Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.58 *Printed on 21 October 2022 at 12:33:26*

Project Informatic	on:				
Assessed By:		2005374	Building Type:	Detached House	
-	Ben Marsh (STR	JUUJ374)	Building Type:		
Dwelling Details:				05 20m ²	
NEW DWELLING			Total Floor Area: 1		
Site Reference :	New Project		Plot Reference:	Plot 7	
Address :	plot 7				
Client Details:					
Name:					
Address :					
-		vithin the SAP calculations.			
It is not a comple	te report of regula	tions compliance.			
1a TER and DER					
	ing system: Mains g	as			
Fuel factor: 1.00 (n	e <i>i</i>		$17 \text{F1} \text{kg/m}^2$		
•	xide Emission Rate Pioxide Emission Ra	, ,	17.51 kg/m² 15.80 kg/m²		ок
1b TFEE and DF			10.00 kg/m		UN
	gy Efficiency (TFE	Ξ)	54.0 kWh/m²		
-	ergy Efficiency (DF		46.5 kWh/m ²		
					ОК
2 Fabric U-value	S				
Element		Average	Highest		
External v	wall	0.17 (max. 0.30)	0.17 (max. 0.70)		ΟΚ
Floor		0.14 (max. 0.25)	0.14 (max. 0.70)		OK
Roof Openings		0.11 (max. 0.20) 1.40 (max. 2.00)	0.11 (max. 0.35) 1.40 (max. 3.30)		OK OK
2a Thermal bridg		1.40 (IIIax. 2.00)	1.40 (max. 5.50)		UK
		from linear thermal transmittar	ces for each junction		
3 Air permeabilit					
	oility at 50 pascals		5.00 (design valu	ne)	
Maximum			10.0)	ок
4 Heating efficie	ncv				
Main Heatin		Database: (rev 507, produ	ct index 017953):		
Main Floatin	ig eyeteni.	· ·	rs or underfloor heating - ma	ains das	
		Brand name: Vaillant	.	0.11	
		Model: ecoTEC exclusive 8			
		Model qualifier: VUW 356/	⊳-7 (H-GB)		
		(Combi) Efficiency 89.7 % SEDBUł	(2009		
		Minimum 88.0 %			ок
Secondary I	heating system:	None			

Regulations Compliance Report

5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls	TTZC by plumbing and	electrical services	ОК
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		ОК
7 Low energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (South Eas	t England):	Not assessed	?
10 Key features			
Roofs U-value		0.11 W/m²K	

Thermal Bridge Report

29.9

20.7

11.9

19.2

E6

E10

E12

E16

Property Details: Plot 7				
Address: Located in: Region: Thermal bridges:	plot 7 England South East England			
Thermal bridges:	User-defined = UD Default = D Approved = A User-defined (individ	lual PSI-values)	Y-Value = 0.0725	
External Junctions Details:				
Junction Type	PSI-Value	Length	Reference	Туре
Other lintels (including other steel lintels)	0.3	12.09	E2	[A]
Sill	0.04	9.147	E3	[A]
Jamb	0.05	26.78	E4	[A]
Ground floor (normal)	0.16	29.9	E5	[A]

0.07

0.06

0.24

0.09

Intermediate floor within a dwelling

Eaves (insulation at ceiling level)

Gable (insulation at ceiling level)

Corner (normal)

[A]

[A]

[A]

[A]



plot 7

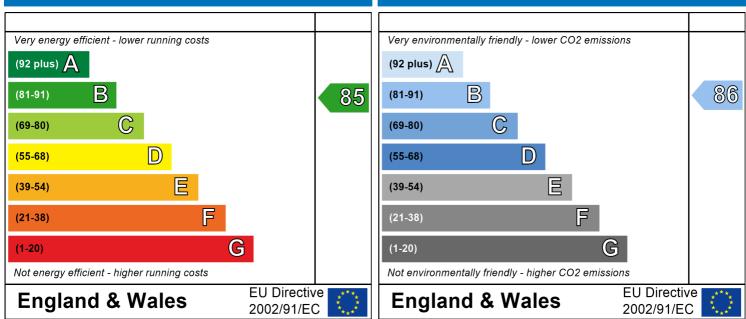
Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 21 October 2022 Ben Marsh 105.29 m²

