Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.18 Printed on 08 November 2019 at 12:21:19

Project Information:

Assessed By: Ross Boulton (STRO028068) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 49.6m²

Plot Reference: Site Reference : B2 Stg 4 Issue B2A-101-07

B2A-101-07, Flat Type 2-20A, Wimbledon, London Address:

Client Details:

Name: **Galliard Homes**

Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c), Mains gas (c)

Fuel factor: 1.00 (mains gas (c), mains gas (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 11.57 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 48.0 kWh/m²

OK

2 Fabric U-values

Element Average Highest 0.15 (max. 0.70) External wall 0.15 (max. 0.30) OK Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK Roof (no roof) **Openings** 1.35 (max. 2.00) 1.35 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

No cylinder thermostat Hot water controls:

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous extract system		
Specific fan power:	0.3	
Maximum	0.7	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	2.92m²	
Windows facing: North West	6.79m²	
Ventilation rate:	4.00	
Blinds/curtains:	Light-coloured curtain or ro	oller blind
	Closed 100% of daylight h	ours

Community heating, heat from boilers - mains gas

Photovoltaic array

Predicted Energy Assessment

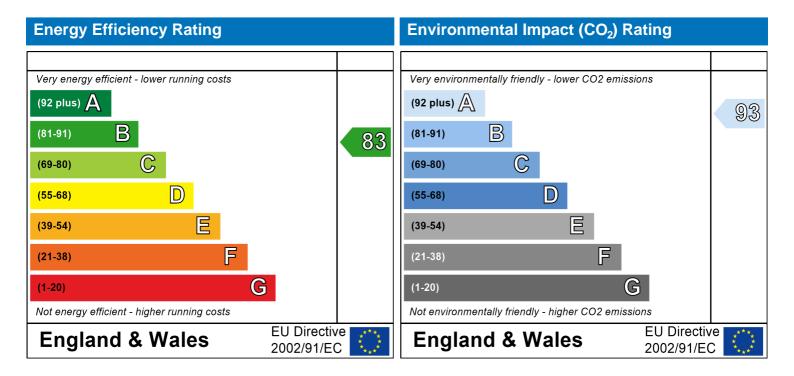


B2A-101-07 Flat Type 2-20A Wimbledon London Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Mid floor Flat 01 December 2018 Ross Boulton 49.6 m²

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.



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: B2A-101-07

Address: B2A-101-07, Flat Type 2-20A, Wimbledon, London

Located in: England Region: Thames valley

UPRN:

Date of assessment:

Date of certificate:

Assessment type:

01 December 2018

08 November 2019

New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 451

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2018

Floor Location: Floor area:

Storey height: 49.6 m^2 2.6 m

0.1.107 0.765 11 0.100

Living area: 24.187 m² (fraction 0.482)

Front of dwelling faces: East

Opening types:

Name: Source: Type: Glazing: Argon: Frame:

 $SE_1.14_2.56 \times 1$ Manufacturer Windows low-E, En = 0.05, soft coat No $SE_2.6_2.61 \times 1$ Manufacturer Windows low-E, En = 0.05, soft coat No

Name: Gap: Frame Factor: g-value: **U-value:** Area: No. of Openings: SE_1.14_2.56 x 1 1.35 16mm or more 8.0 0.5 2.92 SE_2.6_2.61 x 1 16mm or more 0.8 0.5 1.35 6.79

Name: Type-Name: Location: Orient: Width: Height: SE_1.14_2.56 x 1 Wall North West 1.14 2.56 Wall North West SE_2.6_2.61 x 1 2.6 2.61

Overshading: Average or unknown

Opaque Elements:

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa:

External Elements

Wall 46.563 9.71 36.85 0.15 0 False N/A

Upper exposed 25.153 0.13 N/A

Internal Elements
Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1835

Length Psi-value Other lintels (including other steel lintels) [Approved] 3.74 0.3 E2 [Approved] E3 Sill 0 0.04 [Approved] 10.34 0.05 E4 Party floor between dwellings (in blocks of flats) 11.764 0.14 E7

SAP Input

9.676	0.35	E23	Balcony within or between dwellings, balcony support penetrates wall
5.73	0.18	E16	Corner (normal)
2.87	0	E17	Corner (inverted internal area greater than external area)
5.73	0.12	E18	Party wall between dwellings
0	0.12	E25	Staggered party wall between dwellings
6.32	0.32	E20	Exposed floor (normal)
0	0.56	E15	Flat roof with parapet
5.97	0.32	E21	Exposed floor (inverted)
0	0	P3	Intermediate floor between dwellings (in blocks of flats)
0	0.24	P4	Roof (insulation at ceiling level)
5.2	0.16	P7	Exposed floor (normal)
0	0.16	P1	Ground floor

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Centralised whole house extract

Number of wet rooms: Kitchen + 2

Ductwork: , rigid

Approved Installation Scheme: True

Number of chimneys:0Number of open flues:0Number of fans:0Number of passive stacks:0Number of sides sheltered:2Pressure test:5

Main heating system

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: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.309

Tilt of collector: 30°

SAP Input

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home:

No

			User D	otaile: -						
Assessor Name:	Ross Boulton			Strom:	o Mirros	bor		STDC	0028068	
Software Name:	Stroma FSAP 20	112		Softwa					on: 1.0.4.18	
Software Name.	Ottoma i Orti Zo			Address				VOISIC	511. 1.0.4.10	
Address :	B2A-101-07, Flat					71 01				
1. Overall dwelling dime		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	7.0 0.01., _						
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	')
Ground floor					(1a) x		2.6	(2a) =	128.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	49.6	(4)			1		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	128.96	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0		0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				 	0	x .	10 =	0	(7a)
Number of passive vents	8					0	x ·	10 =	0	(7b)
Number of flueless gas t					L		x 4	40 =		(7c)
Number of flueless gas i	1163				L	0			0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has		ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (1.25 for steel or timbe 2.25 for steel or timbe 3.25 for steel or timbe 4.25 for steel or timbe				•	uction			0	(11)
deducting areas of open		esponding to	ine great	er wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	• • • • • • • • • • • • • • • • • • • •	, , ,	. ,		0	(16)
Air permeability value	• •		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•					ia haina	and		0.25	(18)
Air permeability value applie Number of sides sheltere		as been dor	ie or a deg	gree air pei	пеавшу	is being u	seu		2	(19)
Shelter factor	od			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.21	(21)
Infiltration rate modified	for monthly wind spec	ed								
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	•	•	•		•	•	•	_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
N/ind Factor (00.)	100) 4	•		•			•	•	_	
Wind Factor (22a)m = $(2^{23})^{m}$		0.05	0.05	0.00	4	1.00	4 40	4 40	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	_	

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(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		
Calculate effec		_	rate for t	he appli	cable ca	se		!	•		•	•	<u> </u>
If mechanica			andia N. (O	2h) (22a	.) Fm. (a	auation (JEV otho	muiaa (22h	·) (22a)			0.5	(23a)
If exhaust air he)) = (23a)			0.5	(23b)
If balanced with		•	•	ŭ		`		,	OL) (001) [4 (00.)	0	(23c)
a) If balance						<u> </u>	- 	ŕ	, 	- 	1 ` ´	i ÷ 100] I	(240)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance							ÉÉÉ	í `	, ´ ` `	- ´	1 .	1	(O.4h.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole he if (22b)m				•	•				.5 × (23b))		_	
(24c)m= 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If natural vif (22b)m									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - en	iter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)	•	•	•	•	
(25)m= 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5]	(25)
3. Heat losses	s and he Gros area	S	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		X k J/K
Windows Type		(111)	"	ı	2.92		-(1.35)-		3.74		NO/III ·I	IX K	(27)
Windows Type							[1/(1.35)-			=			` '
Floor	<i>.</i>				6.79	=		—, ¦	8.7				(27)
				_	25.15	=	0.13	=	3.26989	<u> </u>		_	(28)
Walls	46.50		9.71		36.85	=	0.15	=	5.53				(29)
Total area of e					71.72		. (15/4/11	\ 0.041			. 0.0	(31)
* for windows and ** include the area						atea using	i tormula 1	/[(1/U-vail	ie)+0.04] a	as given in	paragrapr	1 3.2	
Fabric heat los	s, W/K =	S (A x	U)	,			(26)(30)) + (32) =				21.23	(33)
Heat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	2402.42	(34)
Thermal mass	paramet	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess can be used instea				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix k	<						13.16	(36)
if details of therma	al bridging a	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric hea	at loss							(33) +	(36) =			34.39	(37)
Ventilation hea	at loss ca	lculated	monthly	/				(38)m	= 0.33 × (25)m x (5)	•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 22.17	21.94	21.72	21.28	21.28	21.28	21.28	21.28	21.28	21.28	21.28	21.28		(38)
Heat transfer of	coefficien	t, W/K						(39)m	= (37) + (3	38)m		_	
(39)m= 56.56	56.33	56.11	55.67	55.67	55.67	55.67	55.67	55.67	55.67	55.67	55.67	<u> </u>	
·									Average =		12 /12=	55.84	(39)
Heat loss para	<u> </u>								= (39)m ÷		1	1	
(40)m= 1.14	1.14	1.13	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		140
									Average =	Sum(40) ₁	12 /12=	1.13	(40)

Number of days in month (Table 1a)

Numbe	er of day	s in moi	nth (Tab	le 1a)									•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			•				•	•						
4 Ws	iter heat	ing ener	rav reau	rement								k\/\/h/\/e	ear.	
T. VVC	itor ricat	ing chici	igy roqu	TOTTICITE.								icvvii/yc	Jai.	
												68		(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
		•	ater usad	ne in litre	es per da	av Vd av	erage =	(25 x N)	+ 36		74	06		(43)
										se target o		.00	l	(40)
not more	e that 125	litres per _l	person pei	day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					•	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		
			•		•	•	•	•					888.72	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600	kWh/mon	nth (see Ta	bles 1b, 1	c, 1d)		_
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		
										Γotal = Su	m(45) ₁₁₂ =	-	1165.26	(45)
If instan	taneous w	ater heatii	ng at point •	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)				•	
(46)m=	18.12	15.85	16.36	14.26	13.68	11.81	10.94	12.55	12.7	14.81	16.16	17.55		(46)
	_		منام ماریطنم		olor or M	/\/LIDC	otorogo	within o		مما		_		(47)
_		, ,					_		anie ves	sei		0		(47)
	-	•			_			. ,	ore) onto	or 'O' in (47)			
			not wate	:i (iiii) ii	iciuues i	HStaritar	ieous cc	ווטט וטווות	ers) erite	91 0 111 (47)			
	_		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
,						•	,							. ,
•					ear			(48) x (49)) =					. ,
•			_			or is not		(10) // (10)			'	10		(00)
•				-							0.	02		(51)
	-	_		on 4.3									•	
											1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
			_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03		(54)
	` , ` `	, ,	,								1.	03		(55)
Water	storage	loss cal	culated t	or each	month			((56)m = (55) × (41)r	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	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=	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	v circuit	loss (ar	nual) fro	m Tahla	3	•	•	•				0		(58)
	•	•	•			59)m = ((58) ÷ 36	65 × (41)	m					(/
	-				,	•	. ,	, ,		r thermo	stat)			
(59)m=	Water healing energy requirement: With Vest White healing energy requirement: White healing energy representation of the water use of reduction month by an according to the healing energy representation of the water use of realization of month water water healing energy representation of the water user realization of health energy requirement: White healing energy representation of health ener													
Combi	امع مما	culated	for each	month ((61)m -	(60) : 30	65 v (41	\m					1	
(61)m=			1				· ·	·	n	n	n	n		(61)
(01)/11=	L	<u> </u>							Ŭ		Ŭ			(0.)

Total heat required for water heating calculated for each month (6)	$m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$
	97 138.19 153.98 161.24 172.28 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (e	er '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appe	lix G)
(63)m= 0 0 0 0 0 0 0	0 0 0 0 (63)
Output from water heater	
(64)m= 176.09 155.59 164.31 148.55 146.49 132.2 128.21 1	97 138.19 153.98 161.24 172.28
	Output from water heater (annual) ₁₁₂ 1816.1 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m +	1)m] + 0.8 x [(46)m + (57)m + (59)m]
(65)m= 84.39 75.07 80.48 74.4 74.55 68.97 68.47 7	05 70.96 77.04 78.62 83.12 (65)
include (57)m in calculation of (65)m only if cylinder is in the dw	ing or hot water is from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
	ug Sep Oct Nov Dec
(66)m= 100.7 100.7 100.7 100.7 100.7 100.7 100.7 1	.7 100.7 100.7 100.7 100.7 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also	ee Table 5
	79 21.2 26.91 31.41 33.49 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a)	also see Table 5
	98 166.68 178.83 194.16 208.57 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), a	o see Table 5
	75 46.75 46.75 46.75 46.75 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0	0 0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
	13 -67.13 -67.13 -67.13 -67.13 (71)
Water heating gains (Table 5)	
	34 98.55 103.55 109.19 111.73 (72)
	t)m + (69)m + (70)m + (71)m + (72)m
	92 366.74 389.61 415.08 434.1 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equation	o convert to the applicable orientation.
Orientation: Access Factor Area Flux	g_ FF Gains
Table 6d m ² Table 6a	Table 6b Table 6c (W)
Northwest 0.9x 0.77 x 2.92 x 11.28	0.5 x 0.8 = 9.13 (81)
Northwest 0.9x 0.77 x 6.79 x 11.28	0.5 x 0.8 = 21.24 (81)
Northwest 0.9x 0.77 x 2.92 x 22.97	0.5 x 0.8 = 18.59 (81)
Northwest 0.9x 0.77 x 6.79 x 22.97	0.5 x 0.8 = 43.23 (81)
Northwest 0.9x 0.77 x 2.92 x 41.38	0.5 x 0.8 = 33.49 (81)
Northwest 0.9x 0.77 x 6.79 x 41.38	0.5 x 0.8 = 77.88 (81)
Northwest 0.9x 0.77 x 2.92 x 67.96	0.5 x 0.8 = 55.01 (81)
Northwest 0.9x 0.77 x 6.79 x 67.96	0.5 x 0.8 = 127.91 (81)

