solar <u>g</u> ains in	watts, calcu	ulated	for each	n montl	<u>า</u>			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 83.68		35.32	336.14	417.18		32.06	409.11	345.	91 269.8	175.77	7 102.06	70.44		(83)
Total gains – i	nternal and	solar	(84)m =	: (73)m	+ (8	83)m	, watts				_		-	
(84)m= 500.45	567.24 63	36.63	715.88	775.04	70	68.83	732.17	674.	92 609.89	537.64	488.93	476.06		(84)
7. Mean inter	rnal tempera	ature ((heating	seaso	n)									
Temperature	during hea	ting pe	eriods ir	the liv	ing	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gain	s for li	iving are	a, h1,r	n (s	ее Та	ble 9a)							
Jan	Feb	Mar	Apr	May		Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m= 1	0.99 (0.98	0.92	0.76		0.55	0.4							
-				0.10	1		-	0.4	5 0.72	0.95	0.99	1		(86)
Mean interna	l temperatu	ure in li	iving are			w ste				0.95	0.99	1		(86)
Mean interna (87)m= 20.17	<u> </u>	ure in li 20.53	iving are		follo	w ste 20.99				0.95		1 20.15]	(86) (87)
(87)m= 20.17	20.31 2	0.53	20.79	ea T1 (i 20.95	follo 2	20.99	ps 3 to 7 21	in Ta	able 9c) 20.97]	
(87)m= 20.17 Temperature	20.31 2 during hea	ting pe	20.79 eriods ir	ea T1 (1 20.95 n rest o	follo 2 f dw	20.99 velling	ps 3 to 7 21 from Ta	in Ta 21 able 9	able 9c) 20.97 , Th2 (°C)	20.76	20.42	20.15]]	(87)
(87)m= 20.17 Temperature (88)m= 20.18	20.31 2 during hea 20.19 2	20.53 ting pe 20.19	20.79 eriods ir 20.2	ea T1 (i 20.95 n rest o 20.2	follo 2 f dw	20.99 velling 20.21	ps 3 to 7 21 from Ta 20.21	' in Ta 21 able 9 20.2	able 9c) 20.97 , Th2 (°C)]]	
(87)m= 20.17 Temperature (88)m= 20.18 Utilisation fac	20.31 2 during hea 20.19 2 ctor for gain	ting pe 20.53 20.19 s for re	20.79 eriods in 20.2 est of dv	ea T1 (1 20.95 n rest o 20.2 welling,	follo 2 f dw 2 h2,	20.99 velling 20.21 ,m (se	ps 3 to 7 21 from Ta 20.21 ee Table	7 in Ta 21 able 9 20.2 9a)	able 9c) 20.97 , Th2 (°C) 2 20.21	20.76 20.2	20.42	20.15]]]	(87)
(87)m= 20.17 Temperature (88)m= 20.18	20.31 2 during hea 20.19 2 ctor for gain	20.53 ting pe 20.19	20.79 eriods ir 20.2	ea T1 (1 20.95 n rest o 20.2	follo 2 f dw 2 h2,	20.99 velling 20.21	ps 3 to 7 21 from Ta 20.21	' in Ta 21 able 9 20.2	able 9c) 20.97 , Th2 (°C) 2 20.21	20.76	20.42	20.15]]]	(87)
(87)m= 20.17 Temperature (88)m= 20.18 Utilisation fac	20.31 2 during hea 20.19 2 ctor for gain 0.99 0	20.53 ting pe 20.19 s for re 0.97	20.79 eriods in 20.2 est of dv 0.89	ea T1 (i 20.95 n rest o 20.2 welling, 0.71	follo 2 f dw 2 , h2,	20.99 velling 20.21 ,m (se 0.48	ps 3 to 7 21 from Ta 20.21 ee Table 0.33	7 in Ta 21 able 9 20.2 9a) 0.38	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65	20.76 20.2 0.93	20.42	20.15		(87) (88) (89)