Environmental Impact (CO₂) Rating

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

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

Energy Efficiency Rating



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

SAP Input

Property Details: Pl	ot 7							
Address:		plot 7						
Located in: Region:		Englan South I	a East England					
UPRN:			0					
Date of assessm Date of certifica			ober 2022 ober 2022					
Assessment type			welling design stag	e				
Transaction type		New du	welling					
Tenure type:	colocuro		occupied					
Related party dis Thermal Mass Pa			ive Value Low					
Water use <= 12			False					
PCDF Version:		507						
Property description	n:							
Dwelling type:		House						
Detachment:		Detach	ed					
Year Completed:		2022						
Floor Location:		Floor	area:	c	Storey height			
Floor 0		53.32 r	<u>ກ</u> 2		2.4 m	•		
Floor 1		51.97 r	n²		2.4 m			
Living area:			² (fraction 0.176)					
Front of dwelling fa	aces:	West						
Opening types:								
No man								
Name:	Source:		ype:	Glazing:		Argon:	Fram	
Front	Manufacturer	Sc	olid	-	ed	-	PVC-U	
		So W		Glazing: double-glaze double-glaze		Argon: Yes Yes		
Front Front	Manufacturer SAP 2012	So W W	blid Indows	double-glaze	ed	Yes	PVC-U PVC-U	
Front Front Rear Side Name:	Manufacturer SAP 2012 SAP 2012	So W W	blid Vindows Vindows	double-glaze double-glaze double-glaze	ed	Yes Yes	PVC-U PVC-U PVC-U PVC-U	
Front Front Rear Side Name: Front	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm	So W W W	olid Vindows Vindows Vindows Frame Facto 0.7	double-glaze double-glaze double-glaze r: g-value: 0	ed ed U-value: 1.4	Yes Yes Yes Area: 2.14	PVC-U PVC-U PVC-U PVC-U	
Front Front Rear Side Name: Front Front	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or	So W W W	olid Vindows Vindows Vindows Frame Facto 0.7 0.7	double-glaze double-glaze double-glaze r: g-value: 0 0.76	ed U-value: 1.4 1.4	Yes Yes Yes Area: 2.14 5.53	PVC-U PVC-U PVC-U PVC-U No. o 1 1	
Front Front Rear Side Name: Front	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm	r more r more	olid Vindows Vindows Vindows Frame Facto 0.7	double-glaze double-glaze double-glaze r: g-value: 0	ed ed U-value: 1.4	Yes Yes Yes Area: 2.14	PVC-U PVC-U PVC-U PVC-U	
Front Front Rear Side Name: Front Front Rear Side	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	more more more more	olid Vindows Vindows Frame Facto 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze r: g-value: 0 0.76 0.76 0.76 0.76	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1 1	f Openings:
Front Front Rear Side Name: Front Front Rear	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or	r more r more r more r more e: Lo	olid indows indows indows Frame Facto 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze r: g-value: 0 0.76 0.76	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1	f Openings:
Front Front Rear Side Name: Front Rear Side Name: Front Front Front	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	r more r more r more r more e: Lo E>	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 tocation: ct Walls tt Walls	double-glaze double-glaze double-glaze r: g-value: 0 0.76 0.76 0.76 0.76 0.76 Orient: Unspecified	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width:	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1 1 1	f Openings:
Front Front Rear Side Name: Front Rear Side Name: Front Front Front Rear	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	r more r more r more r more e: Lo E> E>	olid vindows vindows vindows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze 0 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 0 0 0	f Openings:
Front Front Rear Side Name: Front Rear Side Name: Front Front Front	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	r more r more r more r more e: Lo E> E>	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 tocation: ct Walls tt Walls	double-glaze double-glaze double-glaze r: g-value: 0 0.76 0.76 0.76 0.76 0.76 Orient: Unspecified	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 Heigł 0 0	f Openings:
Front Front Rear Side Name: Front Rear Side Name: Front Front Front Rear	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	r more r more r more r more e: Lo E> E> E> E> E>	olid vindows vindows vindows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze 0 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 0 0 0	f Openings:
Front Front Rear Side Name: Front Rear Side Name: Front Front Rear Side	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	r more r more r more r more e: Lo E> E> E> E> E>	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze 0 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0	PVC-U PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 0 0 0	f Openings:
Front Front Rear Side Name: Front Rear Side Name: Front Front Rear Side Overshading: Opaque Elements:	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or	r more r more r more r more e: Lo E> E> E> E> E>	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze 0 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified	ed U-value: 1.4 1.4 1.4	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0	PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 1 0 0 0 0	f Openings:
Front Front Rear Side Name: Front Front Rear Side Name: Front Front Rear Side Overshading: Opaque Elements: Type: External Elements	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or Type-Name	r more r more r more r more e: La E> E> E> E> Averag	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze o 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified Unspecified	ed D-value: 1.4 1.4 1.4 1.4 1.4 Ru value:	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0 0	PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 1 0 0 0 0	f Openings: nt: Kappa:
Front Front Rear Side Name: Front Rear Side Name: Front Front Rear Side Overshading: Opaque Elements: Type: External Elements Ext Walls	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or Type-Name	r more r more r more r more e: Lo E> E> E> E> E> Averag Openings: 16.81	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze o 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified Unspecified Unspecified	ed U-value: 1.4 1.4 1.4 1.4 1.4 Ru value: 0	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0	PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 1 0 0 0 0	f Openings: nt: Kappa: N/A
Front Front Rear Side Name: Front Front Rear Side Name: Front Front Rear Side Overshading: Opaque Elements: Type: External Elements	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or Type-Name	r more r more r more r more e: La E> E> E> E> Averag	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze o 0.76 0.76 0.76 0.76 Orient: Unspecified Unspecified Unspecified	ed D-value: 1.4 1.4 1.4 1.4 1.4 Ru value:	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0 0	PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 1 0 0 0 0	f Openings: nt: Kappa:
Front Front Rear Side Name: Front Front Rear Side Name: Front Front Rear Side Overshading: Opaque Elements: Type: External Elements Ext Walls Cold Roof Ground Floor Internal Elements	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or 16mm or Type-Name	r more r more r more r more e: Lo E> E> E> E> E> Averag Openings: 16.81	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze double-glaze 0 0.76 0.76 0.76 0.76 0.76 0.76 0.76 Unspecified Unspecified Unspecified Unspecified	ed U-value: 1.4 1.4 1.4 1.4 1.4 Ru value: 0	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0 0	PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 1 0 0 0 0	f Openings: nt: Kappa: N/A N/A
Front Front Rear Side Name: Front Front Rear Side Name: Front Front Rear Side Overshading: Opaque Elements: Type: External Elements Ext Walls Cold Roof Ground Floor	Manufacturer SAP 2012 SAP 2012 SAP 2012 Gap: mm 16mm or 16mm or 16mm or 16mm or Type-Name	r more r more r more r more e: Lo E> E> E> E> E> Averag Openings: 16.81	olid indows indows Frame Facto 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	double-glaze double-glaze double-glaze double-glaze 0 0.76 0.76 0.76 0.76 0.76 0.76 0.76 Unspecified Unspecified Unspecified Unspecified	ed U-value: 1.4 1.4 1.4 1.4 1.4 Ru value: 0	Yes Yes Yes Area: 2.14 5.53 8.43 0.714 Width: 0 0 0 0	PVC-U PVC-U PVC-U No. o 1 1 1 1 1 1 1 1 1 0 0 0 0	f Openings: nt: Kappa: N/A N/A

Thermal bridges:

SAP Input

Thermal bridges:	User-define Length	d (individual I Psi-valu		Y-Value = 0.0725
[Approved]	12.09	0.3	E2	Other lintels (including other steel lintels)
[Approved]	9.147	0.04	E3	Sill
[Approved]	26.78	0.05	E4	Jamb
[Approved]	29.9	0.16	E5	Ground floor (normal)
[Approved]	29.9	0.07	E6	Intermediate floor within a dwelling
[Approved]	20.7	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	11.9	0.24	E10	Gable (insulation at ceiling level)
[Approved]	19.2	0.24	E12	Corner (normal)
[Approved]	19.2	0.09	LIU	conter (normal)
Ventilation:				
Pressure test:	Yes (As des	aned)		
Ventilation:		itilation (extra	oct fans)	
Number of chimneys:	0		ict runs)	
5	0			
Number of open flues:				
Number of fans:	3			
Number of passive stacks:	0			
Number of sides sheltered:	2			
Pressure test:	5			
Main heating system:				
Main heating system: Main heating Control:	Gas boilers Fuel: mains Info Source Database: Has integra Brand name Model: eco Model quali (Combi boil Systems wi Central hea Design flow Boiler interl	and oil boilers gas Boiler Datak (rev 507, proc I PFGHRD E: Vaillant FEC exclusive fier: VUW 356 er) th radiators ting pump : 2 temperature ock: Yes	s duct index (835 6/5-7 (H-GE 2013 or late : Unknown	r
Main heating Control:		emperature zo	one control	by suitable arrangement of plumbing and electrical
	services	0. 0110		
	Control cod	e: 2110		
Secondary heating system:				
Secondary heating system:	None			
Water heating:				
Water heating:	From main	heating syste	m	
5	Water code			
	Fuel :mains	aas		
	No hot wat	•		
		eat Recovery S	System	
		(rev 507, prod	•	
	Solar panel			
Others:	Solar parier	. 1 0130		
Electricity tariff:	Standard Ta	ariff		
Electricity tariff:	No	u 111		
In Smoke Control Area:		atony		
Conservatory:	No conserv	atory		
Low energy lights:	100%	,		
Terrain type:		ban / suburba	11)	
EPC language:	English			