								_						
Northwest 0.9	0.77	X	2.9	92	X	9	1.35	X	0.5	X	0.8	=	73.9	(81)
Northwest 0.9	0.77	X	6.7	' 9	x	9	1.35	X	0.5	X	0.8	=	171.9	(81)
Northwest 0.9	0.77	X	2.9	92	X	97	7.38	x	0.5	X	0.8	=	78.8	(81)
Northwest 0.9	0.77	X	6.7	' 9	X	97	7.38	x	0.5	X	0.8	=	183.	(81)
Northwest 0.9	0.77	X	2.9	92	X	9	1.1	х	0.5	X	0.8	=	73.7	4 (81)
Northwest 0.9	0.77	X	6.7	79	X	9	1.1	x	0.5	X	0.8		171.4	(81)
Northwest 0.9	0.77	X	2.9	92	X	72	2.63	x	0.5	x	0.8		58.79	9 (81)
Northwest 0.9	0.77	X	6.7	79	X	72	2.63	x	0.5	X	0.8		136.	7 (81)
Northwest 0.9	0.77	X	2.9	92	X	50	0.42	x	0.5	x	0.8		40.8	1 (81)
Northwest 0.9	0.77	X	6.7	' 9	X	50	0.42	x	0.5	X	0.8	=	94.9	(81)
Northwest 0.9	0.77	X	2.9	92	X	28	8.07	х	0.5	X	0.8	=	22.7	2 (81)
Northwest 0.9	0.77	X	6.7	79	X	28	8.07	X	0.5	X	0.8	=	52.83	3 (81)
Northwest 0.9	0.77	X	2.9	92	X	1	4.2	x	0.5	x	0.8		11.49	9 (81)
Northwest 0.9	0.77	X	6.7	79	X	1	4.2	х	0.5	X	0.8		26.7	2 (81)
Northwest 0.9	0.77	X	2.9	92	X	9).21	x	0.5	X	0.8	=	7.46	(81)
Northwest 0.9	0.77	x	6.7	79	X	9).21	x	0.5	x	0.8		17.3	4 (81)
								_						
Solar gains	in watts, ca	alculated	for eacl	h month	1			(83)m	ı = Sum(74)m	(82)m	1			
(83)m= 30.3	7 61.82	111.38	182.91	245.87	20	62.12	245.21	195	.48 135.71	75.5	5 38.21	24.8		(83)
Total gains	– internal a	nd solar	(84)m =	= (73)m	+ (8	83)m ,	watts	•	•			-	_	
(84)m= 474.	9 503.26	538.15	586.99	626.98	62	22.33	592.95	549	.41 502.46	465.1	5 453.3	458.9		(84)
7. Mean in	ternal temp	erature	(heating	seasor	า)						•		_	
7. Mean in Temperatu			`			area f	rom Tal	ole 9	Th1 (°C)				21	(85)
Temperatu	ire during h	eating p	eriods ir	n the livi	ing			ole 9	Th1 (°C)	1			21	(85)
	re during h	eating p	eriods ir	n the livi	ing n (s			<u> </u>	Th1 (°C)	Oc	t Nov	Dec		(85)
Temperatu Utilisation	re during h	neating p	eriods ir	n the livi	ing n (s	ee Tal	ble 9a)	<u> </u>	ug Sep	Oc 0.8	t Nov	Dec 0.92		(85)
Utilisation Ja (86)m= 0.9	re during h factor for g n Feb	neating p ains for I Mar 0.85	eriods ir iving are Apr 0.77	n the livi ea, h1,n May	ing n (s	ee Tal Jun ^{0.51}	Jul 0.39	A 0.4	ug Sep 3 0.62	 		-		
Utilisation Utilisation Jai (86)m= 0.9	re during h factor for g n Feb n 0.89	neating p ains for I Mar 0.85 ature in I	eriods ir iving are Apr 0.77 iving are	n the living the high	ing n (s	ee Tal Jun 0.51 w ster	ble 9a) Jul 0.39 os 3 to 7	A 0.∠ 7 in T	ug Sep 3 0.62 (able 9c)	0.8	0.88	0.92		(86)
Temperatu Utilisation Jai (86)m= 0.9 Mean inter (87)m= 19.1	re during h factor for gan Feb 0.89 nal temper 5 19.34	neating p ains for I Mar 0.85 ature in I	eriods ir iving are Apr 0.77 iving are	n the living the living the many 0.65 ea T1 (f	ing n (se	ee Tal Jun 0.51 ow ster	Jul 0.39 os 3 to 7 20.95	A 0.47 in T 20.	ug Sep 3 0.62 able 9c) 93 20.74	 	0.88	-		
Temperatu Utilisation Jai (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu	re during he factor for ganger feb 1 0.89 nal temper 1 19.34 ure during he factor for ganger feb 1.89	neating p ains for I Mar 0.85 ature in I 19.72	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir	n the living the hand may 0.65 ea T1 (for 20.61 ea rest of	ing n (second) collo	ee Tal Jun 0.51 www.step 20.85 velling	ble 9a) Jul 0.39 DS 3 to 7 20.95 from Ta	A 0.47 in T 20.	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C)	20.2	0.88	0.92		(86)
Temperatu Utilisation Jai (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu (88)m= 19.9	re during he factor for gan Feb 0.89 nal temper 19.34 are during he 19.97	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98	n the living the living the man of the living the livin	ing (something) (s	Jun 0.51 w step 20.85 relling 9.98	Jul 0.39 os 3 to 7 20.95 from Ta	A 0.47 in T 20.	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C)	0.8	0.88	0.92		(86)
Temperatu Utilisation (86)m= 0.9° Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation	re during he factor for gan Feb 1 0.89 nal temper 5 19.34 re during he factor for gan factor factor for gan factor	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98	n the living the high many 1.65 ea T1 (for 20.61 n rest of 19.98 welling,	ing (something) (s	Jun 0.51 www.step 0.85 velling 9.98 m (se	Jul 0.39 os 3 to 7 20.95 from Ta 19.98 e Table	A 0.47 in T 20.42 able 9 19.42 9a)	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98	20.2	0.88 5 19.64 8 19.98	0.92 19.13		(86) (87) (88)
Temperatu Utilisation Jai (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu (88)m= 19.9	re during he factor for gan Feb 1 0.89 nal temper 5 19.34 re during he factor for gan factor factor for gan factor	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98	n the living the living the man of the living the livin	ing (something) (s	Jun 0.51 w step 20.85 relling 9.98	Jul 0.39 os 3 to 7 20.95 from Ta	A 0.47 in T 20.	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98	20.2	0.88 5 19.64 8 19.98	0.92		(86)
Temperatu Utilisation (86)m= 0.9° Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation	re during he factor for gan Feb 1 0.89 nal temper 5 19.34 re during he factor for gan 1 0.88	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of decorated are	n the living the high man the living the high man the hig	ing (second of the second of t	Jun 0.51 ow step 0.85 velling 9.98 om (se 0.44	Jul 0.39 0s 3 to 7 20.95 from Ta 19.98 e Table 0.31	A 0.47 in T 20.48 in 19.49 a) 0.3	ug Sep 3 0.62 Sable 9c) 93 20.74 9, Th2 (°C) 98 19.98	0.8 20.2 19.9	0.88 5 19.64 8 19.98	0.92 19.13		(86) (87) (88)
Temperatu Utilisation (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation (89)m= 0.9	re during he factor for gan 1	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of decorated are	n the living the high man the living the high man the hig	ing n (see a see	Jun 0.51 ow step 0.85 velling 9.98 om (se 0.44	Jul 0.39 0s 3 to 7 20.95 from Ta 19.98 e Table 0.31	A 0.47 in T 20.48 in 19.49 a) 0.3	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98 15 0.56 to 7 in Tab	0.8 20.2 19.9	0.88 5 19.64 8 19.98 7 0.87	0.92 19.13		(86) (87) (88)
Temperatu Utilisation (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation (89)m= 0.9 Mean inter	re during he factor for gan 1	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in t	eriods ir iving are	m the living the sean of the living the sean of the se	ing n (see a see	yelling 9.98 m (see 0.44 T2 (fc	Jul 0.39 os 3 to 7 20.95 from Ta 19.98 e Table 0.31	A 0.27 in T 20. able 9 19. 9a) 0.3	ug Sep 3 0.62 Sable 9c) 93 20.74 9, Th2 (°C) 98 19.98 15 0.56 10 7 in Tab	0.8 20.2 19.9 0.77 le 9c) 19.1	0.88 5 19.64 8 19.98 0.87	0.92 19.13 19.98 0.91		(86) (87) (88) (89)
Temperatu Utilisation [86]m= 0.9 Mean inter [87]m= 19.1 Temperatu [88]m= 19.9 Utilisation [89]m= 0.9 Mean inter [90]m= 17.5	re during he factor for gan lemper 5 19.34 re during he factor for gan lemper 19.88 real temper 4 17.82	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in 1 18.34	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of de 0.74 the rest 19.02	n the living the sea Hall (for each of the s	ing (see) (see	ee Tal Jun 0.51 w step 20.85 relling 9.98 m (se 0.44 T2 (fo	Jul 0.39 0.39 0.35 19.98 e Table 0.31 ollow sterms	A 0.4 7 in T 20. able 9 19. 9a) 0.3	ug Sep 3 0.62 Table 9c) 93 20.74 0, Th2 (°C) 98 19.98 15 0.56 to 7 in Tab 94 19.74	0.8 20.2 19.9 0.77 le 9c) 19.1 fLA = L	0.88 5 19.64 8 19.98 7 0.87	0.92 19.13 19.98 0.91		(86) (87) (88) (89)
Temperatu Utilisation (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation (89)m= 0.9 Mean inter	re during he factor for gan lemper 5 19.34 re during he factor for gan lemper 4 17.82	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in 1 18.34	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of de 0.74 the rest 19.02	n the living the sea H (for each of the sea H	ing n (second property of the content of the conte	ee Tal Jun 0.51 w step 20.85 relling 9.98 m (se 0.44 T2 (fo	Jul 0.39 0.39 0.35 19.98 e Table 0.31 ollow sterms	A 0.4 7 in T 20. able 9 19. 9a) 0.3	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98 5 0.56 to 7 in Tab 94 19.74 — fLA) × T2	0.8 20.2 19.9 0.77 le 9c) 19.1 fLA = L	0.88 5 19.64 8 19.98 7 0.87 18.25 ving area ÷ (0.92 19.13 19.98 0.91		(86) (87) (88) (89)
Temperatu Utilisation (86)m= 0.9 Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation (89)m= 0.9 Mean inter (90)m= 17.5	re during he factor for gan lemper 5 19.34 re during he factor for gan lemper 4 17.82 relations and temper 4 17.82 relations and temper 2 18.56	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in t 18.34 ature (fo	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of do 0.74 the rest 19.02 r the whole 19.6	n the living the livin	ing n (second left) follo follo follo follo general follo g	ee Tal Jun 0.51 www.ster 0.85 velling 9.98 m (se 0.44 T2 (fc 9.85) g) = fL	Jul 0.39 DS 3 to 7 20.95 from Ta 19.98 e Table 0.31 bllow ste 19.95 A × T1 20.44	A A 0.47 in T 20. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19	ug Sep 3 0.62 Sable 9c) 93 20.74 9, Th2 (°C) 98 19.98 5 0.56 to 7 in Tab 94 19.74 — fLA) × T2 42 20.23	0.8 20.2 19.9 0.77 lle 9c) 19.1 fLA = L	0.88 5 19.64 8 19.98 7 0.87 18.25 ving area ÷ (0.92 19.13 19.98 0.91 17.52 4) =		(86) (87) (88) (89) (90) (91)
Temperatu Utilisation (86)m= 0.9° Mean inter (87)m= 19.1 Temperatu (88)m= 19.9 Utilisation (89)m= 0.9 Mean inter (90)m= 17.5 Mean inter (92)m= 18.3	re during he factor for grant temper 5 19.34 re during he factor for grant 19.97 factor for grant temper 4 17.82 real temper 2 18.56 stment to the factor for grant temper 2 18.56 stment to the factor for grant temper 4 temper 4 temper 5 temper 6 temper 6 temper 7 temper 8	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in t 18.34 ature (fo	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of do 0.74 the rest 19.02 r the whole 19.6	n the living the livin	ing n (second in the second i	ee Tal Jun 0.51 www.ster 0.85 velling 9.98 m (se 0.44 T2 (fc 9.85) g) = fL	Jul 0.39 DS 3 to 7 20.95 from Ta 19.98 e Table 0.31 bllow ste 19.95 A × T1 20.44	A A 0.47 in T 20. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98 5 0.56 to 7 in Tab 94 19.74 — fLA) × T2 42 20.23 where appr	0.8 20.2 19.9 0.77 lle 9c) 19.1 fLA = L	0.88 5 19.64 8 19.98 7 0.87 18.25 ving area ÷ (0.92 19.13 19.98 0.91 17.52 4) =		(86) (87) (88) (89) (90) (91)
Temperatu Utilisation [86]m= 0.9 Mean inter [87]m= 19.1 Temperatu [88]m= 19.9 Utilisation [89]m= 0.9 Mean inter [90]m= 17.5 Mean inter [92]m= 18.3 Apply adju	re during he factor for gan lemper 5 19.34 re during he factor for gan lemper 4 17.82 re lemper 2 18.56 re lemper 2 18.56 re lemper 18.56 re l	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in 1 18.34 ature (fo 19.01 he mean 19.01	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of dr 0.74 the rest 19.02 r the wh 19.6 internal	m the living the high many of the living of	ing n (second in the second i	ee Tal Jun 0.51 w step 0.85 velling 9.98 m (se 0.44 T2 (fc 9.85 g) = fL 20.34 ure from	Jul 0.39 DS 3 to 7 20.95 from Ta 19.98 e Table 0.31 bllow ste 19.95 A × T1 20.44 m Table	9a) 0.3 eps 3 19. + (1 20.	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98 5 0.56 to 7 in Tab 94 19.74 — fLA) × T2 42 20.23 where appr	0.8 20.2 19.9 0.77 le 9c) 19.1 fLA = L	0.88 5 19.64 8 19.98 7 0.87 18.25 ving area ÷ (0.92 19.13 19.98 0.91 17.52 4) =		(86) (87) (88) (89) (90) (91)
Temperatu Utilisation [86]m= 0.9 Mean inter [87]m= 19.1 Temperatu [88]m= 19.9 Utilisation [89]m= 0.9 Mean inter [90]m= 17.5 Mean inter [92]m= 18.3 Apply adju [93]m= 18.3	re during he factor for gan Feb 1 0.89 nal temper 5 19.34 re during he 7 19.97 factor for gan 0.88 nal temper 4 17.82 nal temper 2 18.56 stment to the 2 18.56 eating require mean interports of the state of	neating p ains for I Mar 0.85 ature in I 19.72 neating p 19.98 ains for r 0.83 ature in t 18.34 ature (fo 19.01 he mean 19.01 uirement ernal ten	eriods ir iving are Apr 0.77 iving are 20.2 eriods ir 19.98 est of do 0.74 the rest 19.02 r the wh 19.6 internal 19.6	n the living the high many 10.65 rest of 19.98 rest of 19.56 rest of 19.56 rest of dwelling, 19.56 rest of 19.56 r	ing n (second in the second i	ee Tal Jun 0.51 w step 0.85 velling 9.98 m (se 0.44 T2 (fc 9.85 g) = fL 0.34 ure from 0.34	Jul 0.39 DS 3 to 7 20.95 from Ta 19.98 e Table 0.31 ollow ste 19.95 A × T1 20.44 m Table 20.44	9a) 0.3 eps 3 19. + (1 20.	ug Sep 3 0.62 Table 9c) 93 20.74 9, Th2 (°C) 98 19.98 5 0.56 to 7 in Tab 94 19.74 — fLA) × T2 42 20.23 where appr	0.8 20.2 19.9 0.77 le 9c) 19.1 fLA = L 19.6 opriate 19.6	0.88 5 19.64 8 19.98 7 0.87 18.25 ving area ÷ (6 18.93	0.92 19.13 19.98 0.91 17.52 4) =	0.49	(86) (87) (88) (89) (90) (91)

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Jan

Feb

1100 0														
Utilisatio (94)m= 0		tor ga 0.86	0.81	0.73	0.61	0.47	0.34	0.38	0.58	0.75	0.84	0.88		(94)
Useful g						0.47	0.54	0.30	0.30	0.73	0.04	0.00		(01)
		30.76	437.61	429.23	383.53	290.5	204.21	211.05	289.2	351.05	382.74	405.42		(95)
Monthly	average	exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los										i –			ı	
` ′		9.56	702.1	595.53	465.87	319.66	213.56	223.81	341.03	504.34	658.57	785.09		(97)
Space he (98)m= 28		equire 27.67	ment to 196.78	r each m	10nth, k\ 61.26	/Vh/moni	th = 0.02	24 x [(97])m – (95 0)m] x (4 ⁻¹	1)m 198.6	282.47		
(00)111- 20	70.02 22	-7.07	100.70	110.70	01.20		Ŭ			(kWh/year		L	1481.09	(98)
Space h	eating re	equire	ement in	kWh/m²	?/vear			. 0.0	po. you.	(, ca(c	715,512	29.86	(99)
·						cchomo							20.00	
9b. Energ This part i								ing prov	rided by	a comm	unity scł	neme		
Fraction of				•		_		.	•		urnty 301	iciric.	0	(301)
Fraction of	of space	heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The commu	-	-								up to four	other heat	sources; ti	he latter	
includes boi Fraction o			_		aste heat f	rom powei	r stations.	See Appei	ndix C.			ĺ	0.67	(303a)
Fraction of				•	ource 2								0.33	(303b)
Fraction of						HD				(3	02) x (303	a) –		(304a)
Fraction of	•	•			•		0.2			•	02) x (303	,	0.67	(304b)
					•			ممادين			02) X (303	io) = 	0.33	=
Factor for					•	. ,,		•	iting sys	tem			1	(305)
Distribution		actor	(Table 1	2c) for c	commun	ity neatii	ng syste	m					1.05	(306)
Space he Annual sp	_	atina r	equirem	nent								I	kWh/yea	ir
Space he		_	•						(98) x (3(04a) x (305	5) x (306) :	<u> </u>	1035.73	(307a)
Space he			•							04b) x (30			519.42	(307b)
•					hooting	ovotom.	in O/ (fra	m Toble				_		=
Efficiency		-		•	•	•	•				,		0	(308
Space he	ating red	quiren	nent froi	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water he	_	4:		4								Ī		¬
Annual wa		_	•										1816.1	
If DHW fro Water hea									(64) x (30	03a) x (30	5) x (306) :	=	1270	(310a)
Water hea	at from h	neat s	ource 2						(64) x (30	03b) x (30	5) x (306) :	=	636.91	(310b)
Electricity	used fo	r hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	34.62	(313)
Cooling S	ystem E	nergy	y Efficie	ncy Ratio	0								0	(314)
Space co	oling (if	there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity	for pum	nps ar	nd fans v	within dv	velling (7	Table 4f)	:					!		_
mechanic	al ventila	ation -	- baland	ed, extra	act or po	sitive in	put from	outside					61.36	(330a)

					7(0001)
warm air heating system fans					╣
pump for solar water heating	,				=
Total electricity for the above, kWh/		=(330a) +	+ (330b) + (330g) =	61.36	╡
Energy for lighting (calculated in Ap				230.16	╡
Electricity generated by PVs (Appel	ndix M) (negative quantity)			-254.41	(333)
Electricity generated by wind turbin	e (Appendix M) (negative q	uantity)		0	(334)
10b. Fuel costs – Community heat	ting scheme				
	Fuel kWh/year		Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x		3.35 x 0.01 =	34.7	(340a)
Space heating from heat source 2	(307b) x		4.79 x 0.01 =	24.88	(340b)
Water heating from CHP	(310a) x		3.35 x 0.01 =	42.54	(342a)
Water heating from heat source 2	(310b) x		4.79 x 0.01 =	30.51	(342b)
			Fuel Price		_
Pumps and fans	(331)		0 x 0.01 =	10.77	(349)
Energy for lighting	(332)		0 x 0.01 =	40.42	(350)
Additional standing charges (Table	12)			88	(351)
Energy saving/generation technolog	gies				
Total energy cost	= (340a)(342e) + (345)	.(354) =		271.82	(355)
11b. SAP rating - Community heat	ting scheme				
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		1.23	(357)
SAP rating (section12)	re heating		(358)		
12b. CO2 Emissions – Community	heating scheme				_
Electrical efficiency of CHP unit				32	(361)
Heat efficiency of CHP unit				50.4	(362)
		•			
Space heating from CHP)	(307a) × 100 ÷ (362) =	2055.01	, <u> </u>		(363)
less credit emissions for electricity	$-(307a) \times (361) \div (362) =$, –		_
Water heated by CHP	(310a) × 100 ÷ (362) =		, –		
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$				⊒` ¬
Efficiency of heat source 2 (%)	If there is CHP usi				_
CO2 associated with heat source 2					_
Electrical energy for heat distributio	,	(313) x	0.22	202.31	(372)
Total CO2 associated with commur			0.02	17.57	_
	iity systems	(363)(366) + (368)	(312)	509.26	(373)
CO2 associated with space heating	(cocondany)	(309) x	0 :	= 0	(374)

				_
CO2 associated with water from immersion heater or i	nstantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		509.26	(376)
CO2 associated with electricity for pumps and fans with	hin dwelling (331)) x	0.52	31.85	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	119.45	(379)
Energy saving/generation technologies (333) to (334) Item 1	as applicable	0.52 x 0.01 =	-132.04	(380)
Total CO2, kg/year sum of (376)(3	82) =		528.51	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.66	(384)
El rating (section 14)			92.51	(385)
13b. Primary Energy – Community heating scheme				
Electrical efficiency of CHP unit			32	(361)
Heat efficiency of CHP unit			50.4	(362)
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2055.01 ×	1.22	2507.12	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362a)$) = 657.6 ×	3.07	-2018.84	(364)
Water heated by CHP (310a) × 100 ÷ (362) =	2519.84 ×	1.22	3074.2	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362)$	x) = 806.35 x	3.07	-2475.49	(366)
Efficiency of heat source 2 (%)	s CHP using two fuels repeat (363) to	o (366) for the second fue	95	(367b)
Energy associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x	1.22	1484.96	(368)
Electrical energy for heat distribution	[(313) x	=	106.28	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	72) =	2678.23	(373)
if it is negative set (373) to zero (unless specified of	herwise, see C7 in Appendix (C)	2678.23	(373)
Energy associated with space heating (secondary)	(309) x	0 =	0	(374)
Energy associated with water from immersion heater of	or instantaneous heater(312) x	1.22	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		2678.23	(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	188.37	(378)
Energy associated with electricity for lighting	(332))) x	3.07	706.59	(379)
Energy saving/generation technologies Item 1	Г	3.07 × 0.01 =	-781.05	(380)
Total Primary Energy, kWh/year	m of (376)(382) =		2792.14	(383)
			<u> </u>	

		_ ldoord	Details:						
Accesser Names	Paga Paultan	Useri		Mum	hor.		STDC	2020060	
Contware Hame.	Olionia 1 O/ 11 2012	Property					VOIOIC	311. 1.0. 1.10	
Address :	B2A-101-07, Flat Type				, , , , ,				
			·						
		Are	ea(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			49.6	(1a) x	2	2.6	(2a) =	128.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	·(1n)	49.6	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	128.96	(5)
2. Ventilation rate:									
			other		total			m³ per hou	ır
Number of chimneys	0 +	0 +	0] = [0	X ·	40 =	0	(6a)
Number of open flues	0 +	0 +	0	; = [0	x :	20 =	0	(6b)
Number of intermittent fa	ans			,	2	x	10 =	20	(7a)
				L			10 =		= ' '
·				Ļ					= 1
Number of flueless gas f	ires			L	0	X 4	40 =	0	(7c)
							Air ch	hanges per ho	our
Infiltration due to chimne	evs. flues and fans = (6a)+	+(6b)+(7a)+(7b)+	(7c) =	Г	20				_
	•			ontinue fr			. (0) –	0.10	(0)
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber fra	me or 0.35 fo	r masonr	y constr	ruction			0	(11)
		nding to the grea	iter wall area	a (after					
•	• / .	d) or 0.1 (seal	ed), else e	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else enter 0	, ,	,.					0	(13)
Percentage of window	s and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)		(16)							
	• • •	•	•	•	etre of e	envelope	area	5	(17)
•	•							0.41	(18)
		een done or a de	egree air per	meability	is being u	sed			7(10)
	eu		(20) = 1 - [0.0 75 x (1	19)] =				⊣ ``
	ting shelter factor		(21) = (18)	x (20) =					(21)
·	_							0.04	(= : /
		Jun Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7	•		-	•			_	
 	 	3.8 3.8	3.7	4	4.3	4.5	4.7]	
			,		•	•	•	_	
	' 	T	 		1	1	1	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		