(87)m= 20.17 Temperature (88)m= 20.18 Utilisation fac (89)m= 1	20.312during hea20.192ctor for gain0.990I temperatu	20.53 ting pe 20.19 s for re 0.97	20.79 eriods in 20.2 est of dv 0.89	ea T1 (i 20.95 n rest o 20.2 welling, 0.71	follo 2 f dw 12 h2, 12 (10 10 10 10 10 10 10 10 10 10 10 10 10	20.99 velling 20.21 ,m (se 0.48	ps 3 to 7 21 from Ta 20.21 ee Table 0.33	7 in Ta 21 able 9 20.2 9a) 0.38	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19	20.76 20.2 0.93 e 9c) 19.93	20.42 20.2 0.99 19.45	20.15 20.2 1 19.06]]]]	(87) (88) (89) (90)
(87)m= 20.17 Temperature (88)m= 20.18 Utilisation fac (89)m= 1 Mean interna	20.312during hea20.192ctor for gain0.990I temperatu	10.53 ting pe 10.19 s for re 0.97 ure in t	20.79 eriods in 20.2 est of dv 0.89 he rest	ea T1 (i 20.95 n rest o 20.2 welling, 0.71 of dwel	follo 2 f dw 12 h2, 12 (10 10 10 10 10 10 10 10 10 10 10 10 10	20.99 velling 20.21 ,m (se 0.48 T2 (fo	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste	7 in Ta 21 able 9 20.2 9a) 0.38 eps 3	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19	20.76 20.2 0.93 e 9c) 19.93	20.42 20.2 0.99	20.15 20.2 1 19.06] 	(87) (88) (89)
(87)m= 20.17 Temperature (88)m= 20.18 Utilisation fac (89)m= 1 Mean interna	20.31 2 during hea 2 20.19 2 ctor for gain 0.99 0.10 0.99 1 temperatu 19.28 1	20.53 ting pe 20.19 s for r 0.97 ure in t 9.59	20.79 eriods in 20.2 est of dv 0.89 he rest 19.97	ea T1 (1 20.95 a rest o 20.2 welling, 0.71 of dwel 20.16	follo 2 f dw 2 h2, h2, (ling 2	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste 20.21	7 in Ta 21 able 9 20.2 9a) 0.3a eps 3 20.2	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f	20.76 20.2 0.93 e 9c) 19.93	20.42 20.2 0.99 19.45	20.15 20.2 1 19.06	0.36	(87) (88) (89) (90)
(87)m= 20.17 Temperature (88)m= 20.18 Utilisation fac (89)m= 1 Mean interna (90)m= 19.08	20.31 2 during hea 2 20.19 2 ctor for gain 0.99 0.99 0 I temperatu 19.28 19.28 1	20.53 ting pe 20.19 s for r 0.97 ure in t 9.59	20.79 eriods in 20.2 est of dv 0.89 he rest 19.97	ea T1 (1 20.95 a rest o 20.2 welling, 0.71 of dwel 20.16	follo 2 f dw 2 h2, h2, 0 ling 2 ellin	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste 20.21	7 in Ta 21 able 9 20.2 9a) 0.3a eps 3 20.2	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2	20.76 20.2 0.93 e 9c) 19.93	20.42 20.2 0.99 19.45 ting area ÷ (4	20.15 20.2 1 19.06]]] 	(87) (88) (89) (90)
(87)m= 20.17 Temperature $(88)m= 20.18$ Utilisation fac $(89)m= 1$ Mean internat $(90)m= 19.08$ Mean internat	20.31 2 during hea 2 20.19 2 ctor for gain 0.99 0.99 0 Il temperatu 1 19.28 1 19.66 1	20.53 ting pe 20.19 s for re 0.97 ure in t 9.59 ure (for 9.93	20.79 eriods in 20.2 est of dv 0.89 he rest 19.97 r the wh 20.27	ea T1 (i 20.95 a rest o 20.2 welling, 0.71 of dwel 20.16 ole dwe 20.45	follo 2 f dw 2 f dw 2 1 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21 g) = fl 20.5	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste 20.21 _A × T1 20.5	7 in Ta 21 able 9 20.2 9a) 0.3a 20.2 + (1 - 20.3	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2 5 20.48	20.76 20.2 0.93 e 9c) 19.93 LA = Liv 20.23	20.42 20.2 0.99 19.45 ting area ÷ (4	20.15 20.2 1 19.06]]] 	(87) (88) (89) (90) (91)