SAP Input

Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

							User [Details:						
	ssor N vare Na			n Marsh oma FS				Softwa	a Num are Vei				0005374 on: 1.0.5.58	
A			n lo	. 7		P	roperty	Address	: Plot /					
Addre		olling di	plo [.] mension											
1.000		ening un	TIENSION	ა.			Δre	a(m²)		Δν Ηο	ight(m)		Volume(m ³)	
Ground	d floor						-		(1a) x		<u>2.4</u>	(2a) =	127.97	(3a)
First flo								51.97	(1b) x		2.4	(2b) =	124.73	(3b)
Total flo	oor area	a TFA =	(1a)+(1	o)+(1c)+	(1d)+(1e	e)+(1n)	05.29	(4)			1		J
Dwellin	ıg volum	ne					L		(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	252.7	(5)
2. Ver	ntilation	rate:												_
				main heating		econdar neating	у	other		total			m ³ per hour	
Numbe	er of chir	nneys		0	+	0] + [0] = [0	X 4	40 =	0	(6a)
Numbe	er of ope	en flues	Γ	0	+	0] + [0] = [0	× 2	20 =	0	(6b)
Numbe	er of inte	rmittent	fans							3	x ^	10 =	30	(7a)
Numbe	er of pas	sive ver	nts						Ē	0	x ^	10 =	0	(7b)
Numbe	er of flue	less ga	s fires						Ē	0	x 4	40 =	0	(7c)
												Air ch	anges per ho	ur
Infiltrati	ion due	to chim	neys, flu	es and f	ans = (6	a)+(6b)+(7	a)+(7b)+	(7c) =	Г	30		÷ (5) =	0.12	(8)
lf a pr	essurisati	on test ha	s been ca	rried out o	r is intende	ed, proceed	d to (17),	otherwise	continue fr	rom (9) to ((16)			
		•		elling (n	s)								0	(9)
		filtration									[(9)-	-1]x0.1 =	0	(10)
								or mason	,	uction			0	(11)
				equal user		ponung to	uie grea		a (anei					
If sus	spendeo	d woode	n floor,	enter 0.2	! (unseal	ed) or 0.	1 (seal	ed), else	enter 0				0	(12)
lf no	draught	t lobby,	enter 0.0	05, else	enter 0								0	(13)
	-		ows and	doors di	aught st	ripped							0	(14)
	low infil								2 x (14) ÷ 1				0	(15)
	ation ra								+ (11) + (1				0	(16)
•		•		•			•	our per s	•	etre of e	nvelope	area	5	(17)
		-	-					/ise (18) =		·	1		0.37	(18)
	-	<i>[,] value ap</i> l es shelte		ressurisati	on test nas	s been aon	e or a de	egree air pe	rmeability	is being us	sea		0	
Shelter			sieu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltrati	ion rate	incorpo	rating sl	nelter fac	ctor			(21) = (18) x (20) =				0.31	(21)
			-	nthly wir		ł								· ` `
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly	y avera	ge wind	speed f	rom Tab	e 7									
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjust	ed infiltra	ation rat	,	ng for sh	nelter an	id wind s	peed) =	(21a) x	(22a)m				•	
Coloui	0.4	0.39	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
		al ventila	-		ne appli	cable ca	Se						0	(23a)
lf exh	aust air he	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If bala	anced with	heat reco	very: effic	iency in %	allowing	for in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If	balance	d mecha	anical ve	entilation	with he	at recove	ery (MV	HR) (24a	a)m = (22	2b)m + (2	23b) × [1	l – (23c)) ÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	overy (I	MV) (24b)m = (22	2b)m + (2	23b)		-	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
					•	•		on from c		.5 × (23b)			
(24c)m=	r í	0	0	0	0	0	0	0	0	0	0	0	1	(24c)
								n from l					1	
	<u> </u>		, ,	<u>`</u>	r Ó	r Ì	, 	0.5 + [(2	, 	- -			1	
(24d)m=		0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)
	0.58	change 0.58	rate - er 0.57	oter (24a) or (241	o) or (24)	c) or (24 0.54	d) in box	(25) 0.55	0.56	0.56	0.57	1	(25)
(25)m=	0.56	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(23)
3. He	at losse			paramete										
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·		A X k kJ/K
Doors						2.14	X	1.4	=	2.996				(26)
Windo	ws Type	e 1				5.53	x1	/[1/(1.4)+	0.04] =	7.33				(27)
Windo	ws Type	2				8.43	x1	/[1/(1.4)+	0.04] =	11.18				(27)
Windo	ws Type	93				0.714	, х1	/[1/(1.4)+	0.04] =	0.95				(27)
Floor						53.32	<u>x</u>	0.14	=	7.4648				(28)
Walls		143.	52	16.8	1	126.7	1 X	0.17	=	21.54				(29)
Roof		51.9	7	0		51.97	′ X	0.11	=	5.72				(30)
Total a	area of e	lements	, m²			248.8	1							(31)
				effective wi nternal wal			ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	h 3.2	
		s, W/K =			io ana par			(26)(30)	+ (32) =				57.17	(33)
Heat c	apacity	Cm = S(Axk)	,					((28).	(30) + (32	2) + (32a).	(32e) =	7473.2	
Therm	al mass	parame	ter (TMF	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Low		100	(35)
	-	ments wh ad of a dei			construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Te	able 1f		
					using Ap	opendix ł	<						18.03	(36)
if dotails													I	
			are not kn	own (36) =	= 0.05 x (3	81)								
Total f	abric he	at loss				31)				· (36) =			75.21	(37)
Total f	abric he	at loss		own (36) = d monthly Apr			Jul	Aug		(36) = = 0.33 × (Oct	25)m x (5) Nov	Dec	75.21	(37)

(38)m=	48.35	48.09	47.84	46.65	46.43	45.39	45.39	45.2	45.79	46.43	46.88	47.35		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	123.56	123.3	123.05	121.86	121.63	120.6	120.6	120.41	121	121.63	122.08	122.56		
											Sum(39)1.	12 /12=	121.86	(39)
		· · · ·	HLP), W/ I	r						= (39)m ÷	r		I	
(40)m=	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.14	1.15	1.16	1.16	1.16	4.40	
Numbe	er of dav	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.16	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
A													l	
		ıpancy,∣ 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.()013 x (⁻	TFA -13.		78		(42)
if TF	A £ 13.9	9, N = 1			·			, , <u>-</u>			, 			
			ater usag hot water							se target o		5.58		(43)
		-	person per			-	-		a water at	se larget o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			r day for ea					-						
(44)m=	116.14	111.92	107.7	103.47	99.25	95.03	95.03	99.25	103.47	107.7	111.92	116.14		
										Total = Su	m(44) ₁₁₂ =	=	1267.02	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		_
lf instant	aneous w	vater heati	ng at point	t of use (no	n hot water	r storage)	enter 0 in	hoxes (46		Total = Su	m(45) ₁₁₂ =	-	1661.26	(45)
	25.84	22.6	23.32	20.33	19.51	16.83	15.6	17.9	18.11	21.11	23.04	25.02	l	(46)
(46)m= Water	storage		23.32	20.33	19.51	10.05	15.0	17.9	10.11	21.11	23.04	25.02		(40)
Storage	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	occ fact	or ie kno	wp (k\//k	v/dov/):					0		(40)
,			m Table				i/uay).					0		(48) (49)
			storage		ar			(48) x (49)	_			0		(49)
			eclared of	-		or is not		(-10) X (-10)	. –			0		(30)
		-	factor fr		le 2 (kW	h/litre/da	ıy)					0		(51)
	•	-	ee secti	on 4.3									I	
		from Ta actor fro	bie ∠a m Table	2h								0 0		(52) (53)
			storage		aar			(47) x (51)	x (52) x (53) -				(54)
•••		(54) in (5	-	, KVVII/ yt	Jai			(47) × (51)	(JZ) X (55) -		0 0		(54)
	. ,	. , .	culated f	for each	month			((56)m = (55) × (41)	m	L	-	I	()
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	÷	-	-	-	-		-	-	-	-	-	m Append	l ix H	x -/
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
· · ·			L		L		I			I	L			