· —	ation rat	<u> </u>				` 	<u>` </u>	<u> </u>	ı			1	
0.44 Calculate effe	0.43	0.42 Change i	0.38	0.37 he appli	0.33 cable ca	0.33	0.32	0.34	0.37	0.39	0.4		
If mechanica		•	ato for t	по арри	ouble ou	00						0	(2
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	wise (23b) = (23a)			0	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing for	or in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (22	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (I	ЛV) (24b)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	nouse ex			•	•				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
	n = 1, the	en (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x		0.50		1	(2
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(,
Effective air			<u> </u>		``	ŕ	r		0.57	0.50	0.50	1	(
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(.
3. Heat losse	s and he	at loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-valı		AXU		k-value		Χk
	area	(m²)	m	l ²	A ,r		W/m2		(W/ł	<u><)</u>	kJ/m²-l	K k	J/K
/indows Type					2.92	x1	/[1/(1.4)+	0.04] =	3.87				(
/indows Type	∌ 2				6.79	x1	/[1/(1.4)+	0.04] =	9				(
loor					25.15	3 ×	0.13	=	3.26989)			(
Valls	46.5	6	9.71		36.85	, x	0.18	=	6.63				(
otal area of e	lements	, m²			71.72	2							(
for windows and include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
abric heat los	•	`	U)				(26)(30)	+ (32) =				22.78	(
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	2402.42	(
hermal mass	parame	ter (TMF	P = Cm -	- TFA) in	ı kJ/m²K			Indica	tive Value:	Medium		250	(
or design assess				constructi	ion are no	t known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste				ısina Δn	nandiy l	<i>(</i>						0.00	<u> </u>
nermal bridge					-	`						6.89	(
_	ar bridging	aro mot mir	omn (00) -	- 0.00 x (0	• /			(33) +	(36) =			29.67	(
Thermal bridge details of therma Total fabric he	at loss							(38)m	= 0.33 × (25)m x (5))		
details of therma		alculated	l monthly	/					0-4	Nov			
details of therma		alculated Mar			Jun	Jul	Aug	Sep	Oct	INOV	Dec		
details of therma otal fabric he entilation hea	at loss ca	1	Apr 24.33	May 24.19	Jun 23.56	Jul 23.56	Aug 23.44	Sep 23.8	24.19	24.47	24.76		(
otal fabric he entilation hea Jan 25.38	Feb 25.22	Mar 25.06	Apr	May			Ť	23.8	24.19	24.47			(
details of thermal otal fabric her dentilation her details many details of thermal otal fabric her details of the de	Feb 25.22	Mar 25.06 nt, W/K	Apr 24.33	May 24.19	23.56	23.56	23.44	23.8 (39)m	24.19 = (37) + (3	24.47 38)m	24.76		(
details of thermal otal fabric her dentilation her details many details of thermal otal fabric her details of the de	Feb 25.22	Mar 25.06	Apr	May			Ť	23.8 (39)m 53.47	24.19 = (37) + (3 53.86	24.47 38)m 54.14	24.76	54	
details of thermal otal fabric he entilation head and some 25.38 leat transfer of the some 25.05	Feb 25.22 coefficier 54.89	Mar 25.06 nt, W/K 54.73	Apr 24.33	May 24.19	23.56	23.56	23.44	23.8 (39)m 53.47	24.19 = (37) + (3	24.47 38)m 54.14 Sum(39) ₁	24.76	54	
details of thermal cotal fabric her details of thermal cotal fabric her details of the details o	Feb 25.22 coefficier 54.89	Mar 25.06 nt, W/K 54.73	Apr 24.33	May 24.19	23.56	23.56	23.44	23.8 (39)m 53.47	24.19 = (37) + (3 53.86 Average =	24.47 38)m 54.14 Sum(39) ₁	24.76	54	(;

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
\ eeum	ied occu	inancy I	NI										1	(42)
if TF		9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		68		(42)
Annua	l averag	e hot wa	ater usag									.06		(43)
		-	hot water person per			_	-	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea				ļ		Оер	Oct	INOV	Dec		
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		
()										l	m(44) ₁₁₂ =		888.72	(44)
Energy (content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		
16 to a face		- 1 1 C		-6 (()		h (40		Total = Su	m(45) ₁₁₂ =	=	1165.26	(45)
			ng at point	,			1			I	1	1	1	
(46)m= Water	0 storage	0	0	0	0	0	0	0	0	0	0	0		(46)
	_		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
_		` ,	ind no ta	•			•					100	l	()
	-	_	hot wate		_			. ,	ers) ente	er '0' in (47)			
	storage												•	
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
0,			storage			or io not		(48) x (49)) =			0		(50)
			eclared of factor fr	-								0		(51)
		•	ee section				• • • • • • • • • • • • • • • • • • • •						l	(= -)
	e factor											0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
•			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (, ,	,									0		(55)
	storage	loss cal	culated f	or each	month		,	((56)m = (55) × (41)ı	m	,	,	1	
(56)m=	0	0	0	0	0 (50)	0	0	0	0 (50)	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	-		culated f		,	•	. ,	, ,						
,			rom Tabl			ı —	r						1	(EO)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
	loss cal	culated	for each	month ((60) ÷ 36	65 × (41))m	1	·	1	1	1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Column 102.69 89.81 92.68 80.8 77.53 66.9 61.99 71.14 71.99 83.9 91.58 99.45 (62)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (a3)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater (64)m= 102.69 89.81 92.68 80.8 77.53 66.9 61.99 71.14 71.99 83.9 91.58 99.45 Coutput from water heater (annual)
Cooking gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Couput from water heater (annual) Couput from water heater (annual) Couput from water heating, kWh/month 0.25 (0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]
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] (65)m= 25.67 22.45 23.17 20.2 19.38 16.73 15.5 17.79 18 20.97 22.9 24.86 (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 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(65)m= 25.67
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 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 13.16 11.69 9.5 7.19 5.38 4.54 4.91 6.38 8.56 10.87 12.68 13.52 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 146.2 147.71 143.89 135.75 125.48 115.82 109.37 107.85 111.68 119.82 130.09 139.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 13.16 11.69 9.5 7.19 5.38 4.54 4.91 6.38 8.56 10.87 12.68 13.52 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 146.2 147.71 143.89 135.75 125.48 115.82 109.37 107.85 111.68 119.82 130.09 139.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m= 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 13.16 11.69 9.5 7.19 5.38 4.54 4.91 6.38 8.56 10.87 12.68 13.52 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 146.2 147.71 143.89 135.75 125.48 115.82 109.37 107.85 111.68 119.82 130.09 139.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 13.16 11.69 9.5 7.19 5.38 4.54 4.91 6.38 8.56 10.87 12.68 13.52 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 146.2 147.71 143.89 135.75 125.48 115.82 109.37 107.85 111.68 119.82 130.09 139.74 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(67)m=
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m=
(68)m=
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(70)m= 0
Losses e.g. evaporation (negative values) (Table 5) (71)m=
(71)m=
Water heating gains (Table 5) (72)m= 34.51 33.41 31.14 28.06 26.05 23.23 20.83 23.9 25 28.19 31.8 33.42 (72)
(72)m= 34.51 33.41 31.14 28.06 26.05 23.23 20.83 23.9 25 28.19 31.8 33.42 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
(73)m= 242.03 240.99 232.71 219.18 205.08 191.77 183.28 186.31 193.41 207.05 222.75 234.86 (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)
Northwest $0.9x$ 0.77 x 2.92 x 11.28 x 0.63 x 0.7 = 10.07 (81)
Northwest $0.9x$ 0.77
Northwest $0.9x$ 0.77 x 2.92 x 22.97 x 0.63 x 0.7 = 20.5 (81)
Northwest $0.9x$ 0.77 x 6.79 x 22.97 x 0.63 x 0.7 = 47.66 (81)
Northwest $0.9x$ 0.77 x 2.92 x 41.38 x 0.63 x 0.7 = 36.93 (81)
Northwest 0.9x 0.77 x 6.79 x 41.38 x 0.63 x 0.7 = 85.87 (81)
16/41/36 X 0.65 X 0.77 - 65.67 (61)
Northwest $0.9x$ 0.77 \times 0.79 \times 0.79 \times 0.63 \times 0.63 \times 0.7 $=$ 0.64 0.64

_														
Northwest 0.9x	0.77	X	2.9	92	X	9	1.35	X	0.63	×	0.7	=	81.52	(81)
Northwest 0.9x	0.77	X	6.7	79	X	9	1.35	x	0.63	x	0.7	=	189.55	(81)
Northwest 0.9x	0.77	X	2.9	92	X	9	7.38	X	0.63	X	0.7	=	86.9	(81)
Northwest 0.9x	0.77	X	6.7	79	X	9	7.38	X	0.63	X	0.7	=	202.08	(81)
Northwest 0.9x	0.77	X	2.9	92	X	(91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest 0.9x	0.77	X	6.7	79	X	(91.1	x	0.63	x	0.7	=	189.05	(81)
Northwest 0.9x	0.77	X	2.9	92	X	7	2.63	x	0.63	X	0.7	=	64.81	(81)
Northwest 0.9x	0.77	X	6.7	79	X	7	2.63	X	0.63	x	0.7	=	150.71	(81)
Northwest 0.9x	0.77	X	2.9	92	X	5	0.42	x	0.63	x	0.7	=	44.99	(81)
Northwest 0.9x	0.77	X	6.7	79	X	5	0.42	x	0.63	X	0.7	=	104.63	(81)
Northwest 0.9x	0.77	X	2.9	92	X	2	8.07	x	0.63	x	0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	6.7	79	X	2	8.07	x	0.63	X	0.7	=	58.24	(81)
Northwest 0.9x	0.77	X	2.9	92	X		14.2	x	0.63	X	0.7	=	12.67	(81)
Northwest 0.9x	0.77	X	6.7	79	X		14.2	x	0.63	X	0.7	=	29.46	(81)
Northwest 0.9x	0.77	X	2.9	92	X	(9.21	x	0.63	X	0.7	=	8.22	(81)
Northwest 0.9x	0.77	X	6.7	79	X	9	9.21	x	0.63	X	0.7	=	19.12	(81)
Solar gains in	watts, ca	lculated	for eac	h month	<u>1</u>			(83)m	n = Sum(74)m .	(82)m	1		-	
(83)m= 33.48	68.15	122.79	201.66	271.07	2	88.99	270.34	215	.52 149.62	83.29	9 42.13	27.34		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts					•	-	
(84)m= 275.51	309.14	355.5	420.83	476.15	4	80.76	453.63	401	.83 343.03	290.3	264.88	262.2		(84)
7. Mean inter	nal temp	erature ((heating	seasor	n)									
			(''/									
Temperature	during h		`			area f	from Tab	ole 9	, Th1 (°C)				21	(85)
Temperature Utilisation fac	•	eating p	eriods ir	n the livi	ing			ole 9	, Th1 (°C)				21	(85)
-	•	eating p	eriods ir	n the livi	ing n (s				, Th1 (°C)	Ос	t Nov	Dec	21	(85)
Utilisation fac	tor for ga	eating p	eriods ir iving are	n the livi	ing n (s	ee Ta	ble 9a)		ug Sep	Oc 0.98		Dec 1	21	(85)
Utilisation factors Jan (86)m= 1	tor for ga	eating peains for li Mar 0.99	eriods ir iving are Apr 0.96	n the livi ea, h1,n May	ing n (s	ee Ta Jun ^{0.67}	ble 9a) Jul 0.51	A 0.5	ug Sep 59 0.87				21	
Utilisation fac	tor for ga	eating peains for li Mar 0.99	eriods ir iving are Apr 0.96	n the livi ea, h1,n May	ing n (s	ee Ta Jun ^{0.67}	ble 9a) Jul 0.51	A 0.5	ug Sep 59 0.87 able 9c)		1		21	
Utilisation factors Jan (86)m= 1 Mean internal (87)m= 19.77	retor for garage Feb 1 1 1 tempera 19.9	eating positions for line Mar 0.99 ature in l	eriods ir iving are Apr 0.96 iving are 20.52	n the living the living the many 0.86 ea T1 (f	ing n (s l follo	ee Ta Jun 0.67 ow ste	Jul 0.51 ps 3 to 7 20.99	0.5 7 in T 20.	ug Sep 59 0.87 Table 9c) 99 20.86	0.98	1	1	21	(86)
Utilisation factors Jan (86)m= 1 Mean internal	retor for garage Feb 1 1 1 tempera 19.9	eating positions for line Mar 0.99 ature in l	eriods ir iving are Apr 0.96 iving are 20.52	n the living the living the many 0.86 ea T1 (f	ing n (s follo	ee Ta Jun 0.67 ow ste	Jul 0.51 ps 3 to 7 20.99	0.5 7 in T 20.	ug Sep 59 0.87 Table 9c) 99 20.86 9, Th2 (°C)	0.98	7 20.07	1	21	(86)
Utilisation factors Jan (86)m= 1 Mean interna (87)m= 19.77 Temperature (88)m= 19.99	retor for garage Feb 1 I temperation 19.9 during here 20	eating positions for limited Mar 0.99 atture in limited 20.16 eating positions 20	eriods ir Apr 0.96 iving are 20.52 eriods ir 20.01	n the living the living a, h1,n May 0.86 ea T1 (for 20.83 en rest of 20.01	ing (s) (s) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	ee Ta Jun 0.67 ow ste 20.97 velling	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02	A 0.57 in T 20.	ug Sep 59 0.87 Table 9c) 99 20.86 9, Th2 (°C)	20.4	7 20.07	19.75	21	(86)
Utilisation factors Jan (86)m= 1 Mean interna (87)m= 19.77 Temperature (88)m= 19.99 Utilisation factors	retor for garage Feb 1 I tempera 19.9 during head 20 eter for garage stor f	eating positions for II Mar 0.99 ature in II 20.16 eating positions for recognitions f	eriods ir iving are 0.96 iving are 20.52 eriods ir 20.01 est of d	n the living the hand of the living the hand of the ha	ing (something) (s	ee Ta Jun 0.67 ow ste 20.97 velling 20.02 ,m (se	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table	A 0.57 in T 20. able 9 20. 9a)	ug Sep 59 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02	20.47	7 20.07	19.75	21	(86) (87) (88)
Utilisation factors Jan (86)m= 1 Mean internal (87)m= 19.77 Temperature (88)m= 19.99 Utilisation factors (89)m= 1	tor for garage from 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	eating positions for II Mar 0.99 ature in II 20.16 eating positions for r 0.99	eriods ir iving are 0.96 iving are 20.52 eriods ir 20.01 est of d	n the living (a, h1,n) (a, h1,n) (b, s) (a, h2,n) (c) (a, h2,n) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	ing (s)	ee Ta Jun 0.67 ow ste 20.97 velling 20.02 om (se 0.58	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4	A 0.57 in T 20.42 able 9 20.42 9a)	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02	20.47 20.09	7 20.07	19.75	21	(86)
Utilisation factors Jan	tor for garage from the following has been seen as the followi	eating positions for II Mar 0.99 ature in II 20.16 eating positions for r 0.99 ature in t	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of denotes the rest	n the living the livin	ing (see) (see	ee Ta Jun 0.67 ww ste 20.97 velling 20.02 m (se 0.58	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste	A 0.5.7 in 1 20. 20. 9a) 0.4	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 17 0.81 10 7 in Table	0.98 20.4 20.0 0.98 e 9c)	1 20.07	1 19.75 20		(86) (87) (88) (89)
Utilisation factors Jan (86)m= 1 Mean internal (87)m= 19.77 Temperature (88)m= 19.99 Utilisation factors (89)m= 1	tor for garage from 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	eating positions for II Mar 0.99 ature in II 20.16 eating positions for r 0.99	eriods ir iving are 0.96 iving are 20.52 eriods ir 20.01 est of d	n the living (a, h1,n) (a, h1,n) (b, s) (a, h2,n) (c) (a, h2,n) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	ing (see) (see	ee Ta Jun 0.67 ow ste 20.97 velling 20.02 om (se 0.58	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4	A 0.57 in T 20.42 able 9 20.42 9a)	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 17 0.81 1 to 7 in Table 02 19.94	0.98 20.4 20.0 0.98 e 9c) 19.56	1 20.07 1 20.01 1 3 19.18	1 19.75 20 1 18.86		(86) (87) (88) (89)
Utilisation factors Jan (86)m= 1 Mean interna (87)m= 19.77 Temperature (88)m= 19.99 Utilisation factors (89)m= 1 Mean interna	tor for garage from the following has been seen as the followi	eating positions for II Mar 0.99 ature in II 20.16 eating positions for r 0.99 ature in t	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of denotes the rest	n the living the livin	ing (see) (see	ee Ta Jun 0.67 ww ste 20.97 velling 20.02 m (se 0.58	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste	A 0.5.7 in 1 20. 20. 9a) 0.4	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 17 0.81 1 to 7 in Table 02 19.94	0.98 20.4 20.0 0.98 e 9c) 19.56	1 20.07	1 19.75 20 1 18.86	21	(86) (87) (88) (89)
Utilisation factors Jan	tor for garage from the second	eating positive in 1 20.16 eating positive in 1 0.99 eature in 1 19.26	eriods ir iving are 0.96 iving are 20.52 eriods ir 20.01 est of do 0.95 the rest 19.63	n the living the livin	n (s	ee Ta Jun 0.67 ow ste 20.97 velling 20.02 ,m (se 0.58 T2 (fo	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 collow ste	A 0.5 of 10	ug Sep 59 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 17 0.81 1 to 7 in Table 02 19.94	0.98 20.4 20.0 0.98 e 9c) 19.56	1 20.07 1 20.01 1 3 19.18	1 19.75 20 1 18.86		(86) (87) (88) (89) (90) (91)
Utilisation factors Jan	tor for garage from the following has been seen as the followi	eating positive in 1 20.16 eating positive in 1 20.9 eature in 1 19.26 eature in 1 19.26 eature in 1 19.26 eature (for 19.7	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of do 0.95 the rest 19.63 er the who 20.06	n the living the livin	ing n (s follo 2 h2, h2, colored billing 2	ee Ta Jun 0.67 ow ste 20.97 velling 20.02 m (se 20.01 g) = fl	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste 20.02 LA × T1 20.5	A A 0.57 in T 20. 20. 20. 20. 20. + (1 20.	ug Sep 59 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 17 0.81 1 to 7 in Table 02 19.94 - fLA) × T2 49 20.39	0.98 20.47 20.07 0.98 e 9c) 19.58 fLA = Li	1 20.07 1 20.01 1 20.01 1 20.01 1 20.01 20	1 19.75 20 1 18.86		(86) (87) (88) (89)
Utilisation factors Jan	tor for garage from the following has been seen as the followi	eating positive in I and	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of d 0.95 the rest 19.63 r the wh 20.06 internal	n the living the living that t	ing n (s follo 2 h2, (s h2, (s pollo color color	ee Ta Jun 0.67 w ste 20.97 velling 20.02 m (se 0.58 T2 (fo 20.01) g) = fl 20.47 ure fro	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste 20.02 LA × T1 20.5 m Table	A O.5 of in T 20. able 9 20. eps 3 20. eps 4e,	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 47 0.81 4 to 7 in Table 02 19.94 - fLA) × T2 49 20.39 where appro	0.98 20.47 20.07 0.98 e 9c) 19.58 fLA = Li 20.02 opriate	1 20.07 1 20.01 1 20.01 1 20.01 1 20.01 2 19.61 2 19.61	1 19.75 20 1 18.86 4) =		(86) (87) (88) (89) (90) (91) (92)
Utilisation factors Jan	tor for garage from the following has been depicted by the following has been depicted	eating positive in 1 20.16 eating positive in 1 20.16 eating positive in 1 19.26 eature in 1 19.26 eature (for 19.7 eature in 1 19.7 eature in	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of do 0.95 the rest 19.63 er the who 20.06	n the living the livin	ing n (s follo 2 h2, (s h2, (s pollo color color	ee Ta Jun 0.67 ow ste 20.97 velling 20.02 m (se 20.01 g) = fl	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste 20.02 LA × T1 20.5	A A 0.57 in T 20. 20. 20. 20. 20. + (1 20.	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 47 0.81 4 to 7 in Table 02 19.94 - fLA) × T2 49 20.39 where appro	0.98 20.47 20.07 0.98 e 9c) 19.58 fLA = Li	1 20.07 1 20.01 1 20.01 1 20.01 1 20.01 2 19.61 2 19.61	1 19.75 20 1 18.86 4) =		(86) (87) (88) (89) (90) (91)
Utilisation factors Jan	tor for garage from the following has been seen as the followi	eating prains for line mean 19.7	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of dr 0.95 ehe rest 19.63 r the wh 20.06 internal 20.06	n the living the high may not be a T1 (for 20.83 in rest of 20.01 in welling, 0.81 in of dwelling, 19.9 in ole dwelling, 20.35 it temper 20.35	ing n (s follo 2 h2, h2, c lling 2 ratu 2	ee Ta Jun 0.67 w ste 20.97 velling 20.02 m (se 0.58 T2 (fo 20.01) g) = fl 20.47 ure fro 20.47	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste 20.02 LA × T1 20.5 m Table 20.5	A 0.5 of in T 20.	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 47 0.81 40 7 in Table 02 19.94 - fLA) × T2 49 20.39 where appre	0.98 20.4 20.0 0.98 e 9c) 19.56 fLA = Li 20.0 copriate 20.0	1 20.07 1 20.01 1 1 3 19.18 ving area ÷ (1 19.75 20 1 18.86 4) =	0.49	(86) (87) (88) (89) (90) (91) (92)
Utilisation factors Jan	tor for garage from the form of the form o	eating prains for II O.99 ature in II 20.16 eating prains for race of the control of the con	eriods ir iving are Apr 0.96 iving are 20.52 eriods ir 20.01 est of d 0.95 the rest 19.63 r the wh 20.06 internal 20.06 inperature	n the living the high may not be a T1 (for 20.83 in rest of 20.01 in welling, 0.81 in of dwelling, 19.9 in ole dwelling, 20.35 in temperature obtains the notal control of the control of	ing n (s follo 2 h2, h2, c lling 2 ratu 2	ee Ta Jun 0.67 w ste 20.97 velling 20.02 m (se 0.58 T2 (fo 20.01) g) = fl 20.47 ure fro 20.47	Jul 0.51 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.4 ollow ste 20.02 LA × T1 20.5 m Table 20.5	A 0.5 of in T 20.	ug Sep 69 0.87 Table 9c) 99 20.86 9, Th2 (°C) 02 20.02 47 0.81 40 7 in Table 02 19.94 - fLA) × T2 49 20.39 where appre	0.98 20.4 20.0 0.98 e 9c) 19.56 fLA = Li 20.0 copriate 20.0	1 20.07 1 20.01 1 1 3 19.18 ving area ÷ (1 19.75 20 1 18.86 4) =	0.49	(86) (87) (88) (89) (90) (91) (92)