(87)m= 20.17 Temperature $(88)m= 20.18$ Utilisation fac $(89)m= 1$ Mean interna $(90)m= 19.08$ Mean interna $(92)m= 19.48$	20.31 2 during hea 2 20.19 2 ctor for gain 0.99 0.99 0 I temperatu 19.28 19.28 1 I temperatu 19.66 19.66 1 ment to the 1	20.53 ting pe 20.19 s for re 0.97 ure in t 9.59 ure (for 9.93	20.79 eriods in 20.2 est of dv 0.89 he rest 19.97 r the wh 20.27	ea T1 (i 20.95 a rest o 20.2 welling, 0.71 of dwel 20.16 ole dwe 20.45	follo 2 f dw 2 f dw 2 h2, h2, 0 ling 2 ellin	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21 g) = fl 20.5	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste 20.21 _A × T1 20.5	7 in Ta 21 able 9 20.2 9a) 0.3a 20.2 + (1 - 20.3	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2 5 20.48 vhere appro	20.76 20.2 0.93 e 9c) 19.93 LA = Liv 20.23	20.42 20.2 0.99 19.45 ring area ÷ (4 19.81	20.15 20.2 1 19.06]]] 	(87) (88) (89) (90) (91)
(87)m= 20.17 Temperature $(88)m= 20.18$ Utilisation fac $(89)m= 1$ Mean interna $(90)m= 19.08$ Mean interna $(92)m= 19.48$ Apply adjustr	20.31 2 during hea 2 20.19 2 ctor for gain 0.99 0.99 0 Il temperatu 19.28 19.66 1 nent to the 19.66	20.53 ting pe 20.19 s for re 0.97 rre in t 9.59 rre (for 9.93 mean 9.93	20.79 eriods in 20.2 est of dv 0.89 he rest of 19.97 r the wh 20.27 internal	ea T1 (i 20.95 a rest o 20.2 welling, 0.71 of dwel 20.16 ole dwe 20.45 tempe	follo 2 f dw 2 f dw 2 h2, h2, 0 ling 2 ellin	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21 g) = fl 20.5 ure fro	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste 20.21 -A × T1 20.5 m Table	7 in Ta 21 able 9 20.2 9a) 0.34 20.2 + (1 - 20.2	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2 5 20.48 where approx	20.76 20.2 0.93 e 9c) 19.93 LA = Liv 20.23 opriate	20.42 20.2 0.99 19.45 ring area ÷ (4 19.81	20.15 20.2 1 19.06 19.46]]] 	(87) (88) (89) (90) (91) (92)
(87)m= 20.17 Temperature $(88)m= 20.18$ Utilisation fac $(89)m= 1$ Mean internat $(90)m= 19.08$ Mean internat $(92)m= 19.48$ Apply adjustr $(93)m= 19.48$ 8. Space heat Set Ti to the	20.31 2 during hea 2 20.19 2 ctor for gain 0.99 0.99 0 Il temperatu 19.28 19.66 1 nent to the 19.66 19.66 1 nent to the 19.66	ting pe ting pe 20.19 s for re 0.97 ure in t 9.59 ure (for 9.93 mean 9.93 mean 9.93 mean 19.93	20.79 eriods in 20.2 est of dv 0.89 he rest of 19.97 r the wh 20.27 internal 20.27	ea T1 (1 20.95 1 rest o 20.2 welling, 0.71 of dwel 20.16 0le dwe 20.45 tempe 20.45	follo 2 f dw 2 f dw 2 1 2 1 1 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21 g) = fl 20.5 ire fro 20.5	ps 3 to 7 21 from Ta 20.21 e Table 0.33 ollow ste 20.21 _A × T1 20.5 m Table 20.5	7 in Ta 21 able 9 20.2 9a) 0.38 20.2 + (1 - 20.8 4e, v 20.9	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2 5 20.48 where approx 5 20.48	20.76 20.2 0.93 e 9c) 19.93 LA = Liv 20.23 opriate 20.23	20.42 20.2 0.99 19.45 ring area ÷ (4 19.81	20.15 20.2 1 19.06 19.46]	(87) (88) (89) (90) (91) (92)