Primar	v circui	t loss (ar	nual) fro	om Table	2							0]	(58)
	•	t loss cal	,			59)m = ((58) ÷ 36	65 x (41)	m				1	()
	•	/ factor fi					` '	```		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m				-	1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	leat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		(62)
Solar DI	-IW input	calculated	using App	endix G o	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	1	
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	-	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		_
		-	-					Outp	out from w	ater heate	r (annual)	12	1661.26	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	57.27	50.09	51.69	45.06	43.24	37.31	34.57	39.67	40.15	46.79	51.07	55.46		(65)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Int	ternal g	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	ns (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	167	167	167	167	167	167	167	167	167	167	167	167]	(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	63.33	56.25	45.75	34.63	25.89	21.86	23.62	30.7	41.2	52.32	61.06	65.09		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	394.94	399.03	388.71	366.72	338.97	312.88	295.46	291.36	301.69	323.67	351.43	377.51]	(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5				
(69)m=	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48]	(69)
Pumps	s and fa	ns gains	(Table &	5a)									-	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	on (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34		(71)
Water	heating	gains (T	able 5)											
(72)m=	76.97	74.54	69.47	62.58	58.11	51.82	46.47	53.32	55.76	62.89	70.93	74.55		(72)
Total i	nterna	gains =				(66))m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)m	-	
(73)m=	648.39	642.97	617.08	577.09	536.12	499.71	478.7	488.53	511.8	552.03	596.57	630.3		(73)
6. So	lar gain	s:												
Solar g	gains are	calculated	using sola	r flux from	Table 6a			itions to co	onvert to th	ne applicat		tion.		
Orienta		Access F		Area		Flu		т	g_ able 6b	т	FF		Gains	
		Table 6d		m²		ra	ble 6a	I	anie 00	13	able 6c		(W)	
. .														
Solar ((83)m=	pains in	watts, ca	alculated	for eac	h month 0	0	0	(83)m = S	um(74)m 0	(82)m	0	0	1	(83)
	U U													(00)