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Mar

Jan

Feb

Utilisa	tion fac	tor for g	ains, hm	1:										
(94)m=	1	1	0.99	0.95	0.83	0.63	0.45	0.53	0.83	0.98	1	1		(94)
Usefu	l gains,	hmGm	, W = (9 ²	4)m x (8	4)m							!	l	
(95)m=	274.89	307.75	350.91	399.32	395.71	300.78	205.56	213.44	285.69	283.55	263.7	261.74		(95)
Month	ly aver	age exte	ernal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	826.25	798.14	722.31	602.84	465.9	312.68	207.33	217.3	336.43	507.31	677.27	821.63		(97)
Space	heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	410.22	329.54	276.32	146.53	52.22	0	0	0	0	166.48	297.77	416.56		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2095.64	(98)
Space	heatin	g require	ement in	kWh/m²	²/year								42.25	(99)
8c. Sp	ace co	oling red	quiremen	nt										
Calcu	lated fo	r June, .	July and	August.	See Tal	ole 10b		_	_					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	oerature	and ext	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	500.32	393.87	403.61	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	oss hm									-		
(101)m=	0	0	0	0	0	0.92	0.96	0.93	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) = ((100)m x	(101)m		-					-		
(102)m=	0	0	0	0	0	459.89	377.57	376.68	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	625.54	592.64	533.05	0	0	0	0		(103)
			ement fo			lwelling,	continuo	ous (kW	h) = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
` г		1	(104)m <	<u> </u>	i –	1	1	1	1		1	1	I	
(104)m=	0	0	0	0	0	119.27	160.01	116.33	0	0	0	0		–
01	ft:									= Sum(•	=	395.61	(104)
Cooled			able 10b						1 C =	cooled	area ÷ (4	4) =	1	(105)
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									!	l = Sum((104)	=	0	(106)
Space	cooling	require	ment for	month =	(104)m	× (105)	× (106)r	n		· · · · · · · · · · · · · · · · · · ·	1020 17			
(107)m=	0	0	0	0	0	29.82	40	29.08	0	0	0	0		
L									Total	= Sum(107)	=	98.9	(107)
Space	cooling	require	ment in k	رWh/m²/ب	year				(107)	÷ (4) =			1.99	(108)
8f. Fab	ric En <u>e</u>	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, <u>s</u>	ee sectio	on 1 <u>1</u>)				
		y Efficie	•							+ (108) =	=		44.24	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								50.88	(109)

			User D	etaile: -						
Assessor Name:	Ross Boulton			Strom:	n Mirror	bor		QTD(0028068	
Software Name:	Stroma FSAP 20	112		Softwa					on: 1.0.4.18	
Contware Hame.	Ottoma i Orti Zo			Address				VOIOIC	511. 1.0.1.10	
Address :	B2A-101-07, Flat					71 01				
1. Overall dwelling dime		71 -	,	,						
			Area	a(m²)		Av. He	ight(m)		Volume(m³)
Ground floor			4	49.6	(1a) x	2	2.6	(2a) =	128.96	(3a)
Total floor area TFA = (1	(a)+(1b)+(1c)+(1d)+(1	1e)+(1r	n)	49.6	(4)			•		_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	128.96	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	T + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	j = F	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				,	2	x ·	10 =	20	(7a)
Number of passive vents	S				<u> </u>	0	x	10 =	0	(7b)
Number of flueless gas f					Ļ		x	40 =		(7c)
Number of flueless gas i	1163					0			0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	20		÷ (5) =	0.16	(8)
If a pressurisation test has I		ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	uction			0	(11)
deducting areas of open	oresent, use the value corro ings); if equal user 0.35	esponding to	ine great	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0)							0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	. , ,	, , ,	. ,		0	(16)
Air permeability value,	• • •		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.41	(18)
Air permeability value applie Number of sides sheltere		as been dor	ne or a deg	gree air pei	теарину	is being u	sea			(19)
Shelter factor	Cu			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.34	(21)
Infiltration rate modified	-	ed								`
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7		ı			•			_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
1.00	1 1	ı				1	1		_	
Wind Factor $(22a)m = (2a)m =$	'	1 005	0.05	0.00				4.40	7	
(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	_	

Adjusted infiltr	ration rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4		
Calculate effe		•	rate for t	he appli	cable ca	se	!						
If mechanic			or d'a N. (O	Ol-) (OO -	·		(IE)) - (I	' (00l-	\ (00-\			0	(23a
If exhaust air h) = (23a)			0	(23b
If balanced wit		•	•	ŭ		`						0	(23c)
a) If balance	_				i	- ` ` 		<u> </u>	<u> </u>		```	÷ 100] I	(0.4-
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a
b) If balance	1				ı —		r ´`	<u> </u>	ı ´ `		1	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h if (22b)r	nouse ext $m < 0.5 \times$			•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c
d) If natural if (22b)r	ventilation m = 1, the				•				0.5]		•	•	
(24d)m = 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
3. Heat losse	es and he	at loss r	naramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE	AXU		k-value		λΧk
LLLIVILIAI	area	-	m		A ,r		W/m2		(W/I	<)	kJ/m²·l		J/K
Windows Type	e 1				2.92	x1/	[1/(1.35)+	0.04] =	3.74				(27)
Windows Type	e 2				6.79	x1/	[1/(1.35)+	0.04] =	8.7	=			(27)
Floor					25.15	3 x	0.13	i	3.26989	<u> </u>			(28)
Walls	46.5	6	9.71		36.85	x	0.15	╡┇	5.53	=			(29)
Total area of e	elements	 , m²			71.72	<u></u>							(31)
* for windows and	d roof winde	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	` /
** include the are	as on both	sides of in	ternal wal	ls and par	titions								
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				21.23	(33)
Heat capacity	Cm = S(Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	2402.42	(34)
Thermal mass	s parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
For design asses				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
can be used inste				ioina An	nondiy l	,							(20)
I normal brida			LUIAIEU I	asing Ap	pendix r	`						13.16	(36)
Thermal bridg	•	,		- 0 05 v (3	1)						'		
Thermal bridg if details of therm Total fabric he	al bridging	,		= 0.05 x (3	1)			(33) +	(36) =			34.39	(37)
if details of therm Total fabric he	eat loss	are not kn	own (36) =		1)					25)m x (5)	34.39	(37)
if details of therm Total fabric he	eat loss at loss	are not kn	own (36) =	/		Jul	Aua	(38)m	= 0.33 × (34.39	(37)
if details of therm Total fabric he	eat loss	are not kn	own (36) =		Jun 23.56	Jul 23.56	Aug 23.44			25)m x (5 Nov 24.47	Dec 24.76	34.39	
if details of therm Total fabric he Ventilation he Jan (38)m= 25.38	eat loss cat loss cat loss cat 25.22	are not kn alculated Mar 25.06	own (36) = I monthly Apr	/ May	Jun		Ť	(38)m Sep 23.8	= 0.33 × (Oct 24.19	Nov 24.47	Dec	34.39	
if details of therm Total fabric he Ventilation he Jan (38)m= 25.38 Heat transfer	eat loss cat	are not kn alculated Mar 25.06 nt, W/K	own (36) = I monthly Apr 24.33	/ May 24.19	Jun 23.56	23.56	23.44	(38)m Sep 23.8 (39)m	$= 0.33 \times ($ Oct 24.19 $= (37) + ($	Nov 24.47 38)m	Dec 24.76	34.39	
if details of therm Total fabric he Ventilation he Jan (38)m= 25.38	eat loss cat loss cat loss cat 25.22	are not kn alculated Mar 25.06	own (36) = I monthly Apr	/ May	Jun		Ť	(38)m Sep 23.8 (39)m 58.19	= 0.33 × (Oct 24.19 = (37) + (37)	Nov 24.47 38)m 58.86	Dec 24.76 59.15		(38)
Total fabric he Ventilation he Jan (38)m= 25.38 Heat transfer	pal bridging pat loss at loss cat Feb 25.22 coefficier 59.61	Mar 25.06 nt, W/K 59.46	own (36) = I monthly Apr 24.33	/ May 24.19	Jun 23.56	23.56	23.44	(38)m Sep 23.8 (39)m 58.19	$= 0.33 \times ($ Oct 24.19 $= (37) + ($	Nov 24.47 38)m 58.86 Sum(39)	Dec 24.76 59.15	34.39 58.72	
if details of therm Total fabric her Ventilation her Jan (38)m= 25.38 Heat transfer (39)m= 59.77	pal bridging pat loss at loss cat Feb 25.22 coefficier 59.61	Mar 25.06 nt, W/K 59.46	own (36) = I monthly Apr 24.33	/ May 24.19	Jun 23.56	23.56	23.44	(38)m Sep 23.8 (39)m 58.19	= 0.33 × (Oct 24.19 = (37) + (3) 58.58 Average =	Nov 24.47 38)m 58.86 Sum(39)	Dec 24.76 59.15		(38)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
Assumo	ed occu	pancy, I	N								1.	68		(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.				,
	A £ 13.9 averag	•	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		74	.06		(43)
Reduce t	the annua	ıl average	hot water	usage by	5% if the c	lwelling is	designed t	to achieve		se target o		.00		(10)
not more	1		person per					l .	_				I	
Hot wate	Jan er usage in	Feb	Mar day for ea	Apr	May $Vd m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		
(44)111-	01.47	70.5	73.34	72.30	09.02	00.03	00.03	09.02	l		m(44) ₁₁₂ =	l	888.72	(44)
Energy c	ontent of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			ables 1b, 1			 ` '
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		
If instant	anaaya w	ator hooti	na ot noint	of upo (no	hot water	r otorogo)	ontor O in	hoves (16		Γotal = Su	m(45) ₁₁₂ =	•	1165.26	(45)
г					1			boxes (46)			Ι ,		Ī	(46)
(46)m= Water s	0 storage	0 loss:	0	0	0	0	0	0	0	0	0	0		(40)
Storage	e volum	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	-	_	ind no ta		-			` '					•	
			hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
,			m Table			`	3,					0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
			eclared o	-									! !	4
		•	factor fr ee section		ie Z (KVV	n/litre/da	ıy)					0		(51)
	-	from Ta										0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
			storage	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
	. , .	54) in (5	•	, ,				//==>				0		(55)
г			culated f			1 -		((56)m = (, , ,		1 -		1	(50)
(56)m=	0 r contains	0 dedicated	d solar sto	0 rage (57)	0 = (56)m	0 x [(50) = (0 H11)] <i></i> (5)	0) else (5	0 7)m = (56)	0 m where (0 H11) is fro	m Annend	lix H	(56)
					1		· · · · ·	1						(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		, ,
•		•	nual) fro			50\m - /	(50) · 26	SE v (41)	m			0		(58)
-						•	. ,	$65 \times (41)$		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	culated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m			•		•	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
			•	•	•	•	•	*	•		•	•		

Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	l
(62)m= 102.69 89.81 92.68 80.8 77.53 66.9 61.99 71.14 71.99 83.9 91.58 99.45	(62)
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)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 102.69 89.81 92.68 80.8 77.53 66.9 61.99 71.14 71.99 83.9 91.58 99.45	
Output from water heater (annual) ₁₁₂ 990.47	(64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]	
(65)m= 25.67 22.45 23.17 20.2 19.38 16.73 15.5 17.79 18 20.97 22.9 24.86	(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	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92 83.92	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 13.03 11.58 9.41 7.13 5.33 4.5 4.86 6.32 8.48 10.77 12.57 13.39	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	` '
(68)m= 146.2 147.71 143.89 135.75 125.48 115.82 109.37 107.85 111.68 119.82 130.09 139.74	(68)
	(00)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39	(69)
	(09)
Pumps and fans gains (Table 5a)	(70)
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	(7 4)
(71)m= -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13 -67.13	(71)
Water heating gains (Table 5)	
(72)m= 34.51 33.41 31.14 28.06 26.05 23.23 20.83 23.9 25 28.19 31.8 33.42	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 241.91 240.88 232.62 219.11 205.03 191.72 183.24 186.25 193.33 206.95 222.63 234.73	(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)	
	_
Northwest 0.9x 0.77 x 2.92 x 11.28 x 0.5 x 0.8 = 9.13	(81)
Northwest 0.9x 0.77 x 6.79 x 11.28 x 0.5 x 0.8 = 21.24	(81)
Northwest 0.9x 0.77 x 2.92 x 22.97 x 0.5 x 0.8 = 18.59	(81)
Northwest a a	_
Northwest $0.9x$ 0.77 x 6.79 x 22.97 x 0.5 x 0.8 = 43.23	(81)
Northwest 0.9x	(81)
	╡``
Northwest 0.9x 0.77 x 2.92 x 41.38 x 0.5 x 0.8 = 33.49	(81)