(87)m= 20.17 Temperature $(88)m= 20.18$ Utilisation fac $(89)m= 1$ Mean interna $(90)m= 19.08$ Mean interna $(92)m= 19.48$ Apply adjustr $(93)m= 19.48$ 8. Space heat Set Ti to the the utilisation	20.312during hea20.192ctor for gain0.990I temperatu19.281I temperatu19.661nent to the19.661sting requiremean interrfactor for g	20.53 ting period ting period ting period s for re- 0.97 ure in t 9.59 ure (for 9.93 mean 9.93 ement pains u	20.79 eriods in 20.2 est of dv 0.89 he rest 19.97 r the wh 20.27 internal 20.27	ea T1 (1 20.95 a rest o 20.2 welling, 0.71 of dwel 20.16 20.45 tempe 20.45 tempe 20.45	follo 2 f dw 2 f dw 2 f dw 2 c ling 2 c ling 2 c ling 2 c ling 2 c ling 2 c ling 2 c c ling 2 c c c c c c c c c c c c c c c c c c	$\frac{20.99}{20.21}$,m (second second	ps 3 to 7 21 from Ta 20.21 ee Table 0.33 ollow ste 20.21 -A × T1 20.5 m Table 20.5	7 in Ta 21 able 9 20.2 9a) 0.3 20.2 + (1 - 20.3 20.2 + (1 - 20.3 20.2 + (1 - 20.3 20.2 20.3	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2 5 20.48 where approx 5 20.48 e 9b, so tha	20.76 20.2 0.93 e 9c) 19.93 LA = Liv 20.23 ppriate 20.23 t Ti,m=	20.42 20.2 0.99 19.45 ring area ÷ (4 19.81 19.81	20.15 20.2 1 19.06 19.46 19.46 19.46		(87) (88) (89) (90) (91) (92)
(87)m= 20.17 Temperature $(88)m= 20.18$ Utilisation fac $(89)m= 1$ Mean internat $(90)m= 19.08$ Mean internat $(92)m= 19.48$ Apply adjustr $(93)m= 19.48$ 8. Space heat Set Ti to the	20.31 2 during hea 20.19 2 ctor for gain 2 0.99 0 I temperatu 1 19.28 1 I temperatu 1 19.66 1 nent to the 1 19.66 1 nent to the 1 19.66 1 ting require mean interr factor for g Feb	20.53 ting pe 20.19 s for re 0.97 ure in t 9.59 ure (for 9.93 mean 9.93 mean 9.93 sment hal tem gains u Mar	20.79 eriods in 20.2 est of dv 0.89 he rest of 19.97 r the wh 20.27 internal 20.27 internal 20.27	ea T1 (1 20.95 1 rest o 20.2 welling, 0.71 of dwel 20.16 0le dwe 20.45 tempe 20.45	follo 2 f dw 2 f dw 2 f dw 2 c ling 2 c ling 2 c ling 2 c ling 2 c ling 2 c ling 2 c c ling 2 c c c c c c c c c c c c c c c c c c	20.99 velling 20.21 ,m (se 0.48 T2 (fo 20.21 g) = fl 20.5 ire fro 20.5	ps 3 to 7 21 from Ta 20.21 e Table 0.33 ollow ste 20.21 _A × T1 20.5 m Table 20.5	7 in Ta 21 able 9 20.2 9a) 0.38 20.2 + (1 - 20.8 4e, v 20.9	able 9c) 20.97 , Th2 (°C) 2 20.21 3 0.65 to 7 in Tabl 2 20.19 f - fLA) × T2 5 20.48 where approx 5 20.48 where approx 5 20.48	20.76 20.2 0.93 e 9c) 19.93 LA = Liv 20.23 opriate 20.23	20.42 20.2 0.99 19.45 ring area ÷ (4 19.81 19.81	20.15 20.2 1 19.06 19.46		(87) (88) (89) (90) (91) (92)