7 Me	648.39	642.97	617.08	577.09	536.12	499.71	478.7	488.53	511.8	552.03	596.57	630.3		(84)
7.100	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area t	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.96	0.96	0.95	0.92	0.86	0.76	0.77	0.87	0.93	0.96	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ullow ste	ns 3 to 7	, 7 in Tabl	e 9c)					
(87)m=	18.58	18.7	18.99	19.43	19.92	20.42	20.72	20.7	20.34	19.73	19.09	18.55		(87)
		during h		l orioda ir	roct of	l dwolling	from To		h2 (°C)					
(88)m=	19.94	19.94	19.95	eriods ir 19.95	19.96	19.96	19.96	19.97	12 (C)	19.96	19.95	19.95		(88)
									10.00	10.00	10.00	10.00		()
				rest of d		r Ì	i	<u> </u>						(00)
(89)m=	0.96	0.96	0.95	0.93	0.9	0.81	0.66	0.68	0.83	0.92	0.95	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)	i			
(90)m=	16.71	16.88	17.31	17.95	18.66	19.36	19.74	19.72	19.25	18.39	17.47	16.68		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.18	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	17.04	17.2	17.6	18.21	18.88	19.55	19.91	19.89	19.44	18.62	17.75	17.01		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.04	17.2	17.6	18.21	18.88	19.55	19.91	19.89	19.44	18.62	17.75	17.01		(93)
8. Sp	ace hea	ting requ	uirement	i i										
				•		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	ilisation	factor fo	or gains	using Ta	ble 9a		r				, I	·	ulate	
the ut	ilisation Jan	factor fo Feb	or gains Mar	using Ta Apr		ned at ste Jun	ep 11 of Jul	Table 9l Aug	o, so tha Sep	t Ti,m=(Oct	76)m an Nov	d re-calc Dec	ulate	
the ut Utilisa	ilisation Jan ation fac	factor fo Feb tor for g	or gains Mar ains, hm	using Ta Apr I:	ble 9a May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ulate	(04)
the ut Utilisa (94)m=	ilisation Jan ation fac	factor fo Feb tor for ga	or gains Mar ains, hm 0.93	using Ta Apr : 0.91	ble 9a May 0.87		r				, I	·	ulate	(94)
the ut Utilisa (94)m= Usefu	ilisation Jan ation fac 0.94 Il gains,	factor fo Feb tor for ga 0.93 hmGm	or gains Mar ains, hm 0.93 , W = (94	using Ta Apr 1: 0.91 4)m x (84	ble 9a May 0.87 4)m	Jun 0.78	Jul 0.66	Aug 0.67	Sep 0.8	Oct 0.89	Nov 0.92	Dec 0.94	ulate	
the ut Utilisa (94)m= Usefu (95)m=	ilisation Jan ation fac 0.94 Il gains, 607.95	factor for Feb tor for gr 0.93 hmGm 600.61	or gains Mar ains, hm 0.93 W = (94 571.03	using Ta Apr 1: 0.91 4)m x (8- 523.49	ble 9a May 0.87 4)m 465.91	Jun 0.78 391.82	Jul	Aug	Sep	Oct	Nov	Dec	ulate	(94) (95)
the ut Utilisa (94)m= Usefu (95)m= Montl	ilisation Jan ation fac 0.94 Il gains, 607.95 nly avera	factor for Feb tor for ga 0.93 hmGm 600.61 age exte	or gains Mar ains, hm 0.93 , W = (94 571.03	using Ta Apr 1: 0.91 4)m x (84 523.49 perature	ble 9a May 0.87 4)m 465.91 e from Ta	Jun 0.78 391.82 able 8	Jul 0.66 313.77	Aug 0.67 325.98	Sep 0.8 410.15	Oct 0.89 489.59	Nov 0.92 551.15	Dec 0.94 593.42	ulate	(95)
the ut Utilisa (94)m= Usefu (95)m= Montl (96)m=	ilisation Jan ation fac 0.94 ul gains, 607.95 nly avera 4.3	factor for Feb tor for g 0.93 hmGm 600.61 age exte 4.9	or gains Mar ains, hm 0.93 W = (94 571.03 rnal tem 6.5	using Ta Apr a: 0.91 4)m x (84 523.49 perature 8.9	ble 9a May 0.87 4)m 465.91 e from Ta 11.7	Jun 0.78 391.82 able 8 14.6	Jul 0.66 313.77 16.6	Aug 0.67 325.98 16.4	Sep 0.8 410.15 14.1	Oct 0.89 489.59 10.6	Nov 0.92	Dec 0.94	ulate	
the ut Utilisa (94)m= Usefu (95)m= Montl (96)m= Heat	ilisation Jan ation fac 0.94 Il gains, 607.95 nly avera 4.3 loss rate	factor for Feb tor for g 0.93 hmGm 600.61 age exte 4.9	or gains Mar ains, hm 0.93 W = (94 571.03 rnal tem 6.5	Apr Apr 0.91 4)m x (84 523.49 perature 8.9 nal tempe	ble 9a May 0.87 4)m 465.91 e from Ta 11.7	Jun 0.78 391.82 able 8 14.6	Jul 0.66 313.77 16.6	Aug 0.67 325.98 16.4	Sep 0.8 410.15 14.1	Oct 0.89 489.59 10.6	Nov 0.92 551.15	Dec 0.94 593.42	ulate	(95)
the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m=	ilisation Jan ation fac 0.94 Il gains, 607.95 nly avera 4.3 loss rate 1574.02	factor for Feb tor for g 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99	or gains Mar ains, hm 0.93 , W = (94 571.03 rnal tem 6.5 an intern 1366.09	using Ta Apr 1: 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 1 873.44	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46	Jul 0.66 313.77 16.6 =[(39)m 399.58	Aug 0.67 325.98 16.4 x [(93)m 420.2	Sep 0.8 410.15 14.1 - (96)m 646.48	Oct 0.89 489.59 10.6] 975.78	Nov 0.92 551.15 7.1 1300.55	Dec 0.94 593.42 4.2	ulate	(95) (96)
the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m=	ilisation Jan ation fac 0.94 Il gains, 607.95 nly avera 4.3 loss rate 1574.02	factor for Feb tor for g 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99	or gains Mar ains, hm 0.93 , W = (94 571.03 rnal tem 6.5 an intern 1366.09	Apr Apr 0.91 4)m x (84 523.49 perature 8.9 nal tempe	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 1 873.44	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46	Jul 0.66 313.77 16.6 =[(39)m 399.58	Aug 0.67 325.98 16.4 x [(93)m 420.2	Sep 0.8 410.15 14.1 - (96)m 646.48	Oct 0.89 489.59 10.6] 975.78	Nov 0.92 551.15 7.1 1300.55	Dec 0.94 593.42 4.2	ulate	(95) (96)
the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space	ilisation Jan ation fac 0.94 Il gains, 607.95 nly avera 4.3 loss rate 1574.02 e heatin	factor for Feb tor for ga 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99 g require	or gains Mar ains, hm 0.93 W = (94 571.03 rmal tem 6.5 an intern 1366.09 ement fo	using Ta Apr 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 or each n	ble 9a May 0.87 4)m 465.91 9 from Ta 11.7 9 rature, 873.44 nonth, k\	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont	Jul 0.66 313.77 16.6 =[(39)m 1 399.58 th = 0.02	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97 0	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73	Nov 0.92 551.15 7.1 1300.55 1)m	Dec 0.94 593.42 4.2 1569.35 726.09	ulate 4296.63	(95) (96)
the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space (98)m=	ilisation Jan ation fac 0.94 Il gains, 607.95 hly avera 4.3 loss rate 1574.02 e heatin 718.76	factor for Feb tor for g 0.93 hmGm 600.61 age exte 4.9 for mea 1516.99 g require 615.81	or gains Mar ains, hm 0.93 , W = (94 571.03 rnal tem 6.5 an intern 1366.09 ement fo 591.53	using Ta Apr 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 or each n 439.95	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 1 873.44 nonth, kV 303.21	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont	Jul 0.66 313.77 16.6 =[(39)m 1 399.58 th = 0.02	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97 0	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73	Nov 0.92 551.15 7.1 1300.55 1)m 539.56	Dec 0.94 593.42 4.2 1569.35 726.09	4296.63	(95) (96) (97)](98)
the ut Utilisa (94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space (98)m=	ilisation Jan ation fac 0.94 I gains, 607.95 nly avera 4.3 loss rate 1574.02 e heatin 718.76	factor for Feb tor for gi 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99 g require 615.81 g require	or gains Mar ains, hm 0.93 , W = (9 571.03 rnal tem 6.5 an intern 1366.09 ement fo 591.53	using Ta Apr 1: 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 r each n 439.95	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 1 873.44 nonth, kV 303.21	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont 0	Jul 0.66 313.77 16.6 =[(39)m : 399.58 th = 0.02 0	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97) 0 Tota	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0 1 per year	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73	Nov 0.92 551.15 7.1 1300.55 1)m 539.56	Dec 0.94 593.42 4.2 1569.35 726.09		(95) (96) (97)
the ut Utilisa (94)m= Usefu (95)m= Montil (96)m= Heat (97)m= Space (98)m= Space (98)m=	ilisation Jan ation fac 0.94 Il gains, 607.95 nly avera 4.3 loss rate 1574.02 e heatin 718.76 e heatin ergy rec	factor for Feb tor for ga 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99 g require 615.81 g require	or gains Mar ains, hm 0.93 , W = (9 571.03 rnal tem 6.5 an intern 1366.09 ement fo 591.53	using Ta Apr 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 or each n 439.95	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 1 873.44 nonth, kV 303.21	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont 0	Jul 0.66 313.77 16.6 =[(39)m : 399.58 th = 0.02 0	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97) 0 Tota	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0 1 per year	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73	Nov 0.92 551.15 7.1 1300.55 1)m 539.56	Dec 0.94 593.42 4.2 1569.35 726.09	4296.63	(95) (96) (97)](98)
the ut Utilisa (94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space (98)m= Space 9a. En Space	ilisation Jan ation fac 0.94 I gains, 607.95 nly avera 4.3 loss rate 1574.02 e heatin 718.76 e heatin ergy rec e heatir	factor for Feb tor for gi 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99 g require 615.81 g require juiremen ng:	or gains Mar ains, hm 0.93 , W = (94 571.03 rnal tem 6.5 an intern 1366.09 ement fo 591.53 ement in ats - Ind	using Ta Apr 1: 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 r each n 439.95 kWh/m ² ividual h	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 873.44 nonth, kk 303.21	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont 0	Jul 0.66 313.77 16.6 =[(39)m 1 399.58 th = 0.02 0 ncluding	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97) 0 Tota micro-C	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0 1 per year	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73	Nov 0.92 551.15 7.1 1300.55 1)m 539.56	Dec 0.94 593.42 4.2 1569.35 726.09	4296.63	(95) (96) (97)](98)
the ut Utilisa (94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space (98)m= Space 9a. En Space Fracti	ilisation Jan ation fac 0.94 I gains, 607.95 hly avera 4.3 loss rate 1574.02 e heatin 718.76 e heatin ergy rec e heatin	factor for Feb tor for gi 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99 g require 615.81 g require juiremen ng: bace hea	or gains Mar ains, hm 0.93 W = (94) 571.03 rnal tem 6.5 an intern 1366.09 ement fo 591.53 ement in at from s	using Ta Apr 1: 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 or each n 439.95 kWh/m ² ividual h	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 873.44 nonth, k\ 303.21 4/year eating sy	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont 0	Jul 0.66 313.77 16.6 =[(39)m 2 399.58 th = 0.02 0 ncluding	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97) 0 Tota micro-C	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0 I per year CHP)	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73	Nov 0.92 551.15 7.1 1300.55 1)m 539.56	Dec 0.94 593.42 4.2 1569.35 726.09	4296.63 40.81 0	(95) (96) (97) (98) (99) (201)
the ut Utilisa (94)m= Usefu (95)m= Montil (96)m= Heat (97)m= Space (98)m= Space (98)m= Space Fracti	ilisation Jan ation fac 0.94 Il gains, 607.95 hly avera 4.3 loss rate 1574.02 e heatin 718.76 e heatin ergy rec e heatir ion of sp	factor for Feb tor for g: 0.93 hmGm 600.61 age exte 4.9 e for mea 1516.99 g require 615.81 g require pace hea bace hea	or gains Mar ains, hm 0.93 W = (94) 571.03 ornal tem 6.5 an interr 1366.09 ement for 591.53 ement in ts - Ind at from s at from m	using Ta Apr 1: 0.91 4)m x (84 523.49 perature 8.9 nal tempe 1134.53 r each n 439.95 kWh/m ² ividual h	ble 9a May 0.87 4)m 465.91 e from Ta 11.7 erature, 1 873.44 nonth, kV 303.21 4/year eating sy y/supple em(s)	Jun 0.78 391.82 able 8 14.6 Lm , W = 596.46 Wh/mont 0	Jul 0.66 313.77 16.6 =[(39)m : 399.58 th = 0.02 0 ncluding	Aug 0.67 325.98 16.4 x [(93)m 420.2 24 x [(97) 0 Tota micro-C	Sep 0.8 410.15 14.1 - (96)m 646.48)m - (95 0 I per year CHP) - (201) =	Oct 0.89 489.59 10.6] 975.78)m] x (4 361.73 (kWh/year	Nov 0.92 551.15 7.1 1300.55 1)m 539.56	Dec 0.94 593.42 4.2 1569.35 726.09	4296.63 40.81	(95) (96) (97) (98) (99)