_														_
Northwest _{0.9x}	0.77	х	2.9	92	X	9	1.35	x	0.5	X	0.8	=	73.94	(81)
Northwest 0.9x	0.77	X	6.7	79	X	9	1.35	x	0.5	X	0.8	=	171.93	(81)
Northwest 0.9x	0.77	X	2.9	92	X	9	7.38	X	0.5	X	0.8	=	78.83	(81)
Northwest 0.9x	0.77	X	6.7	79	X	9	7.38	x	0.5	X	0.8	=	183.3	(81)
Northwest 0.9x	0.77	X	2.9	92	X	(91.1	x	0.5	X	0.8	=	73.74	(81)
Northwest _{0.9x}	0.77	X	6.7	79	X	(91.1	x	0.5	x	0.8	=	171.47	(81)
Northwest 0.9x	0.77	X	2.9	92	X	7	2.63	x	0.5	x	0.8	=	58.79	(81)
Northwest 0.9x	0.77	Х	6.7	79	X	7	2.63	X	0.5	X	0.8	=	136.7	(81)
Northwest 0.9x	0.77	Х	2.9	92	X	5	0.42	X	0.5	x	0.8	=	40.81	(81)
Northwest 0.9x	0.77	х	6.7	79	X	5	0.42	x	0.5	x	0.8	=	94.9	(81)
Northwest 0.9x	0.77	х	2.9	92	X	2	8.07	x	0.5	x	0.8	=	22.72	(81)
Northwest _{0.9x}	0.77	X	6.7	79	X	2	8.07	x	0.5	×	0.8	=	52.83	(81)
Northwest 0.9x	0.77	X	2.9	92	X		14.2	x	0.5	×	0.8	=	11.49	(81)
Northwest 0.9x	0.77	X	6.7	79	X		14.2	x	0.5	X	0.8	=	26.72	(81)
Northwest 0.9x	0.77	X	2.9	92	X		9.21	x	0.5	X	0.8	=	7.46	(81)
Northwest 0.9x	0.77	X	6.7	79	X		9.21	x	0.5	x	0.8	=	17.34	(81)
_		_ _								_				_
Solar gains in	watts, ca	lculated	for eacl	h month	h			(83)m	n = Sum(74)m	(82)m	1		_	
(83)m= 30.37	61.82	111.38	182.91	245.87	2	62.12	245.21	195	.48 135.71	75.5	5 38.21	24.8		(83)
Total gains - i	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts					_	_	
(84)m= 272.28	302.69	344	402.02	450.9	4	53.85	428.45	381	.73 329.04	282.4	9 260.84	259.53		(84)
7. Mean inter	nal tamp	oroturo /	/l +!:		· ·									
7. Mean inter	nai temp	erature (neating	seasoi	n)									
Temperature	•		`			area t	from Tal	ole 9	, Th1 (°C)				21	(85)
	during h	eating p	eriods ir	n the liv	ing			ole 9	, Th1 (°C)				21	(85)
Temperature	during h	eating p	eriods ir	n the liv	ring n (s				, Th1 (°C)	Oc	t Nov	Dec	21	(85)
Temperature Utilisation fac	during he	eating po	eriods ir	n the liv ea, h1,n	ring n (s	ee Ta	ble 9a)		ug Sep	Oc 0.92	-	Dec 0.98	21	(85)
Temperature Utilisation fac Jan (86)m= 0.97	during he stor for ga Feb 0.96	eating po ains for li Mar 0.94	eriods ir iving are Apr 0.88	n the livea, h1,n May	ring m (s	ee Ta Jun ^{0.65}	Jul 0.52	A 0.5	ug Sep 58 0.79	┢	-	-	21	
Temperature Utilisation fac	during he stor for ga Feb 0.96	eating po ains for li Mar 0.94	eriods ir iving are Apr 0.88	n the livea, h1,n May	n (s	ee Ta Jun ^{0.65}	Jul 0.52	A 0.5	ug Sep 58 0.79 able 9c)	┢	0.96	-	21	
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41	during heter for gase Feb 0.96 I tempera 18.64	eating positions for line Mar 0.94 ature in l	eriods ir iving are Apr 0.88 iving are	n the livea, h1,n May 0.78 ea T1 (f	n (s	ee Ta Jun 0.65 ow ste	Jul 0.52 ps 3 to 7 20.89	0.5 7 in T 20.	ug Sep 58 0.79 Table 9c) 84 20.49	0.92	0.96	0.98	21	(86)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna	during heter for gase Feb 0.96 I tempera 18.64	eating positions for line Mar 0.94 ature in l	eriods ir iving are Apr 0.88 iving are	n the livea, h1,n May 0.78 ea T1 (f	follo	ee Ta Jun 0.65 ow ste	Jul 0.52 ps 3 to 7 20.89	0.5 7 in T 20.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C)	0.92	0.96	0.98	21	(86)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92	during heter for garage Feb 0.96 l tempera 18.64 during heter 19.92	eating ponions for line Mar 0.94 eature in language 19.92	eriods ir Apr 0.88 iving are 19.74 eriods ir	n the livea, h1,n May 0.78 ea T1 (1 20.32 n rest of 19.94	m (s	ee Ta Jun 0.65 ow ste 20.72 velling	Jul 0.52 ps 3 to 7 20.89 from Ta	A 0.57 in T 20.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C)	0.92	0.96	0.98	21	(86)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors	during heter for gaset of for gaset or gaset or for gaset or for gaset or	eating ponions for line Mar 0.94 eature in language 19.92 eating ponions for r	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of d	n the livea, h1,n May 0.78 ea T1 (1 20.32 n rest of 19.94 welling,	ring (s	ee Ta Jun 0.65 ow ste 20.72 velling 19.95 ,m (se	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table	A 0.57 in T 20.42 able 9 19.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94	19.7	0.96 6 18.98 4 19.93	0.98 18.37 19.93	21	(86) (87) (88)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors (89)m= 0.97	during heter for gase to represent the second secon	eating ponions for line Mar 0.94 eating ponions for r 0.93	eriods ir iving are 0.88 iving are 19.74 eriods ir 19.93 est of do	n the livea, h1,n May 0.78 ea T1 (1 20.32 n rest of 19.94 welling, 0.74	ing m (s	ee Ta Jun 0.65 ow ste 20.72 velling 9.95 om (se 0.57	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42	A 0.57 in T 20.42 able 9 19.42 9a)	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94	0.92 19.7 19.9	0.96	0.98	21	(86)
Temperature Utilisation fact Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation fact (89)m= 0.97 Mean interna	during heter for gase to repeat the second s	eating ponding for line in lin	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of do 0.86 the rest	n the livea, h1,n May 0.78 ea T1 (fraction 20.32 n rest of 19.94 welling, 0.74 of dwel	follo	ee Ta Jun 0.65 w ste 20.72 velling 19.95 m (se 0.57	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste	A 0.5.7 in T 20. 20. 19. 19. 9a) 0.4	ug Sep 68 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab	0.92 19.7 19.9 0.9 e 9c)	0.96 18.98 4 19.93 0.96	0.98 18.37 19.93	21	(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors (89)m= 0.97	during heter for gase to represent the second secon	eating ponions for line Mar 0.94 eating ponions for r 0.93	eriods ir iving are 0.88 iving are 19.74 eriods ir 19.93 est of do	n the livea, h1,n May 0.78 ea T1 (1 20.32 n rest of 19.94 welling, 0.74	follo	ee Ta Jun 0.65 ow ste 20.72 velling 9.95 om (se 0.57	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42	A 0.57 in T 20.42 able 9 19.42 9a)	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59	0.92 19.7 19.9 0.9 [e 9c) 18.8	0.96 18.98 4 19.93 0.96	0.98 18.37 19.93 0.97		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors (89)m= 0.97 Mean interna	during heter for gase to repeat the second s	eating ponding for line in lin	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of do 0.86 the rest	n the livea, h1,n May 0.78 ea T1 (fraction 20.32 n rest of 19.94 welling, 0.74 of dwel	follo	ee Ta Jun 0.65 w ste 20.72 velling 19.95 m (se 0.57	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste	A 0.5.7 in T 20. 20. 19. 19. 9a) 0.4	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59	0.92 19.7 19.9 0.9 [e 9c) 18.8	0.96 18.98 4 19.93 0.96	0.98 18.37 19.93 0.97	0.49	(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors (89)m= 0.97 Mean interna (90)m= 17.55 Mean interna	during heter for gase to repeat the second s	eating ponions for line ature in language eating ponions for range eating eating for range eating eating for range eating for range eating for range eating ea	eriods ir iving are 0.88 iving are 19.74 eriods ir 19.93 est of do 0.86 the rest 18.86	n the livea, h1,r May 0.78 ea T1 (1 20.32 n rest of 19.94 welling, 0.74 of dwel 19.41	follo follo follo follo f dw	ee Ta Jun 0.65 w ste 20.72 velling 9.95 m (se 0.57 T2 (fo	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste 19.89	A 0.5 of 19.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59	0.92 19.7 19.9 0.9 [e 9c) 18.8	0.96 18.98 4 19.93 0.96	0.98 18.37 19.93 0.97		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors (89)m= 0.97 Mean interna (90)m= 17.55 Mean interna (92)m= 17.97	during heter for gase to repeat the second s	eating poning for line in land 19.09 eating poning for range of 19.92 eating for range of 19.92 eating for range of 18.23 eature in target of 18.65	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of do 0.86 the rest 18.86 r the whole 19.29	n the livea, h1,r May 0.78 ea T1 (1 20.32 n rest of 19.94 welling, 0.74 of dwel 19.41	ing m (s	ee Ta Jun 0.65 w ste 20.72 velling 9.95 m (se 0.57 T2 (fo 9.77 g) = fl 20.23	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste 19.89 LA × T1 20.38	A A 0.57 in T 20.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 10 7 in Tab 87 19.59 — fLA) × T2 35 20.03	0.92 19.7 19.9 0.9 0.9 18.8 fLA = L	0.96 18.98 19.93 0.96 18.13 ving area ÷ (0.98 18.37 19.93 0.97		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation factors (89)m= 0.97 Mean interna (90)m= 17.55 Mean interna (92)m= 17.97 Apply adjustn	during heter for gase to refer for gase 18.64 during heter for gase 19.92 deter for gase 17.78 determinent to the rest of the	eating poning for line mean poning for reacting poning for reactin	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of dr 0.86 the rest 18.86 r the wh 19.29 internal	n the live a, h1,n May 0.78 ea T1 (for 20.32 in rest or 19.94 in model of dwelling, 19.41 in ole dwelling, 19.85 it temper and the live	follo z follo follo z follo follo z follo z ratu follo follo z follo follo follo z follo follo follo z follo follo follo z follo follo follo follo z follo follo	ee Ta Jun 0.65 w ste 20.72 velling 9.95 m (se 0.57 T2 (fo 9.77 g) = fl 20.23 ure fro	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste 19.89 LA × T1 20.38 m Table	A 0.5 of 19. of	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59 — fLA) × T2 35 20.03 where appre	0.92 19.7 19.9 0.9 0.9 18.8 fLA = L 19.3 opriate	0.96 18.98 19.93 0.96 18.13 ving area ÷ (0.98 18.37 19.93 0.97 17.52 4) =		(86) (87) (88) (89) (90) (91) (92)
Temperature Utilisation fact Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation fact (89)m= 0.97 Mean interna (90)m= 17.55 Mean interna (92)m= 17.97 Apply adjustn (93)m= 17.97	during heter for gase to refer for gase to refer gase to refer gase 17.78 I temperate 17.78 I temperate 17.78	eating poning for line in land 19.92 eating poning for range of 19.92 eating for range of 19.92 eature in table 18.65 eature (for 18.65 eature in land 18.65	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of do 0.86 the rest 18.86 r the whole 19.29	n the livea, h1,r May 0.78 ea T1 (1 20.32 n rest of 19.94 welling, 0.74 of dwel 19.41	follo z follo follo z follo follo z follo z ratu follo follo z follo follo follo z follo follo follo z follo follo follo z follo follo follo follo z follo follo	ee Ta Jun 0.65 w ste 20.72 velling 9.95 m (se 0.57 T2 (fo 9.77 g) = fl 20.23	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste 19.89 LA × T1 20.38	A A 0.57 in T 20.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59 — fLA) × T2 35 20.03 where appre	0.92 19.7 19.9 0.9 0.9 18.8 fLA = L	0.96 18.98 19.93 0.96 18.13 ving area ÷ (0.98 18.37 19.93 0.97 17.52 4) =		(86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation fact (89)m= 0.97 Mean interna (90)m= 17.55 Mean interna (92)m= 17.97 Apply adjustm (93)m= 17.97 8. Space hear	during heter for gase tor for gase 18.64 during heter for gase 19.92 deter for gase 17.78 determinent to the 18.19 determ	eating poning for line in land	eriods ir iving are Apr 0.88 iving are 19.74 eriods ir 19.93 est of dr 0.86 the rest 18.86 r the wh 19.29 internal 19.29	n the livea, h1,n May 0.78 ea T1 (fraction 19.94 welling, 0.74 of dwel 19.41 nole dwe 19.85 tempe 19.85	follo follo follo follo follo follo follo follo follo z fawthered fawthered fawthered fawthered z z	ee Ta Jun 0.65 w ste 20.72 velling 9.95 m (se 0.57 T2 (fo 9.77 g) = fl 20.23 ure fro 20.23	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste 19.89 LA × T1 20.38 m Table 20.38	9a) 0.4 0.5 4eps 3 19.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59 - fLA) × T2 35 20.03 where appress 35 20.03	0.92 19.7 19.9 0.9 0.9 18.8 fLA = L 19.3 opriate 19.3	0.96 18.98 19.93 0.96 18.13 ving area ÷ (0.98 18.37 19.93 0.97 17.52 4) =	0.49	(86) (87) (88) (89) (90) (91) (92)
Temperature Utilisation fact Jan (86)m= 0.97 Mean interna (87)m= 18.41 Temperature (88)m= 19.92 Utilisation fact (89)m= 0.97 Mean interna (90)m= 17.55 Mean interna (92)m= 17.97 Apply adjustn (93)m= 17.97	during heter for gase tor for gase 18.64 during heter for gase 19.92 deter for gase 17.78 determine the second sec	eating poning for line in land	eriods in iving are Apr 0.88 iving are 19.74 eriods in 19.93 est of do 0.86 the rest 18.86 r the who 19.29 internal 19.29 internal 19.29	n the livea, h1,n May 0.78 ea T1 (fraction 19.94 welling, 0.74 of dwel 19.41 role dwe 19.85 I tempe 19.85 re obtai	follo follo follo follo follo follo follo follo follo z fawthered fawthered fawthered fawthered z z	ee Ta Jun 0.65 w ste 20.72 velling 9.95 m (se 0.57 T2 (fo 9.77 g) = fl 20.23 ure fro 20.23	Jul 0.52 ps 3 to 7 20.89 from Ta 19.95 ee Table 0.42 ollow ste 19.89 LA × T1 20.38 m Table 20.38	9a) 0.4 0.5 4eps 3 19.	ug Sep 58 0.79 Table 9c) 84 20.49 9, Th2 (°C) 95 19.94 18 0.73 1 to 7 in Tab 87 19.59 - fLA) × T2 35 20.03 where appress 35 20.03	0.92 19.7 19.9 0.9 0.9 18.8 fLA = L 19.3 opriate 19.3	0.96 18.98 19.93 0.96 18.13 ving area ÷ (0.98 18.37 19.93 0.97 17.52 4) =	0.49	(86) (87) (88) (89) (90) (91) (92)

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Mar

Jan

Feb

Utilisation fa	actor for g	ains, hm	n:										
(94)m= 0.96	0.94	0.91	0.85	0.74	0.59	0.46	0.52	0.74	0.89	0.94	0.96		(94)
Useful gain	s, hmGm	, W = (9	4)m x (8	4)m	!	!			!	!		l	
(95)m= 260.8	6 285.92	314.6	341.21	333.73	270.03	198.15	199.4	242.63	251.08	246.27	249.77		(95)
Monthly ave	erage exte	ernal 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)
Heat loss ra	ate for me	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 816.9	4 792.53	722.3	610.01	477.65	326.43	218.88	228.16	344.99	510.52	673.78	812.46		(97)
Space heat	ing requir	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m= 413.7	2 340.44	303.33	193.54	107.08	0	0	0	0	193.02	307.81	418.64		
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2277.57	(98)
Space heat	ing requir	ement in	kWh/m²	²/year								45.92	(99)
8c. Space of	cooling red	quiremer	nt										
Calculated	for June,	July and	August.	See Tal	ble 10b					_			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss ra	ate Lm (ca	lculated	using 2	5°C inter	rnal temp	oerature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m= 0	0	0	0	0	544.7	428.8	439.49	0	0	0	0		(100)
Utilisation fa	actor for lo	oss hm		•	•	•	•	•	•	•			
(101)m= 0	0	0	0	0	0.75	0.81	0.77	0	0	0	0		(101)
Useful loss,	, hmLm (V	Vatts) =	(100)m >	(101)m				_					
(102)m= 0	0	0	0	0	409.37	347.71	339.42	0	0	0	0		(102)
Gains (sola	r gains ca	lculated	for appli	icable w	eather re	egion, se	e Table	10)					
(103)m= 0	0	0	0	0	594.03	563.14	509.48	0	0	0	0		(103)
Space cool					dwelling,	continu	ous (kW	h = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
set (104)m	1	ì i		i	 			ı			ı	1	
(104)m= 0	0	0	0	0	132.95	160.28	126.52	0	0	0	0		_
									l = Sum(=	419.76	(104)
Cooled fracti		oblo 10b	`					† C =	cooled	area ÷ (4	1) =	1	(105)
Intermittency (106)m= 0	7 factor (1)		0	0	0.25	0.25	0.25	0	0	0	0		
(100)111= 0					0.25	0.25	0.25	!	<u> </u>	<u> </u>	<u> </u>		7(400)
Space coolin	na reauire	ment for	month =	: (104)m	× (105)	× (106)r	m	TOla	I = Sum(16U4)	=	0	(106)
(107)m= 0	0	0	0	0	33.24	40.07	31.63	0	0	0	0		
,		<u> </u>	<u> </u>	<u> </u>	<u> </u>	l		I Total	l = Sum(107)	 =	104.94	(107)
Space coolin	na require	ment in l	Λ/h/m2/s	vear) ÷ (4) =	10201			(108)
8f. Fabric En	• .				der spec	rial cone	litions s	` '	` ` '			2.12	(100)
Fabric Ener			aiculatet	i Orny un	der spe t	siai curic	mions, 50		+ (108) :	_		48.03	(109)
i abile Ellel	gy Lincie	поу						(33)	T (100):	_		40.03	(109)