0.97

0.89

0.73

0.51

0.35

0.4

0.68

0.93

0.99

1

0.99

1

(94)m=

(94)

Usefu	l gains,	hmGm	, W = (9	4)m x (8-	4)m									
(95)m=	497.96	560.84	616.52	640.24	562.58	390.34	259.65	272.04	413.29	501.34	483.2	474.26		(95)
Month	ly aver	age exte	rnal terr	perature	e 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 l	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1053.13	1020.26	925.71	770.7	591.2	392.83	259.85	272.49	427.12	651.05	864.03	1044.2		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4 ⁻	1)m			
(98)m=	413.05	308.73	230.04	93.93	21.3	0	0	0	0	111.38	274.2	424.03		
								Tota	l per year	(kWh/year) = Sum(9	B) _{15,912} =	1876.65	(98)
Space	e heatin	g require	ement in	ı kWh/m²	²/year								23.79	(99)
9a. Ene	ergy rec	luiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
Space	e heatir	ng:												_
Fractio	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fractio	on of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fractio	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 – ((203)] =		·	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ז, %					·	0	(208)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (o	alculate	d above)		-						
	413.05	308.73	230.04	93.93	21.3	0	0	0	0	111.38	274.2	424.03		
(211)m	= {[(98)m x (20	4)] } x 1	100 ÷ (20)6)									(211)
Ĩ	441.76	330.19	246.03	100.46	22.78	0	0	0	0	119.12	293.27	453.51		
-				•				Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2007.12	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month									J
= {[(98)	m x (20)1)]}x1	00 ÷ (20)8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
-								Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	=	0	(215)
Water I	heating	I												-
Output	from w	ater hea	ter (calc	ulated a	bove)									
	196.97	173.6	182.31	163.41	160.12	143.06	137.38	150.77	150.51	169.45	179.19	192.22		_
Efficien	icy of w	ater hea	iter			-		-					79.8	(216)
(217)m=	86.74	86.33	85.44	83.4	80.92	79.8	79.8	79.8	79.8	83.73	85.95	86.87		(217)
		heating,												
· / -		m x 100			407.07	470.07	470.45	400.00	400.04	000.00	000 F	004.00		
(219)m=	227.06	201.08	213.39	195.94	197.87	179.27	172.15	188.93	188.61	202.38	208.5	221.28		٦
_								Tota	I = Sum(21				2396.46	(219)
	l totals	fuelues	d main	ovetem	4					k	Wh/year		kWh/year	7
Space	neating	iuei use	a, main	system	1								2007.12	ļ
Water h	neating	fuel use	d										2396.46	
Electric	ity for p	oumps, fa	ans and	electric	keep-ho	t								
centra	l heatin	g pump:										30		(230c)
		01-00												

boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of	(230a)(230g) =	[75	(231)
Electricity for lighting			[349	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x	0.216	= [433.54	(261)
Space heating (secondary)	(215) x	0.519	= [0	(263)
Water heating	(219) x	0.216	= [517.64	(264)
Space and water heating	(261) + (262) + (263) + (26	4) =	[951.17	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [38.93	(267)
Electricity for lighting	(232) x	0.519	= [181.13	(268)
Total CO2, kg/year		sum of (265)(271) =	[1171.23	(272)

TER =

14.85 (273)