Total gains – internal and solar (84)m = (73)m + (83)m, watts

Efficie	ency of I	main spa	ace heat	ing syste	em 1								90.6	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	n, %						0	(208)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space			· · ·	alculate	d above))			1			1	1	
	718.76	615.81	591.53	439.95	303.21	0	0	0	0	361.73	539.56	726.09		
(211)m	= {[(98)m x (20	4)] } x 1	100 ÷ (20)6)									(211)
	793.33	679.7	652.9	485.6	334.67	0	0	0	0	399.26	595.55	801.42		-
								Tota	ll (kWh/yea	ar) =Sum(2	211) _{15,1012}	2	4742.42	(211)
•				y), kWh/	month									
r		01)] } x 1		Î.									1	
(215)m=	0	0	0	0	0	0	0	0 Tota	0 II (kWh/yea	0	0	0		
								TULA	ii (KVVII/yea	ar) =0um(2	213) _{15,1012}	<u>-</u>	0	(215)
	heating		tor (calc	ulated a	hove)									
Cuipui	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		
Efficien	icy of w	ater hea	iter	I			I				I	I	85	(216)
(217)m=	89.46	89.44	89.37	89.22	88.84	85	85	85	85	88.96	89.3	89.5		 (217)
L Fuel fo	r water	heating,	kWh/m	onth			1				1		1	
(219)m	= (64)	<u>m x 100</u>) <u>m</u>				·				i	1	
(219)m=	192.53	168.42	173.93	151.9	146.37	132.01	122.33	140.38	142.05	158.18	172.01	186.37		-
_								lota	I = Sum(2'				1886.49	(219)
	I totals	fueluse	nd main	system	1					k	Wh/year	•	kWh/year	7
•	-			System	1								4742.42	ļ
water i	neating	fuel use	d										1886.49	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	ıl heatir	g pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)
Total e	lectricity	/ for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electric	ity for li	ghting											447.38	(232)
Total d	elivered	l energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				7151.29	(338)
10a. F	uel cos	ts - indiv	/idual he	eating sy	stems:									
						Fu	el			Fuel P	rice		Fuel Cost	
							/h/year			(Table	12)		£/year	
Space	heating	- main s	system 1	1		(21	1) x			3.4	8	x 0.01 =	165.04	(240)
Space	heating	- main s	system 2	2		(21	3) x			0	· · · · ·	x 0.01 =	0	(241)
Space	heating	- secon	dary			(21	5) x			13.	19	x 0.01 =	0	(242)
Water I	neating	cost (otl	ner fuel)			(21	9)			3.4	8	x 0.01 =	65.65	(247)
Pumps	, fans a	nd elect	ric keep	-hot		(23	1)			13.	19	x 0.01 =	9.89	(249)
			ch of (2	30a) to (230g) se			licable a	nd apply			-	Table 12a	-
Energy	for ligh	ting				(23)	∠)			13.	19	x 0.01 =	59.01	(250)

Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (2 Total energy cost (244)	54) as needed 5)(247) + (250)(254) =		419.59 (255	5)
11a. SAP rating - individual heating system	IS			
Energy cost deflator (Table 12)			0.42 (256	5)
Energy cost factor (ECF) [(25	5) x (256)] ÷ [(4) + 45.0] =		1.17 (257	')
SAP rating (Section 12)			83.64 (258	5)
12a. CO2 emissions – Individual heating s	stems including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216 =	1024.36 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263	3)
Water heating	(219) x	0.216 =	407.48 (264	4)
Space and water heating	(261) + (262) + (263) + (2	264) =	1431.85 (265	i)
Electricity for pumps, fans and electric keep	-hot (231) x	0.519 =	38.93 (267	')
Electricity for lighting	(232) x	0.519 =	232.19 (268	3)
Total CO2, kg/year		sum of (265)(271) =	1702.96 (272	!)
CO2 emissions per m ²		(272) ÷ (4) =	16.17 (273	5)
EI rating (section 14)			85 (274	F)
13a. Primary Energy				
	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22 =	5785.75 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263	\$)
Energy for water heating	(219) x	1.22 =	2301.52 (264	•)
Space and water heating	(261) + (262) + (263) + (2	264) =	8087.27 (265	i)
Electricity for pumps, fans and electric keep	-hot (231) x	3.07 =	230.25 (267	')
Electricity for lighting	(232) x	0 =	1373.46 (268	3)
'Total Primary Energy		sum of (265)(271) =	9690.99 (272	<u>?</u>)
Primary energy kWh/m²/year		(272) ÷ (4) =	92.04 (273	3)