			Пост Г) etaile.						
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 201		User D	Strom Softwa	are Ver	sion:			0028068 on: 1.0.4.18	
Address	B2A-101-07, Flat T			Address)1-07				
Address: 1. Overall dwelling dim	· ·	ype 2-20	A, VVIIIII	Jiedon, L	ondon					
1. Overall dwelling diff	1011310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.6	(2a) =	128.96	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n)	49.6	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	(3n) =	128.96	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0	=	0	x 2	20 =	0	(6b)
Number of intermittent f	ans				, E	0	x -	10 =	0	(7a)
Number of passive vent	ts					0	x ·	10 =	0	(7b)
Number of flueless gas						0	x	40 =	0	(7c)
rumber et muelees gae	00									(,,,)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (6	6a)+(6b)+(7	'a)+(7b)+((7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	ed, procee	d to (17),	otherwise (continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
	present, use the value corres nings); if equal user 0.35	sponaing ic	ine great	ler wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2			(4-)		0	(15)
Infiltration rate	50 1: 1			(8) + (10)	. , , ,	, , ,	, ,		0	(16)
If based on air permeab	e, q50, expressed in cul		•	•	•	etre of e	envelope	area	5	(17)
•	lies if a pressurisation test ha					is beina u	sed		0.25	(18)
Number of sides shelter				, ,	,	J			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.21	(21)
Infiltration rate modified	for monthly wind speed	d							_	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22\m · 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
(224)111- 1.21 1.23	1.20 1.1 1.00	0.90	0.90	0.32	'	1.00	1.14	1.10]	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(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		
Calculate effe		_	rate for t	he appli	cable ca	se	•		•		•	•	— ,
If mechanic			andiv N. (2	2h) _ (22c) v Emy (c	auation (VEVV othor	auioo (22h	\ _ (22a\			0.5	(23a
If exhaust air h) = (23a)			0.5	(23b)
		•	•	· ·		`			DL) (1	201.)	4 (00-)	0	(23c)
a) If balance	ea mecha 0	anicai ve	ntilation	with nea	at recove	ery (IVIVI	TR) (248	0 = (22)	2b)m + (<i>i</i>	23b) × [$\frac{1 - (23c)}{0}$	÷ 100] I	(24a
(27											0		(244
b) If balance	ea mecha 0	anicai ve		without	neat red		VIV) (240 0	, `	 		0		(24b
(24b)m= 0			0			0		0	0	0	0		(240)
c) If whole h	nouse ex n < 0.5 ×			•	•				5 v (23h	۸			
(24c)m = 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If natural									0.0	0.0	0.0		,
,	m = 1, the				•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•		
(25)m= 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
2. Host lessed	o and he	oot loop v	oromot	241			•						
3. Heat losse	es and ne	•			Net Ar	00	U-valı	10	AXU		k-value	·	λΧk
ELEMENT	area		Openin m		A,r		W/m2		(W/I	<)	kJ/m²·ł		J/K
Windows Type	e 1				2.92	x1/	[1/(1.35)+	- 0.04] =	3.74				(27)
Windows Type	e 2				6.79	<u>x</u> 1/	[1/(1.35)+	- 0.04] =	8.7				(27)
Floor					25.15	3 x	0.13	¦	3.26989				(28)
Walls	46.5	;6	9.71		36.85	=	0.15	=	5.53			$\exists \vdash$	(29)
Total area of e			0		71.72	=	00		0.00				(31)
* for windows and			ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	(0.)
** include the area									, ,	J	, , ,		
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				21.23	(33)
Heat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a)	(32e) =	2402.42	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
For design assess				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in T	able 1f		
can be used inste				icina An	nondiy l	,					ĺ		(20)
I DORMOI BRIDA	es . 5 (L	x i) can	CHAIEO I	asing Ap	penaix r	`						13.16	(36)
Thermal bridg	al hridaina	are not kn		- 0 05 v (3	•								
if details of therma Total fabric he		are not kn		= 0.05 x (3	•			(33) +	(36) =			34.39	(37)
if details of therma Total fabric he	eat loss		own (36) =		•					25)m x (5)	34.39	(37)
if details of therma Total fabric he Ventilation hea	eat loss at loss ca	alculated	own (36) =	/	1)	Jul	Aua	(38)m	= 0.33 × (34.39	(37)
if details of therma Total fabric he	eat loss		own (36) =		•	Jul 21.28	Aug 21.28			25)m x (5 Nov 21.28	Dec 21.28	34.39	(37)
if details of thermal Total fabric her Ventilation her Jan (38)m= 22.17	eat loss at loss ca Feb 21.94	alculated Mar 21.72	own (36) = I monthly Apr	/ May	Jun		Ť	(38)m Sep 21.28	= 0.33 × (Oct 21.28	Nov 21.28	Dec	34.39	
Total fabric her Ventilation her Jan (38)m= 22.17 Heat transfer of	eat loss cat los cat loss cat loss cat los cat loss cat loss cat loss cat loss cat loss cat loss cat l	Mar 21.72	own (36) = I monthly Apr 21.28	/ May 21.28	Jun 21.28	21.28	21.28	(38)m Sep 21.28 (39)m	$= 0.33 \times ($ Oct 21.28 $= (37) + ($	Nov 21.28 38)m	Dec 21.28	34.39	
if details of thermal Total fabric her Ventilation her Jan (38)m= 22.17	eat loss at loss ca Feb 21.94	alculated Mar 21.72	own (36) = I monthly Apr	/ May	Jun		Ť	(38)m Sep 21.28 (39)m 55.67	= 0.33 × (Oct 21.28 = (37) + (37)	Nov 21.28 38)m 55.67	Dec 21.28 55.67		(38)
Total fabric he Ventilation hea (38)m= 22.17 Heat transfer (eat loss cat los cat loss cat loss cat los cat loss cat loss cat loss cat loss cat loss cat los cat lo	Mar 21.72 nt, W/K	own (36) = I monthly Apr 21.28	/ May 21.28	Jun 21.28	21.28	21.28	(38)m Sep 21.28 (39)m 55.67	$= 0.33 \times ($ Oct 21.28 $= (37) + ($	Nov 21.28 38)m 55.67 Sum(39)	Dec 21.28 55.67	34.39 55.84	
if details of thermal Total fabric her Ventilation her Jan (38)m= 22.17 Heat transfer (39)m= 56.56	eat loss cat los cat loss cat loss cat los cat loss cat loss cat loss cat loss cat loss cat los cat lo	Mar 21.72 nt, W/K	own (36) = I monthly Apr 21.28	/ May 21.28	Jun 21.28	21.28	21.28	(38)m Sep 21.28 (39)m 55.67	= 0.33 × (Oct 21.28 = (37) + (3) 55.67 Average =	Nov 21.28 38)m 55.67 Sum(39)	Dec 21.28 55.67		(38)

Number of days in month (Table 1a)

			I			Ι.	Ι	Ι ,	Γ.	Ι	l	I 5	İ	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
\ eeum	ed occi	pancy, I	NI									00	1	(42)
				[1 - exp	(-0.0003	349 x (TF	-A -13.9)2)1 + 0.0	0013 x (⁻	TFA -13.		68		(42)
	A £ 13.9	-			(•		, ,,			- /			
			ater usaç									.06		(43)
		-	not water person pei			-	-	to achieve	a water us	se target o	f			
1			· · ·		i	 			<u> </u>		·		1	
Hotwoto	Jan	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 Y	Aug	Sep	Oct	Nov	Dec		
r	_	-						· ·					1	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		– , .
Energy o	content of	hot water	used - cal	culated m	onthly – 1	100 v Vd r	m v nm v F	Tm / 360(O kWh/mor		m(44) ₁₁₂ =		888.72	(44)
o,			1	ı						· ·		. ,	Ī	
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		–
If instant	taneous พ	ator hoatii	ng at point	of use (no	hot water	r storage)	enter∩in	hoves (46		Total = Su	m(45) ₁₁₂ =	=	1165.26	(45)
ſ							1		1	1	1	ı	Ī	(40)
(46)m=	18.12 storage	15.85	16.36	14.26	13.68	11.81	10.94	12.55	12.7	14.81	16.16	17.55		(46)
	_		includir	na anv si	olar or W	/M/HRS	storage	within s	ame ves	امء		0]	(47)
•		` ,	ind no ta	•			_		arrio voo	001		0		(47)
	-	_			_			, ,	ers) ente	er 'O' in <i>(</i>	47)			
	storage		not wate) (ti ii) ii	1014400 1	riotaritar	10040 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	010) 01110	31 O III (.,,			
	_		eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
			m Table			`	• ,					0		(49)
•			storage		-ar			(48) x (49) =			10		(50)
•			eclared o	-		or is not	known:	(10) X (10	, –		'	10		(50)
			factor fr	-							0.	.02		(51)
	-	•	ee secti	on 4.3										
		from Ta									1.	.03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
• • • • • • • • • • • • • • • • • • • •			storage	, kWh/y	ear			(47) x (51) x (52) x (53) =	1.	.03		(54)
Enter	(50) or (54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	i lix 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)
` ′ [<u> </u>		<u> </u>	l	l .	1	1	l				(50)
	-		nual) fro			50)	(50) - 00	SE (44)				0		(58)
-	-		culated t			•	. ,	, ,	ım a cylinde	r thormo	etat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
			l .			<u> </u>	<u> </u>		22.01	20.20	22.01	20.20		(30)
r	loss cal	culated	for each		(61)m =	(60) ÷ 30	65 × (41))m					Ī	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

	or water n	eatına ca	alculated	l tor eac	h month	(62)m :	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 176.09 155.5		148.55	146.49	132.2	128.21	138.97	138.19	153.98	161.24	172.28		(62)
Solar DHW input calculate	d using App	endix G or	· Appendix	: H (negati	ve quantity	/) (enter '	D' if no sola	r contribut	tion to wate	r heating)	ı	
(add additional lines	if FGHRS	and/or \	vwhrs	applies	, see Ap	pendix	G)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water he	eater				•		•				•	
(64)m= 176.09 155.5	9 164.31	148.55	146.49	132.2	128.21	138.97	138.19	153.98	161.24	172.28		
	•	•			•	Ou	put from wa	ater heate	r (annual) ₁	12	1816.1	(64)
Heat gains from water	er heating.	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1	
(65)m= 84.39 75.07	80.48	74.4	74.55	68.97	68.47	72.05	70.96	77.04	78.62	83.12		(65)
include (57)m in c	alculation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (s	ee Table 5	and 5a):									
Metabolic gains (Tal	le 5). Wat	ts										
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 83.92 83.92	83.92	83.92	83.92	83.92	83.92	83.92	83.92	83.92	83.92	83.92		(66)
Lighting gains (calcu	lated in A	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5	•			•	
(67)m= 13.03 11.58	9.41	7.13	5.33	4.5	4.86	6.32	8.48	10.77	12.57	13.39		(67)
Appliances gains (ca	lculated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Tal	ble 5			•	
(68)m= 146.2 147.7	1 143.89	135.75	125.48	115.82	109.37	107.85	111.68	119.82	130.09	139.74		(68)
Cooking gains (calcu	lated in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 31.39 31.39	31.39	31.39	31.39	31.39	31.39	31.39	31.39	31.39	31.39	31.39		(69)
Pumps and fans gair	ns (Table :	Ба)		•	•		•	•	•	•	•	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evapora	ion (nega	tive valu	es) (Tab	le 5)							-	
(71)m= -67.13 -67.13	3 -67.13											
	9 -07.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13		(71)
Water heating gains		-67.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13	-67.13		(71)
Water heating gains (72)m= 113.43 111.7	(Table 5)	ļ.	-67.13 100.2	-67.13 95.79	-67.13 92.03	-67.13 96.84	-67.13 98.55	-67.13 103.55	-67.13 109.19	-67.13 111.73] 	(71) (72)
	(Table 5)	ļ.		95.79	92.03	96.84	l	103.55	109.19	111.73]	. ,
(72)m= 113.43 111.7	(Table 5) 2 108.17	ļ.		95.79	92.03	96.84	98.55	103.55	109.19	111.73]]]	. ,
(72)m= 113.43 111.7 Total internal gains	(Table 5) 2 108.17	103.34	100.2	95.79	92.03)m + (67)m	96.84 + (68)m	98.55 + (69)m + (103.55 (70)m + (7	109.19 71)m + (72)	111.73		(72)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1	(Table 5) 2 108.17 = 3 309.64	103.34	100.2	95.79 (66) 264.28	92.03)m + (67)m 254.44	96.84 + (68)m 259.19	98.55 + (69)m + (103.55 (70)m + (7 282.3	109.19 (1)m + (72) 300.02	111.73 m 313.04		(72)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculate Orientation: Access	(Table 5) 2 108.17 = 3 309.64 ad using sola	103.34 294.39 r flux from Area	100.2 279.18 Table 6a a	95.79 (66) 264.28 and assoc	92.03 0m + (67)m 254.44 iated equa	96.84 + (68)m 259.19	98.55 + (69)m + (266.88	103.55 (70)m + (7 282.3	109.19 71)m + (72) 300.02 ble orientat	111.73 m 313.04	Gains	(72)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculate Orientation: Access Table 6	(Table 5) 2 108.17 = 3 309.64 ad using sola	103.34 294.39	100.2 279.18 Table 6a a	95.79 (66) 264.28 and assoc	92.03)m + (67)m 254.44	96.84 + (68)m 259.19	98.55 + (69)m + (266.88	103.55 (70)m + (7 282.3	109.19 71)m + (72) 300.02	111.73 m 313.04	Gains (W)	(72)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculate Orientation: Access Table 6 Northwest 0.9x 0.5	(Table 5) 2 108.17 = 3 309.64 ed using solars Factor	103.34 294.39 r flux from Area m²	100.2 279.18 Table 6a	95.79 (66) 264.28 and assoc Flu	92.03 0m + (67)m 254.44 iated equa	96.84 + (68)m 259.19	98.55 + (69)m + (266.88	103.55 (70)m + (7 282.3	109.19 71)m + (72) 300.02 ble orientat	111.73 m 313.04		(72)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculate Orientation: Access Table 6 Northwest 0.9x 0.1	(Table 5) 2 108.17 = 8 309.64 ed using solar Factor 6d	103.34 294.39 r flux from Area m²	100.2 279.18 Table 6a a	95.79 (66) 264.28 and assoc Flu Tal	92.03)m + (67)m 254.44 iated equality ble 6a	96.84 1 + (68)m 259.19 tions to c	98.55 + (69)m + (266.88 onvert to the G_ Table 6b	103.55 (70)m + (7 282.3 e applical	109.19 (1)m + (72) 300.02 ble orientat FF (able 6c	111.73 mm 313.04 ion.	(W)	(72)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculate Orientation: Access Table 6 Northwest 0.9x 0.1 Northwest 0.9x 0.2 Northwest 0.9x 0.3	(Table 5) 2	103.34 294.39 r flux from Area m² 2.9	100.2 279.18 Table 6a a	95.79 (66) 264.28 and assoc Flu Tal x 1	92.03)m + (67)m 254.44 iated equal X ble 6a	96.84 1 + (68)m 259.19 tions to c	98.55 + (69)m + (266.88 onvert to the G_ Table 6b 0.5	103.55 (70)m + (7 282.3 e applical	109.19 71)m + (72) 300.02 tole orientat FF Table 6c 0.8	111.73 mm 313.04 cion.	(W) 9.13	(72) (73) (81) (81) (81)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains are calculated Orientation: Access Table 6 Northwest 0.9x 0.0	(Table 5) 2 108.17 = 8 309.64 ed using sola Factor 6d 27	103.34 294.39 r flux from Area m² 2.9 6.7	100.2 279.18 Table 6a a	95.79 (66) 264.28 and associ Flu Tai X 1 X 2	92.03)m + (67)m 254.44 iiated equal IX ble 6a 11.28	96.84 1 + (68)m 259.19 tions to c	98.55 + (69)m + (266.88 onvert to the G_ Table 6b 0.5 0.5	103.55 (70)m + (7 282.3 e applical	109.19 71)m + (72) 300.02 cole orientate FF Table 6c 0.8 0.8	111.73 m 313.04 ion.	9.13 21.24	(72) (73) (81) (81) (81)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculate Orientation: Access Table 6 Northwest 0.9x 0.0	(Table 5) 2 108.17 = 3 309.64 ed using solar Factor 6d 27	294.39 r flux from Area m² 2.9 6.7	100.2 279.18 Table 6a a	95.79 (66) 264.28 and assoc Flu Tal x	92.03)m + (67)m 254.44 iated equal IX ble 6a 11.28 11.28	96.84 1 + (68)m 259.19 tions to c	98.55 + (69)m + (266.88 onvert to the G_ Table 6b 0.5 0.5	103.55 (70)m + (7 282.3 e applical T x x x	109.19 71)m + (72) 300.02 ble orientat FF able 6c 0.8 0.8	111.73 mm 313.04 cion.	9.13 21.24 18.59	(72) (73) (81) (81) (81)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculated Orientation: Access Table 6 Northwest 0.9x 0. Northwest 0.9x 0.	(Table 5) 2	294.39 r flux from Area m² 2.9 6.7	100.2 279.18 Table 6a a	95.79 (66) 264.28 and assoc Flu Tal x	92.03 m + (67)m 254.44 iated equal IX ble 6a 11.28 11.28 12.97	96.84 1 + (68)m 259.19 tions to c x	98.55 + (69)m	103.55 (70)m + (7 282.3 T	109.19 109.19 300.02 ble orientat FF able 6c 0.8 0.8 0.8	111.73 mm 313.04 cion.	(W) 9.13 21.24 18.59 43.23	(72) (73) (81) (81) (81) (81) (81)
(72)m= 113.43 111.7 Total internal gains (73)m= 320.83 319.1 6. Solar gains: Solar gains are calculated Orientation: Access Table 6 Northwest 0.9x 0.0	(Table 5) 2	294.39 r flux from Area m² 2.9 6.7 2.9 2.9	100.2 279.18 Table 6a a	95.79 (66) 264.28 and associ Flu Tai x	92.03)m + (67)m 254.44 iiated equa IX ble 6a 11.28 11.28 22.97 22.97	96.84 1 + (68)m 259.19 tions to c	98.55 + (69)m + (266.88 onvert to the G_ Table 6b 0.5 0.5 0.5 0.5	103.55 (70)m + (7 282.3 e applical X X X X X	109.19 71)m + (72) 300.02 cole orientat FF cable 6c 0.8 0.8 0.8 0.8	111.73 mm 313.04 cion.	9.13 21.24 18.59 43.23 33.49	(72) (73) (81) (81) (81) (81)