				User D	etails:						
Assessor Name: Software Name:	Ben Marsh Stroma FS				Strom Softwa	are Vei				005374 n: 1.0.5.58	
			Р	roperty	Address	: Plot /					
Address :	plot 7										
1. Overall dwelling dime	ensions:				n (ma 2)		A., 11-) / o l o (
Ground floor					a(m²)	(10) X	Av. He		(20) -	Volume(m ³)	
						(1a) x	2	2.4	(2a) =	127.97	(3a)
First floor				5	51.97	(1b) x	2	2.4	(2b) =	124.73	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+(1r	1	05.29	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	252.7	(5)
2. Ventilation rate:											
	main heating		econdar eating	у	other		total			m ³ per hour	
Number of chimneys	0] + [0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	 +	0	ī + Г	0	- 1 - [0	x2	20 =	0	(6b)
Number of intermittent fa	ins					- L	3	x ′	10 =	30	(7a)
Number of passive vents	5					L L	0	x ′	10 =	0] (7b)
Number of flueless gas f	ires						0	x 4	40 =	0	_](7c)
5						L	•			•	
									Air ch	anges per hou	ır
Infiltration due to chimne	ys, flues and f	ans = <mark>(6</mark>	a)+(6b)+(7	a)+(7b)+(7c) =	Г	30	· ·	÷ (5) =	0.12	(8)
If a pressurisation test has l			ed, proceed	d to (17),	otherwise o	continue fr	om (9) to ((16)			_
Number of storeys in t	he dwelling (n	s)								0	(9)
Additional infiltration								[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: C							ruction			0	(11)
if both types of wall are p deducting areas of openi			ponding to	the great	ter wall are	a (after					
If suspended wooden	• / /		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no draught lobby, er	ter 0.05, else	enter 0								0	(13)
Percentage of window	s and doors di	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabi	lity value, then	(18) = [(1	7) ÷ 20]+(8	8), otherw	ise (18) = ((16)				0.37	(18)
Air permeability value applie		on test has	s been don	e or a de	gree air pe	rmeability	is being us	sed			-
Number of sides sheltere	ed				(20) - 1	[0 075 v (1	0)1			2	(19)
Shelter factor	Cara a bailtean fair	4			(20) = 1 -		[9]] =			0.85	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.31	(21)
Infiltration rate modified		· · ·						NI.		l	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp										I	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.1.1	0.4	0.39	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
		al ventila	-	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	√5)) , othe	rwise (23b) = (23a)			0	(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If	balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVH	HR) (24a	a)m = (22	2b)m + (1	23b) × [1	– (23c)		(
, (24a)m=		0	0	0	0	0	0	0	0	0	0	0	-	(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation c then (24c	•	•				5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (22t		•				0.5]				
(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	x (25)					
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3. He	at losse	s and he	eat loss i	paramete	er:									
ELEN		Gros area	S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·l		A X k kJ/K
Doors						2.14	x	1.4	=	2.996				(26)
Windov	ws Type	e 1				5.53	x1/	/[1/(1.4)+	0.04] =	7.33				(27)
Windov	ws Type	2				8.43	x1/	/[1/(1.4)+	0.04] =	11.18				(27)
Windov	ws Type	93				0.714	x1/	/[1/(1.4)+	0.04] =	0.95				(27)
Floor						53.32	<u>x</u>	0.14	=	7.4648				(28)
Walls		143.	52	16.8	1	126.7	1 X	0.17	=	21.54				(29)
Roof		51.9	17	0		51.97	' x	0.11	=	5.72				(30)
Total a	rea of e	lements	, m²			248.8	1							(31)
				effective wil nternal wall			ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in j	paragraph	n 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				57.17	(33)
Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a)	.(32e) =	7473.28	(34)
Therm	al mass	parame	ter (TMF	⁻ = Cm ÷	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	Low		100	(35)
can be ι	ised inste	ad of a de	tailed calc					ecisely the	e indicative	values of	TMP in Ta	ible 1f		
	-		•	culated ι	• •	•	<						18.03	(36)
	of therma abric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			75.04	(37)
			alculated	d monthly	/						25)m x (5)		75.21	(37)
	Jan	Feb	Mar	Apr	, May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m=	48.35	48.09	47.84	46.65	46.43	45.39	45.39	45.2	45.79	46.43	46.88	47.35		(38)
			_	40.00	40.40	40.00	40.00	40.2				47.00		(00)
1			· ·						. ,	= (37) + (3	· ·			
(39)m=	123.56	123.3	123.05	121.86	121.63	120.6	120.6	120.41	121	121.63	122.08	122.56		
Heat Ic	oss nara	meter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) ₁	12 /12=	121.86	(39)
(40)m=	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.14	1.15	1.16	1.16	1.16		
(-)				-							Sum(40)1	I	1.16	(40)
Numbe	er of day	s in mo	nth (Tab	le 1a)						^o		L		
	Jan	Feb	Mar	Apr	Мау	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	ting ene	rgy requi	irement:								kWh/ye	ar:	
		ipancy, l		[1 - ovo	(_0 0003		-13 Ω)2)] + 0.0	1013 v /	FEA _13		.78		(42)
	A £ 13.9		+ 1.70 X	li - exh	(-0.0003	949 X (11	A -13.9	<i>)</i> 2)] + 0.0	JU13 X (IFA - 13.	.9)			
Annua	laverag	e hot wa						(25 x N)				5.58		(43)
		-		• •		-	-	to achieve	a water us	se target o	f			
		· · ·	person per	- · ·	r		·							
Hot wot	Jan	Feb	Mar day for ea	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
i	-		-		r	r	r	· ·	r		1			
(44)m=	116.14	111.92	107.7	103.47	99.25	95.03	95.03	99.25	103.47	107.7	111.92	116.14		٦
Enerav o	content of	hot water	used - cal	culated mo	onthlv = 4.	190 x Vd.r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b. 1		1267.02	(44)
(45)m=	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		
(10)		100.01	100.10	100.02	100.01		100.00	110.02			m(45) ₁₁₂ =	I	1661.26	(45)
lf instant	aneous w	ater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46				L		
(46)m=	25.84	22.6	23.32	20.33	19.51	16.83	15.6	17.9	18.11	21.11	23.04	25.02		(46)
Water	storage	loss:	1	1	I	1	1	1	1		I			
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-	ind no ta		-			• •						
			hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss facto	or is kno	wn (k\//h	n/dav).					0		(48)
,			m Table				"aay).					0		(49)
			storage		əar			(48) x (49)) –					(50)
0,			eclared of			or is not		(40) X (40)	, –			0		(50)
,			factor fr	•								0		(51)
	-	-	ee secti	on 4.3										
		from Ta		Oh								0		(52)
			m Table									0		(53)
			storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	. ,	(54) in (5	,	(au I	التحريم معر			((50))				0		(55)
1	-	r	culated f	1	r	·	i	((56)m = (i			,		
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
it cylinde	er contains	s dedicate	a solar sto	rage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5	u), else (5	/)m = (56)	m where (H11) is fro	om Appendix	КН	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primar	v circui	t loss (ar	nual) fro	om Table	• 3							0]	(58)
	•	t loss cal	,			59)m = ((58) ÷ 36	65 × (41)	m				1	
(mo	dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	, cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 30	65 × (41)m					-	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
Total h	leat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		(62)
Solar Di	-IW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	1	
(add a	dditiona	al lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	-	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		_
								Outp	out from w	ater heate	r (annual)₁	12	1661.26	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	57.27	50.09	51.69	45.06	43.24	37.31	34.57	39.67	40.15	46.79	51.07	55.46		(65)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Int	ternal g	ains (see	Table 5	5 and 5a):									
Metab	olic gaiı	ns (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				-	
(67)m=	25.33	22.5	18.3	13.85	10.36	8.74	9.45	12.28	16.48	20.93	24.42	26.04]	(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-		-	
(68)m=	264.61	267.35	260.43	245.7	227.11	209.63	197.96	195.21	202.13	216.86	235.46	252.93		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5				
(69)m=	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92		(69)
Pumps	and fa	ns gains	(Table &	5a)			•			•	•	•		
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. e	/aporatio	n (nega	tive valu	es) (Tab	le 5)	•			•	•	•		
(71)m=	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34		(71)
Water	heating	gains (T	able 5)											
(72)m=	76.97	74.54	69.47	62.58	58.11	51.82	46.47	53.32	55.76	62.89	70.93	74.55		(72)
Total i	nterna	gains =		•		(66))m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72))m		
(73)m=	434.67	432.14	415.95	389.89	363.33	337.95	321.62	328.57	342.12	368.43	398.57	421.27		(73)
6. So	lar gain	s:	ı		ı			ı						
Solar g	gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	tion.		
Orienta		Access F	actor	Area		Flu		-	g	-	FF		Gains	
		Table 6d		m²		Ta	ble 6a	Т	able 6b	T	able 6c		(W)	
		watts, ca		1		1	1		um(74)m .	1	r		1	(0.5)
(83)m=	0	0	0	0	0	0	0	0	0	0	0	0		(83)