_								-						
Northwest _{0.9x}	0.77	х	2.9	92	X	9	1.35	X	0.5	X	0.8	=	73.94	(81)
Northwest 0.9x	0.77	X	6.7	79	X	9	1.35	X	0.5	X	0.8	=	171.93	(81)
Northwest 0.9x	0.77	x	2.9	92	x	9	7.38	X	0.5	X	0.8	=	78.83	(81)
Northwest 0.9x	0.77	x	6.7	79	X	9	7.38	X	0.5	x	0.8	=	183.3	(81)
Northwest _{0.9x}	0.77	Х	2.9	92	X	9	91.1	X	0.5	x	0.8	=	73.74	(81)
Northwest 0.9x	0.77	х	6.7	79	X	9	91.1	X	0.5	x	0.8	=	171.47	(81)
Northwest 0.9x	0.77	х	2.9	92	X	7	2.63	X	0.5	×	0.8	=	58.79	(81)
Northwest 0.9x	0.77	х	6.7	79	X	7	2.63	X	0.5	x	0.8	=	136.7	(81)
Northwest 0.9x	0.77	х	2.9	92	X	5	0.42	X	0.5	x	0.8	=	40.81	(81)
Northwest 0.9x	0.77	X	6.7	79	X	5	0.42	X	0.5	x	0.8	=	94.9	(81)
Northwest 0.9x	0.77	х	2.9	92	X	2	8.07	X	0.5	x	0.8	=	22.72	(81)
Northwest _{0.9x}	0.77	х	6.7	79	X	2	8.07	X	0.5	x	0.8	=	52.83	(81)
Northwest 0.9x	0.77	х	2.9	92	X		14.2	X	0.5	x	0.8	=	11.49	(81)
Northwest _{0.9x}	0.77	х	6.7	79	X		14.2	X	0.5	x	0.8	=	26.72	(81)
Northwest _{0.9x}	0.77	х	2.9	92	X	9	9.21	X	0.5	x	0.8	=	7.46	(81)
Northwest _{0.9x}	0.77	х	6.7	79	X	9	9.21	X	0.5	x	0.8	=	17.34	(81)
Solar gains in	watts, ca	alculated	for eac	h month	<u>1</u>			(83)n	n = Sum(74)m .	(82)m	1		_	
(83)m= 30.37	61.82	111.38	182.91	245.87	2	62.12	245.21	195	.48 135.71	75.5	5 38.21	24.8		(83)
Total gains – i	nternal a	and solar	(84)m =	= (73)m	+ (8	83)m	, watts						_	
(84)m= 351.2	381	421.02	477.3	525.05	5	526.4	499.65	454	.67 402.59	357.8	338.23	337.84		(84)
7. Mean inter	nal temp	perature	(heating	seasor	n)									
7. Mean inter Temperature			`			area f	from Tal	ole 9	, Th1 (°C)				21	(85)
	during h	neating p	eriods ii	n the liv	ing			ole 9	, Th1 (°C)				21	(85)
Temperature	during h	neating p	eriods ii	n the liv	ing n (s				, Th1 (°C)	Ос	t Nov	Dec	21	(85)
Temperature Utilisation fac	during h	neating p	eriods in	n the liv	ing n (s	ee Ta	ble 9a)		ug Sep	Oc 0.87	_	Dec 0.96	21	(85)
Temperature Utilisation fac Jan (86)m= 0.95	during heter for g	neating p ains for I Mar 0.91	eriods ii iving are Apr 0.84	n the livea, h1,n May	ing n (s	ee Ta Jun ^{0.57}	Jul 0.45	A 0.	ug Sep 5 0.71	-	_		21	
Temperature Utilisation fac	during heter for g	neating p ains for I Mar 0.91	eriods ii iving are Apr 0.84	n the livea, h1,n May	ing n (s	ee Ta Jun ^{0.57}	Jul 0.45	A 0.	ug Sep 5 0.71 able 9c)	-	0.93		21	
Temperature Utilisation fact Jan (86)m= 0.95 Mean interna (87)m= 18.79	during heter for general Feb 0.94 I temper 19.01	neating p ains for I Mar 0.91 rature in 19.43	eriods in iving are Apr 0.84 living ar	n the livea, h1,n May 0.72 ea T1 (f	ing n (s l follo	ee Ta Jun 0.57 ow ste 20.8	Jul 0.45 ps 3 to 7 20.93	A 0.	ug Sep 5 0.71 Table 9c) 9 20.64	0.87	0.93	0.96	21	(86)
Temperature Utilisation factors Jan (86)m= 0.95 Mean internal	during heter for general Feb 0.94 I temper 19.01	neating p ains for I Mar 0.91 rature in 19.43	eriods in iving are Apr 0.84 living ar	n the livea, h1,n May 0.72 ea T1 (f	ing n (s follo	ee Ta Jun 0.57 ow ste 20.8	Jul 0.45 ps 3 to 7 20.93	A 0.	ug Sep 5 0.71 Table 9c) 9 20.64 9, Th2 (°C)	0.87	0.93	0.96	21	(86)
Temperature Utilisation fact Jan (86)m= 0.95 Mean internation (87)m= 18.79 Temperature (88)m= 19.97	during heter for g Feb 0.94 I temper 19.01 during h	meating p ains for I Mar 0.91 rature in 19.43 neating p	eriods in iving are 0.84 living are 20 eriods in 19.98	n the livea, h1,n May 0.72 ea T1 (f 20.49 n rest of 19.98	n (s	ee Ta Jun 0.57 ow ste 20.8 velling	Jul 0.45 ps 3 to 7 20.93 from Ta	A 0.7 in 1 20 able 9 19.	ug Sep 5 0.71 Table 9c) 9 20.64 9, Th2 (°C)	20.03	0.93	0.96	21	(86)
Temperature Utilisation fact Jan (86)m= 0.95 Mean interna (87)m= 18.79 Temperature (88)m= 19.97 Utilisation fact	during heter for g Feb 0.94 I temper 19.01 during heter for g	neating p ains for I Mar 0.91 rature in 19.43 neating p 19.98 ains for I	eriods in iving are 0.84 living are 20 eriods in 19.98	n the livea, h1,n May 0.72 ea T1 (for 20.49 in rest of 19.98 welling,	ing (s)	ee Ta Jun 0.57 ow ste 20.8 velling 9.98 ,m (se	Jul 0.45 ps 3 to 7 20.93 from Ta 19.98 ee Table	A 0. 7 in 1 20 able 9 19.	ug Sep 5 0.71 Table 9c) .9 20.64 9, Th2 (°C) 98 19.98	20.03	0.93	0.96 18.77 19.98	21	(86) (87) (88)
Temperature Utilisation fact Jan (86)m= 0.95 Mean interna (87)m= 18.79 Temperature (88)m= 19.97 Utilisation fact (89)m= 0.94	during heter for g Feb 0.94 I temper 19.01 during heter for g 0.93	meating p ains for I Mar 0.91 rature in 19.43 neating p 19.98 ains for I 0.89	eriods in iving are 0.84 living are 20 eriods in 19.98 rest of d 0.81	n the livea, h1,n May 0.72 ea T1 (for 20.49 in rest of 19.98 welling, 0.68	ing (s)	ee Ta Jun 0.57 ow ste 20.8 velling 9.98 om (se 0.51	Jul 0.45 ps 3 to 7 20.93 from Ta 19.98 ee Table 0.36	A 0.7 in 7 20 able 9 19. 9a)	ug Sep 5 0.71 Table 9c) .9 20.64 9, Th2 (°C) 98 19.98	0.87 20.03 19.96	0.93 3 19.33 3 19.98	0.96	21	(86)
Temperature Utilisation fact Jan (86)m= 0.95 Mean internation (87)m= 18.79 Temperature (88)m= 19.97 Utilisation fact (89)m= 0.94 Mean internation	during heter for g Feb 0.94 I temper 19.01 during heter for g 0.93 I temper	meating p ains for I Mar 0.91 rature in 19.43 neating p 19.98 ains for I 0.89	eriods in iving are 0.84 living are 20 eriods in 19.98 rest of d 0.81 the rest	n the livea, h1,n May 0.72 ea T1 (f 20.49 n rest of 19.98 welling, 0.68 of dwel	follo	ee Ta Jun 0.57 w ste 20.8 velling 19.98 m (se 0.51 T2 (fo	Jul 0.45 ps 3 to 7 20.93 from Ta 19.98 ee Table 0.36 ollow ste	A 0 7 in 1 20 8 ble 9 9a) 0.4	ug Sep 5 0.71 Table 9c) 9 20.64 9, Th2 (°C) 98 19.98 10 0.65 10 7 in Table	0.87 20.03 19.96 0.85	0.93 3 19.33 3 19.98 0.92	0.96 18.77 19.98		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 0.95 Mean interna (87)m= 18.79 Temperature (88)m= 19.97 Utilisation factors (89)m= 0.94	during heter for g Feb 0.94 I temper 19.01 during heter for g 0.93	meating p ains for I Mar 0.91 rature in 19.43 neating p 19.98 ains for I 0.89	eriods in iving are 0.84 living are 20 eriods in 19.98 rest of d 0.81	n the livea, h1,n May 0.72 ea T1 (for 20.49 in rest of 19.98 welling, 0.68	follo	ee Ta Jun 0.57 ow ste 20.8 velling 9.98 om (se 0.51	Jul 0.45 ps 3 to 7 20.93 from Ta 19.98 ee Table 0.36	A 0.7 in 7 20 able 9 19. 9a)	ug Sep 5 0.71 Table 9c) .9 20.64 9, Th2 (°C) 98 19.98 11 0.65 1 to 7 in Table 91 19.63	0.87 20.03 19.96 0.85 e 9c) 18.8	0.93 3 19.33 3 19.98 0.92	0.96 18.77 19.98 0.95		(86) (87) (88) (89)
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Temperature Utilisation fact Jan (86)m= 0.95 Mean interna (87)m= 18.79 Temperature (88)m= 19.97 Utilisation fact (89)m= 0.94 Mean interna (90)m= 17.03 Mean interna (92)m= 17.89	during heter for g Feb 0.94 I temper 19.01 during heter for g 0.93 I temper 17.35 I temper 18.16	meating properties of the second properties of	eriods in iving are 0.84 living are 20 eriods in 19.98 rest of d 0.81 the rest 18.76 r the whal 19.37	n the livea, h1,n May 0.72 ea T1 (f 20.49 n rest of 19.98 welling, 0.68 of dwel 19.42 nole dwe 19.94	follo	ee Ta Jun 0.57 ow ste 20.8 velling 9.98 m (se 0.51 T2 (fo 9.81 g) = fl 20.29	Jul 0.45 ps 3 to 7 20.93 from Ta 19.98 pe Table 0.36 ollow ste 19.93 LA × T1 20.42	A A 0 7 in 1 200 7 in 1 9a) 19 9a) 0 + (1 20	ug Sep 5 0.71 Table 9c) .9 20.64 9, Th2 (°C) 98 19.98 11 0.65 10 7 in Table 91 19.63 - fLA) × T2 39 20.12	0.87 20.03 19.96 0.85 e 9c) 18.8 fLA = Li	0.93 19.33 19.98 0.92 1 17.83 ving area ÷ (-	0.96 18.77 19.98 0.95		(86) (87) (88) (89)
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Temperature Utilisation fact Jan (86)m= 0.95 Mean internation (87)m= 18.79 Temperature (88)m= 19.97 Utilisation fact (89)m= 0.94 Mean internation (90)m= 17.03 Mean internation (92)m= 17.89 Apply adjustr (93)m= 17.89	during heter for g Feb 0.94 I temper 19.01 during heter for g 0.93 I temper 17.35 I temper 18.16 ment to t 18.16	meating properties of the mean series of the mean s	eriods in iving are 0.84 living are 20 eriods in 19.98 rest of d 0.81 the rest 18.76 r the whal 19.37	n the livea, h1,n May 0.72 ea T1 (f 20.49 n rest of 19.98 welling, 0.68 of dwel 19.42 nole dwe 19.94	ing n (s follo ee Ta Jun 0.57 ow ste 20.8 velling 9.98 m (se 0.51 T2 (fo 9.81 g) = fl 20.29	Jul 0.45 ps 3 to 7 20.93 from Ta 19.98 pe Table 0.36 ollow ste 19.93 LA × T1 20.42	A A 0 7 in 1 200 7 in 1 9a) 19 9a) 0 + (1 20	ug Sep 5 0.71 able 9c) 9 20.64 9, Th2 (°C) 98 19.98 10.65 10 7 in Table 91 19.63 - fLA) × T2 39 20.12 where appre	0.87 20.03 19.96 0.85 e 9c) 18.8 fLA = Li	0.93 19.33 19.98 0.92 1 17.83 ving area ÷ (0.96 18.77 19.98 0.95 17.01 4) =		(86) (87) (88) (89) (90) (91)	
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Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Mar

Jan

Feb

I Militaria of a star for wains have								
Utilisation factor for gains, hm: (94)m= 0.93 0.91 0.87 0.79 0.68 0.53	0.4	0.45	0.66	0.83	0.9	0.93		(94)
Useful gains, hmGm , W = (94)m x (84)m	0.1	0.10	0.00	0.00	0.0	0.00		(- /
(95)m= 325.27 346.21 366.59 378.91 354.71 277.91	199.27	203.89	264.38	296.4	305.43	314.81		(95)
Monthly average external temperature from Table 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 mean internal temperature, Lm , W	 	1 - ` 	<u> </u>	ī —	l		1	(07)
(97)m= 768.79 746.9 683.22 582.61 458.94 316.89		222.3	335.2	490.17	638.05	761.03		(97)
Space heating requirement for each month, kWh/more (98)m= 329.98 269.27 235.57 146.66 77.55 0	$\frac{100}{100} = 0.02$	24 X [(97)m – (95 0	144.17	239.48	331.99		
()		<u> </u>	l per year	<u> </u>	<u> </u>	1	1774.67	(98)
Space heating requirement in kWh/m²/year			, ,		,	,	35.78	(99)
9b. Energy requirements – Community heating schem	e.							
This part is used for space heating, space cooling or v		tina prov	ided by	a comm	unitv sch	neme.		
Fraction of space heat from secondary/supplementary					,		0	(301)
Fraction of space heat from community system 1 – (30)1) =						1	(302)
The community scheme may obtain heat from several sources. The				up to four	other heat	sources; ti	he latter	
includes boilers, heat pumps, geothermal and waste heat from pow Fraction of heat from Community CHP	er stations.	See Appe	naix C.				0.67	(303a)
Fraction of community heat from heat source 2							0.33	(303b)
Fraction of total space heat from Community CHP				(3	02) x (303	a) =	0.67	(304a)
Fraction of total space heat from community heat sour	ce 2			(3	02) x (303	b) =	0.33	(304b)
Factor for control and charging method (Table 4c(3)) f	or comm	unity hea	ating sys	tem			1	(305)
Distribution loss factor (Table 12c) for community hear	ing syste	em					1.05	(306)
Space heating						·	kWh/yea	r
Annual space heating requirement							1774.67	
Space heat from Community CHP			(98) x (30	04a) x (30	5) x (306) :	=	1241.03	(307a)
Space heat from heat source 2			(98) x (30	04b) x (30	5) x (306) :	=	622.38	(307b)
Efficiency of secondary/supplementary heating system	n in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space heating requirement from secondary/supplement	ntary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating						,		_
Annual water heating requirement							1816.1	
If DHW from community scheme: Water heat from Community CHP			(64) x (30	03a) x (30	5) x (306) :	=	1270	(310a)
Water heat from heat source 2			(64) x (30	03b) x (30	5) x (306) :	=	636.91	(310b)
Electricity used for heat distribution		0.01	× [(307a).	(307e) +	- (310a)((310e)] =	37.7	(313)
Cooling System Energy Efficiency Ratio							0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity for pumps and fans within dwelling (Table 4 mechanical ventilation - balanced, extract or positive in		outside					61.36	(330a)
	.646.170111	. Catoluc					01.50	

warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year	-	=(330a) + (330b	o) + (330g) =		61.36	(331)
Energy for lighting (calculated in Appendix L)					230.16	(332)
Electricity generated by PVs (Appendix M) (negat	ve quantity)				-254.41	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)				0	(334)
12b. CO2 Emissions - Community heating schem	е					
Electrical efficiency of CHP unit					32	(361)
Heat efficiency of CHP unit					50.4	(362)
	Ener kWh		Emission fact kg CO2/kWh		nissions CO2/year	
Space heating from CHP) $(307a) \times 100 \div (307a) \times 1$	362) = 246	62.35 ×	0.22		531.87	(363)
less credit emissions for electricity $-(307a) \times (361)$	÷ (362) = 78	7.95 ×	0.52	[-408.95	(364)
Water heated by CHP (310a) × 100 ÷ (3	362) = 25	19.84 ×	0.22	[544.28	(365)
less credit emissions for electricity -(310a) x (361)	÷ (362) = 80	6.35 ×	0.52		-418.49	(366)
Efficiency of heat source 2 (%)	here is CHP using two fuels r	epeat (363) to	(366) for the second	d fuel	95	(367b)
CO2 associated with heat source 2	[(307b)+(310b)] x 10	00 ÷ (367b) x	0.22	= [286.32	(368)
Electrical energy for heat distribution	[(313) x		0.52	= [19.57	(372)
Total CO2 associated with community systems	(363)(366	5) + (368)(372	2)	= [554.6	(373)
CO2 associated with space heating (secondary)	(309) x		0	= [0	(374)
CO2 associated with water from immersion heate	r or instantaneous heat	er (312) x	0.22	= [0	(375)
Total CO2 associated with space and water heating	ng (373) + (374	1) + (375) =			554.6	(376)
CO2 associated with electricity for pumps and fan	s within dwelling (331))	x	0.52	= [31.85	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= [119.45	(379)
Energy saving/generation technologies (333) to (3 Item 1	34) as applicable		0.52 x 0.0	1 =	-132.04	(380)
Total CO2, kg/year sum of (370	5)(382) =		_		573.86	(383)
Dwelling CO2 Emission Rate (383) ÷ (4)	=				11.57	(384)
El rating (section 14)					91.87	(385)

			l lear F	Details:						
Access Name:	Ross Boult	00	U36FL		o N	her:		CTDO	020060	
Assessor Name:				Strom					028068	
Software Name:	Stroma FS	AP 2012	December	Softwa				versio	n: 1.0.4.18	
	B04 404 07		Property)1-07				
Address :		, Flat Type 2-2	20A, Wimi	bledon, L	ondon					
Overall dwelling dime	ensions:		•	4 0)						. .
Craying Haar				a(m²)	l., ,		eight(m)	_	Volume(m ³	<u>-</u>
Ground floor				49.6	(1a) x		2.6	(2a) =	128.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	49.6	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	128.96	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	= +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	(7a)
Number of passive vents	2				F	0	x	10 =	0	(7b)
•					Ļ			40 =		= '
Number of flueless gas f	ires					0	×	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a)+(6b)	+(7a)+(7b)+	(7c) =	Г	20		÷ (5) =	0.16	(8)
If a pressurisation test has t					_ continue fr			- (0) -	0.16	(0)
Number of storeys in t			(/,			(-)	(1.5)		0	(9)
Additional infiltration	3 (,					[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0).25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction	IX-		0	(11)
if both types of wall are p	resent, use the val	lue corresponding			•					 `
deducting areas of openi	• / .		0.4 ()	1\ -1						
If suspended wooden		,	U.1 (seale	ea), eise	enter U				0	(12)
If no draught lobby, en	•		ī						0	(13)
Percentage of window	s and doors dra	aught stripped		0.05 10.0					0	(14)
Window infiltration				0.25 - [0.2	` '	_			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	e area	5	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	rise (18) =	(16)				0.41	(18)
Air permeability value applie		n test has been o	done or a de	gree air pe	rmeability	is being u	ised			_
Number of sides sheltered	ed			(2.2)	(2	(19)
Shelter factor					[0.075 x (′	19)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18) x (20) =				0.34	(21)
Infiltration rate modified	 	'		T .			T		1	
Jan Feb	Mar Apr	May Jur	ı Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1				1	1	1	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4									
(00.)	, 	1.09 0.05	0.05	T 0.00		1	1 440	1 440	l	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted inf	iltration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.44		0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4]	
Calculate et		_	rate for t	he appli	cable ca	se		l					_
	ical ventila		on die N. (O	10h) (00-		C (I	NEW - di-) (00-)			0	(23a)
	r heat pump)) = (23a)			0	(23b)
	with heat reco	•	•	_								0	(23c)
· ·	iced mech	i		i	·	- 	, 	ŕ	- 		- ` ` `) ÷ 100] 1	(0.4=)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
· -	ced mech	i	r	i	i		1	<u> </u>	<u> </u>	1	1 .	1	(O.4h.)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0]	(24b)
•	e house ex o)m < 0.5 >			-	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natur	al ventilation	on or wh	ole hous	e positiv	re input	ventilati	on from I	oft	1	1		1	
if (22b	m = 1, th	en (24d)	m = (22l	o)m othe	rwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]	,		-	
(24d)m = 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58]	(24d)
Effective a	air change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	(25)				-	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
3. Heat los	ses and he	eat loss i	paramet	er:									
ELEMEN			Openin		Net Ar	ea	U-val	ue	ΑXU		k-value	e A	Χk
	area	(m^2)	'n		A ,r	m²	W/m2		(W/		kJ/m²•		J/K
Windows Ty	rpe 1				2.92	_x 1	/[1/(1.4)+	0.04] =	3.87				(27)
Windows Ty	rpe 2				6.79	_X 1	/[1/(1.4)+	0.04] =	9				(27)
Floor					25.15	3 x	0.13	=	3.2698	9			(28)
Walls	46.5	56	9.71		36.85	5 X	0.18	=	6.63	₹ i			(29)
Total area o	f elements	s, m²			71.72	2							(31)
* for windows a						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	
Fabric heat							(26)(30)) + (32) =				22.78	(33)
Heat capaci		,	,					((28).	(30) + (32	2) + (32a).	(32e) =	2402.42	(34)
Thermal ma	ss parame	ter (TMF	o = Cm -	: TFA) ir	n kJ/m²K	,		Indica	itive Value	: Medium		250	(35)
For design ass	essments wh	ere the de	tails of the				recisely the	e indicative	e values of	TMP in T	able 1f		`
can be used in				uoina An	nondiy l	V							(2C)
Thermal brid	-				-	N.						6.89	(36)
Total fabric		are not ki	OWII (30) -	- 0.00 X (3	')			(33) +	(36) =			29.67	(37)
Ventilation h	eat loss c	alculated	d monthly	V				(38)m	= 0.33 × ((25)m x (5))		` ′
Jar	T	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m= 25.3	+	25.06	24.33	24.19	23.56	23.56	23.44	23.8	24.19	24.47	24.76	1	(38)
Heat transfe	r coefficie	nt W/K			!			(39)m	= (37) + (38)m		1	
(39)m= 55.0		54.73	54	53.86	53.23	53.23	53.11	53.47	53.86	54.14	54.43	1	
(12)	1								Average =	L	<u> </u>	54	(39)
Heat loss pa	arameter (l	HLP), W	/m²K						= (39)m ÷				
(40)m= 1.11	1.11	1.1	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.09	1.1		
									Average =	Sum(40) ₁	12 /12=	1.09	(40)

Number of days in month (Table 1a)

Numbe	 		Man		N4=	1	11	Δ	0	0-4	Nierr	Data	I	
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assum	ed occu	pancy, I	N								1.	68		(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)			
	A £ 13.9 Laverag	•	ater usag	ae in litre	s per da	av Vd.av	erage =	(25 x N)	+ 36		74	.06		(43)
Reduce	the annua	l average	hot water	usage by	5% if the c	lwelling is	designed t	` ,		se target o		.00		(40)
not more	e that 125	litres per p	person per	day (all w	ater use, i	not and co	ld)						•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					•	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		_
Energy (content of	hot water	used - cal	culated m	onthly – 1	100 v Vd r	n v nm v Γ	Tm / 360(m(44) ₁₁₂ = ables 1b, 1		888.72	(44)
			·			1		ı		,		,	Ī	
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117	1405.00	7(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		i otai = Su	m(45) ₁₁₂ =		1165.26	(45)
(46)m=	18.12	15.85	16.36	14.26	13.68	11.81	10.94	12.55	12.7	14.81	16.16	17.55		(46)
` '	storage		.0.00	0	.0.00		10.01	12.00	.=		1			, ,
Storag	e volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If comr	munity h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage		oclared l	occ foct	or ic kno	wo (k\\/k	2/d2v/):					00	I	(40)
,			eclared l		טווא פו וכ	wii (Kvvi	i/uay).					39		(48)
•			m Table					(40) × (40)	\			54		(49)
• • • • • • • • • • • • • • • • • • • •			storage eclared o	-		or is not		(48) x (49)) =		0.	75		(50)
			factor fr	-								0		(51)
	•	•	ee secti	on 4.3										
	e factor			O.								0		(52)
-			m Table									0		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
	(50) or (, ,	,	or ooob	manth			//EC\m /	FF) (44).		0.	75		(55)
1			culated f						55) × (41)ı				1	(50)
(56)m=		21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58 H11) is fro	23.33	iv L	(56)
-													I	, \
(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)
	•	•	nual) fro									0		(58)
	-		culated f			•	. ,	, ,						
,			rom Tab								<u> </u>	20.00	Ī	(50)
(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)
1	loss cal	culated	for each		(61)m =	(60) ÷ 30	65 × (41))m		·	1		•	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$)m + (46)m + (57)m + (59)m + (61)m
(62)m= 167.41 147.75 155.63 140.15 137.81 123.8 119.53 130.29 129.79	45.3 152.83 163.6 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar co	ntribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
(64)m= 167.41 147.75 155.63 140.15 137.81 123.8 119.53 130.29 129.79	45.3 152.83 163.6
Output from wate	heater (annual) ₁₁₂ 1713.87 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]
(65)m= 77.45 68.8 73.53 67.68 67.6 62.24 61.53 65.1 64.23 7	0.09 71.9 76.18 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water	er is from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov Dec
	3.92 83.92 83.92 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
	0.87 12.68 13.52 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table	` ′
	19.82 130.09 139.74 (68)
	130.02
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39 31.39	1.39 31.39 31.39 (69)
	1.39 31.39 31.39
Pumps and fans gains (Table 5a)	2 2 (70)
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3	3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)	(74)
	67.13 -67.13 -67.13 (71)
Water heating gains (Table 5)	
(72)m= 104.09 102.38 98.83 94 90.87 86.45 82.7 87.51 89.21 9	4.21 99.86 102.39 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (80)m	m + (71)m + (72)m
	76.07 293.81 306.83 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the a	•
Orientation: Access Factor Area Flux g_ Table 6d m² Table 6a Table 6b	FF Gains Table 6c (W)
Northwest 0.9x 0.77 x 2.92 x 11.28 x 0.63	x 0.7 = 10.07 (81)
Northwest 0.9x 0.77 x 6.79 x 11.28 x 0.63	x = 0.7 = 23.41 (81)
Northwest 0.9x 0.77 x 2.92 x 22.97 x 0.63	x = 0.7 = 20.5 (81)
Northwest 0.9x 0.77 x 6.79 x 22.97 x 0.63	x = 0.7 = 47.66 (81)
Northwest 0.9x 0.77 x 2.92 x 41.38 x 0.63	x 0.7 = 36.93 (81)
Northwest 0.9x 0.77 × 6.79 × 41.38 × 0.63	x 0.7 = 85.87 (81)
Northwest 0.9x 0.77 x 2.92 x 67.96 x 0.63	
	x 0.7 = 60.64 (81)

Northwest _{0.9x}	0.77	X	2.9)2	X	9	1.35	X	0.63	X	0.7	=	81.52	(81)
Northwest _{0.9x}	0.77	X	6.7	'9	X	9	1.35	X	0.63	X	0.7	=	189.55	(81)
Northwest _{0.9x}	0.77	X	2.9)2	X	9	7.38	x	0.63	X	0.7	=	86.9	(81)
Northwest _{0.9x}	0.77	Х	6.7	'9	X	9	7.38	x	0.63	x	0.7	=	202.08	(81)
Northwest _{0.9x}	0.77	Х	2.9)2	X	9	91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest _{0.9x}	0.77	Х	6.7	' 9	X	9	91.1	x	0.63	x	0.7	=	189.05	(81)
Northwest 0.9x	0.77	х	2.9)2	X	7	2.63	x	0.63	x	0.7	=	64.81	(81)
Northwest 0.9x	0.77	x	6.7	' 9	X	7	2.63	x	0.63	×	0.7		150.71	(81)
Northwest 0.9x	0.77	х	2.9)2	X	5	0.42	x	0.63	x	0.7	=	44.99	(81)
Northwest 0.9x	0.77	x	6.7	' 9	X	5	0.42	x	0.63	x	0.7		104.63	(81)
Northwest 0.9x	0.77	x	2.9)2	X	2	8.07	x	0.63	×	0.7		25.05	(81)
Northwest 0.9x	0.77	х	6.7	'9	X	2	8.07	x	0.63	x	0.7	=	58.24	(81)
Northwest 0.9x	0.77	X	2.9)2	X	,	14.2	x	0.63	x	0.7	=	12.67	(81)
Northwest 0.9x	0.77	X	6.7	'9	X	_	14.2	x	0.63	x	0.7	=	29.46	(81)
Northwest 0.9x	0.77	X	2.9)2	X	9	9.21	x	0.63	x	0.7		8.22	(81)
Northwest 0.9x	0.77	x	6.7	9	X	9	9.21	x	0.63	x	0.7	-	19.12	(81)
_														
Solar gains in	watts ca	lculated	for eacl	h month	า			(83)m	n = Sum(74)m .	(82)m				
(83)m= 33.48	68.15	122.79	201.66	271.07	\neg	88.99	270.34	215	 	83.29		27.34		(83)
Total gains – ir													1	
(84)m= 348.1	381.11	426.19	489.78	543.96	Ť	46.98	518.49	468	.43 410.25	359.3	6 335.94	334.18	1	(84)
, ,						10.00	010.40	100	.40 410.20	000.0	0 000.04	004.10		(0.)
7 Maan intar														
7. Mean inter			`										•	_
Temperature			`			area f	from Tal	ole 9	, Th1 (°C)				21	(85)
	during h	eating p	eriods ir	n the liv	ing			ole 9	, Th1 (°C)				21	(85)
Temperature	during h	eating p	eriods ir	n the liv	ing n (s				, Th1 (°C)	Ос	t Nov	Dec	21	(85)
Temperature Utilisation fac	during h	eating po	eriods ir iving are	the livea, h1,n	ing n (s	ее Та	ble 9a)		ug Sep	Oc 0.96		Dec 1	21	(85)
Temperature Utilisation fac Jan (86)m= 1	during he tor for ga Feb 0.99	eating points for line Mar	eriods ir iving are Apr 0.93	n the liv ea, h1,n May 0.8	ing n (s	ee Ta Jun ^{0.6}	ble 9a) Jul 0.45	A 0.5	ug Sep 51 0.79	-			21	
Temperature Utilisation fac Jan (86)m= 1 Mean internal	during ho tor for ga Feb 0.99	eating points for line Mar 0.98 ature in l	eriods ir iving are Apr 0.93 iving are	n the livea, h1,n May 0.8	ing n (s	ee Ta Jun ^{0.6} ow ste	ble 9a) Jul 0.45 ps 3 to 7	0.5 7 in T	ug Sep 51 0.79 Table 9c)	0.96	0.99	1	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91	during hotel tor for garage Feb 0.99 tempera 20.04	eating points for line Mar 0.98 ature in l	eriods ir iving are Apr 0.93 iving are 20.62	n the livea, h1,n May 0.8 ea T1 (f	ing n (s	ee Ta Jun 0.6 ow ste	ble 9a) Jul 0.45 ps 3 to 7	0.5 7 in T 20.	ug Sep 51 0.79 Table 9c) 99 20.92	-	0.99		21	
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature	during hotel tor for garage feb 0.99 tempera 20.04 during hotel tempera 20.04	eating points for line Mar 0.98 ature in l 20.28 eating points	eriods ir iving are Apr 0.93 iving are 20.62 eriods ir	n the livea, h1,n May 0.8 ea T1 (f 20.88	ing n (s follo	ee Ta Jun 0.6 ow ste 20.98	Jul 0.45 ps 3 to 7 21 from Ta	A 0.57 in T 20.	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C)	0.96	0.99	19.89	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91	during hotel tor for garage Feb 0.99 tempera 20.04	eating points for line Mar 0.98 ature in l	eriods ir iving are Apr 0.93 iving are 20.62	n the livea, h1,n May 0.8 ea T1 (f	ing n (s follo	ee Ta Jun 0.6 ow ste	ble 9a) Jul 0.45 ps 3 to 7	0.5 7 in T 20.	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C)	0.96	0.99	1	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature	tor for gate feb 0.99 temperate 20.04 during he 20	eating positions for line Mar 0.98 ature in large 20.28	eriods ir iving are Apr 0.93 iving are 20.62 eriods ir 20.01	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of	ing n (s	Jun 0.6 w ste 20.98 velling	Jul 0.45 ps 3 to 7 21 from Ta 20.02	A 0.57 in T 20.	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C)	0.96	0.99	19.89	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature (88)m= 19.99	tor for gate feb 0.99 temperate 20.04 during he 20	eating positions for line Mar 0.98 ature in large 20.28	eriods ir iving are Apr 0.93 iving are 20.62 eriods ir 20.01	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of	n (s	Jun 0.6 w ste 20.98 velling	Jul 0.45 ps 3 to 7 21 from Ta 20.02	A 0.57 in T 20.	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C) 02 20.02	0.96	0.99	19.89	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature (88)m= 19.99 Utilisation fac (89)m= 0.99	tor for gate to tor for gate to to for gate to to for gate to for	eating points for line Mar 0.98 ature in l 20.28 eating points for r 0.97	eriods ir iving are 0.93 iving are 20.62 eriods ir 20.01 est of do	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of 20.01 welling, 0.75	ing n (s	Jun 0.6 www.ste 20.98 velling 20.02 "m (see 0.52	Jul 0.45 ps 3 to 7 21 from Ta 20.02 ee Table 0.35	A 0.57 in T 20. able 9 20. 9a) 0.4	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C) 02 20.02	20.59 20.0°	0.99	19.89		(86) (87) (88)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature (88)m= 19.99 Utilisation fac (89)m= 0.99 Mean internal	tor for gate to tor for gate to to for gate to to for gate to for	eating points for line Mar 0.98 ature in l 20.28 eating points for r 0.97	eriods ir iving are 0.93 iving are 20.62 eriods ir 20.01 est of do	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of 20.01 welling, 0.75	ing n (s following followi	Jun 0.6 www.ste 20.98 velling 20.02 "m (see 0.52	Jul 0.45 ps 3 to 7 21 from Ta 20.02 ee Table 0.35	A 0.57 in T 20. able 9 20. 9a) 0.4	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C) 02 20.02 11 0.72 10 7 in Table	20.59 20.0°	0.99	19.89		(86) (87) (88)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature (88)m= 19.99 Utilisation fac (89)m= 0.99	tor for gate temperature for for gate temperature for gate for gate for for gate for g	eating positive in the control of th	Apr 0.93 iving are 20.62 eriods ir 20.01 est of dr 0.91 che rest	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of 20.01 welling, 0.75 of dwel	ing n (s following followi	ee Ta Jun 0.6 ow ste 20.98 velling 20.02 ,m (se 0.52	Jul 0.45 ps 3 to 7 21 from Ta 20.02 ee Table 0.35 ollow ste	A 0.5.7 in T 20. 20. 20. 9a) 0.4	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C) 02 20.02 11 0.72 1 to 7 in Tabl 02 19.95	0.96 20.59 20.00 0.95 le 9c) 19.54	0.99 20.2 20.01 0.99	1 19.89 20 1 18.53		(86) (87) (88) (89)
Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature (88)m= 19.99 Utilisation fac (89)m= 0.99 Mean internal (90)m= 18.55	tor for gate to to for gate to to for gate to for gate 18.73	eating positive in I 20.28 eating positive in I 20.97 eature in I 19.09	eriods ir iving are 0.93 iving are 20.62 eriods ir 20.01 est of do 0.91 the rest 19.58	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of 20.01 welling, 0.75 of dwel 19.9	ing n (s	ee Ta Jun 0.6 ow ste 20.98 velling 20.02 ,m (se 0.52 T2 (fo	Jul 0.45 ps 3 to 7 21 from Ta 20.02 ee Table 0.35 collow ste	A 0.5 7 in T 20. 20. 9a) 0.4 eps 3	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C) 02 20.02 11 0.72 1 to 7 in Table 02 19.95	0.96 20.59 20.0° 0.95 le 9c) 19.54 fLA = Li	0.99	1 19.89 20 1 18.53	0.49	(86) (87) (88) (89)
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Temperature Utilisation fac Jan (86)m= 1 Mean internal (87)m= 19.91 Temperature (88)m= 19.99 Utilisation fac (89)m= 0.99 Mean internal (90)m= 18.55 Mean internal (92)m= 19.21 Apply adjustm (93)m= 19.21 8. Space hear	tor for garage of the second s	eating policins for line mean 19.67 irement enting policins for recording policins for reco	eriods ir iving are Apr 0.93 iving are 20.62 eriods ir 20.01 est of do 0.91 the rest 19.58 er the who 20.09 internal 20.09	n the livea, h1,n May 0.8 ea T1 (f 20.88 n rest of 20.01 welling, 0.75 of dwel 19.9 ole dwe 20.38 tempe 20.38	ing n (s follo 2 h2 h1 ling 2 ratu 2	ee Ta Jun 0.6 ow ste 20.98 velling 20.02 ,m (se 0.52 T2 (fo 20.01) g) = fl 20.48 ure fro 20.48	Jul 0.45 ps 3 to 7 21 from Ta 20.02 ee Table 0.35 ollow ste 20.02 A × T1 20.5 m Table 20.5	A A 0.57 in T 20. able 5 20. 9a) 0.4 4e, 20	ug Sep 51 0.79 Table 9c) 99 20.92 9, Th2 (°C) 02 20.02 11 0.72 1 to 7 in Table 02 19.95 - fLA) × T2 5 20.42 where appre 5 20.42	0.96 20.59 20.09 19.54 20.09 20.09 20.09	0.99 20.2 20.01 0.99 4 18.98 ving area ÷ (1 19.89 20 1 18.53 4) =	0.49	(86) (87) (88) (89) (90) (91)

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Mar

Jan

Feb

Utilisat	ion factor	r for ga	ains, hm	1:										
(94)m=		0.99	0.97	0.91	0.77	0.56	0.4	0.46	0.75	0.95	0.99	0.99		(94)
Useful	gains, hn	nGm ,	W = (94	4)m x (84	4)m									
(95)m=	345.72 3	76.65	414.39	447.66	419.09	305.98	206.46	215.52	307.8	340.33	331.53	332.3		(95)
Monthl	y average	e exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	oss rate fo						-` /	-``	`				1	
` ′		94.19	721.05	604.25	467.35	313.09	207.41	217.5	338.14	509.22	675.34	815.95	I	(97)
· -	heating r					r		 ` 	<u>``</u>	ŕ				
(98)m=	353.47 2	80.59	228.15	112.74	35.9	0	0	0	0	125.66	247.54	359.84		7,000
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1743.88	(98)
Space	heating r	equire	ement in	kWh/m²	/year								35.16	(99)
9a. Ene	rgy requir	remen	ıts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	heating:													,
Fractio	n of spac	e hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fractio	n of spac	e hea	t from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fractio	n of total	heatir	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficier	ncy of ma	in spa	ce heat	ing syste	em 1								93.5	(206)
Efficier	ncy of sec	conda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Space	heating r	equire	ement (c	alculate	d above))			· · ·				•	
	353.47 2	80.59	228.15	112.74	35.9	0	0	0	0	125.66	247.54	359.84		
(211)m :	= {[(98)m	x (20	4)] } x 1	00 ÷ (20	16)	-		-	-	-	-			(211)
	378.04 3	00.09	244.02	120.58	38.4	0	0	0	0	134.39	264.75	384.85		
_	•							Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	1865.11	(211)
Space	heating f	uel (se	econdar	y), kWh/	month							•		-
= {[(98 <u>)</u> r	n x (201)] } x 1	00 ÷ (20	8)		•				•	•			
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		,
								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water h	•													
	from wate	er heat 47.75	ter (calc 155.63	ulated al	oove) 137.81	123.8	119.53	130.29	129.79	145.3	152.83	163.6		
L	cy of wate			140.13	137.01	123.0	119.55	130.29	129.79	145.5	132.03	103.0	79.8	(216)
		86.5	85.83	84.24	81.8	79.8	79.8	79.8	79.8	84.43	86.09	86.86	79.6	(217)
` ' L	water he				01.0	79.0	79.0	7 9.0	79.0	04.43	00.09	00.00		(211)
	= (64)m	•												
(219)m=		70.81	181.32	166.37	168.47	155.14	149.79	163.27	162.64	172.09	177.52	188.34		
_								Tota	I = Sum(2	19a) ₁₁₂ =			2048.71	(219)
Annual										k'	Wh/year	. '	kWh/year	-
Space h	neating fu	el use	d, main	system	1								1865.11	
Water h	eating fue	el use	d										2048.71]
Electrici	ty for pun	nps, fa	ans and	electric	keep-ho	t						•		

central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				232.35	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission factors kg CO2/kWh	ctor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	402.86	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	442.52	(264)
Space and water heating	(261) + (262) + (263) + (264) =			845.38	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	120.59	(268)
Total CO2, kg/year	sum	of (265)(271) =		1004.9	(272)

TER =

(273)

20.26