(84)m=	434.67	432.14	415.95	389.89	363.33	337.95	321.62	328.57	342.12	368.43	398.57	421.27		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area l	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.98	0.98	0.96	0.93	0.87	0.88	0.94	0.97	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ns 3 to 7	in Table	e 9c)					
(87)m=	18.25	18.37	18.68	19.15	19.68	20.22	20.58	20.55	20.13	19.46	18.79	18.23		(87)
Tom		during h		orioda ir	roct of	dwolling	from To		h2 (°C)					
(88)m=	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.97	19.96	19.96	19.95	19.95		(88)
														. ,
		tor for ga	0.98	0.97	velling, l	n2,m (se 0.9	0.8	, 	0.02	0.96	0.98	0.98		(89)
(89)m=	0.98							0.81	0.92		0.98	0.98		(03)
		l temper				<u> </u>	1	· · · · · · · · · · · · · · · · · · ·		,			I	(0.0)
(90)m=	16.23	16.41	16.87	17.55	18.32	19.11	19.6	19.56	18.98	18.01	17.03	16.2		(90) רבי ר
									Т	LA = LIVIN	g area ÷ (4	+) =	0.18	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	ling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	16.59	16.76	17.18	17.83	18.56	19.31	19.77	19.73	19.18	18.27	17.34	16.56		(92)
	<u> </u>	nent to th			· · ·		m Table			-			I	
(93)m=	16.59	16.76	17.18	17.83	18.56	19.31	19.77	19.73	19.18	18.27	17.34	16.56		(93)
		ting requ						T 1 1 01		· .	70)			
		mean int factor fo		•		ed at ste	ep 11 of	I able 90	o, so tha	t II,m=(76)m an	d re-caid	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	L	tor for g		•	,									
(94)m=	0.97	0.97	0.96	0.95	0.93	0.88	0.78	0.79	0.89	0.94	0.96	0.97		(94)
Usefu	ul gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	422.18	418.88	401.19	372.12	338.55	296.4	251.68	260.14	304.78	347.84	384.39	410.11		(95)
	<u> </u>	age exte					· · · · ·						l	
(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)
		e for mea		· · ·					· ,		4050.00	4544.44		(07)
(97)m=		1462.12		1088.69	834.66	567.86	382.03	401.48	614.67	932.72	1250.29	1514.41		(97)
Space (98)m=		~ ~ ~ ~			ابا ماندهم)	1 \			
	r	g require					1	_ ,		_ 、	· · · · · ·	821.6		
(90)11=	e heatin 815.26	g require 701.06	ement fo 679.63	r each n 515.93	1000 1000 1000 1000 1000 1000 1000 100	Wh/mont 0	th = 0.02	0	0	435.15	623.45	821.6	4061 18	
	815.26	701.06	679.63	515.93	369.1		1	0		435.15	623.45		4961.18	(98)
	815.26	ř i	679.63	515.93	369.1		1	0	0	435.15	623.45		4961.18 47.12	(98) (99)
Space 9a. En	815.26 e heatin ergy rec	701.06 g require	679.63 ement in	515.93 kWh/m ²	369.1 /year	0	0	0 Tota	0 I per year	435.15	623.45			-
Space 9a. En Spac	815.26 e heatin ergy rec e heatir	701.06 g require quiremen	679.63 ement in its – Indi	515.93 kWh/m² ividual h	369.1 /year eating sy	0 /stems i	0 ncluding	0 Tota	0 I per year	435.15	623.45		47.12	(99)
Space 9a. En Spac Fracti	815.26 e heatin ergy rec e heatin ion of sp	701.06 g require quiremen ng: pace hea	679.63 ement in hts – Ind	515.93 kWh/m² ividual h econdar	369.1 /year eating sy y/supple	0 /stems i	0 ncluding	0 Tota micro-C	0 I per year CHP)	435.15	623.45		47.12 0	(99) (201)
Space 9a. En Spac Fracti Fracti	815.26 e heatin ergy rec e heatin ion of sp ion of sp	701.06 g require quiremen	679.63 ement in its – Indi it from so it from m	515.93 kWh/m² vidual h econdar nain syst	369.1 //year eating sy y/supple em(s)	0 /stems i	0 ncluding system	0 Tota micro-C (202) = 1 -	0 I per year CHP)	435.15 (kWh/year	623.45		47.12	(99)

Total gains – internal and solar (84)m = (73)m + (83)m, watts

Efficie	ency of	main spa	ace heat	ting syste	em 1								90.6	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g requir	ement (o	calculate	d above))	1	1	1		1	1		
	815.26	701.06	679.63	515.93	369.1	0	0	0	0	435.15	623.45	821.6		
(211)m		í .	1 · · ·	100 ÷ (20	<u>,</u>								1	(211)
	899.84	773.79	750.14	569.46	407.4	0	0	0	0	480.3	688.13	906.85		-
		/						Tota	l (kWh/yea	ar) =5um(2	211) _{15,1012}	=	5475.92	(211)
			econdar 00 ÷ (20	ˈy), kWh/ ນອນ	month									
(215)m=			00 - (20	0	0	0	0	0	0	0	0	0		
							I	Tota	l I (kWh/yea	ar) =Sum(2	1 215) _{15,1012}	 =	0	(215)
Water	heating	3												
Output	from w	ater hea	ter (calc	ulated a	bove)								1	
	172.24	150.64	155.45	135.52	130.04	112.21	103.98	119.32	120.74	140.72	153.6	166.8		_
1		ater hea	ì		1			1	i		1	1	85	(216)
(217)m=		89.56	89.5	89.38	89.07	85	85	85	85	89.16	89.44	89.6		(217)
		-	, kWh/m) ÷ (217)											
. ,	192.29	168.21	173.68	151.63	145.99	132.01	122.33	140.38	142.05	157.82	171.75	186.16		
I			•	•				Tota	I = Sum(2	19a) ₁₁₂ =			1884.3	(219)
	I totals									k	Wh/year		kWh/yea	r
Space	heating	fuel use	ed, main	system	1								5475.92	
Water	heating	fuel use	ed										1884.3	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	ng pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)
Total e	lectricit	y for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting		-									447.38	(232)
	•		for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				7882.6	(338)
				`	, , ,	. ,	uding mi	、 ,						
							Ŭ							
							hergy Vh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space	heating	(main s	system 1)		(21	1) x			0.2	16	=	1182.8	(261)
Space	heating	(secon	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating					(21	9) x			0.2	16	=	407.01	(264)
Space	and wa	ter heat	ing			(26	1) + (262)	+ (263) + (264) =				1589.81	(265)
Electric	city for p	oumps, f	ans and	electric	keep-ho	t (23	1) x			0.5	19	=	38.93	(267)
Electric	city for I	ighting				(23	2) x			0.5	19	=	232.19	(268)
Total C	CO2, kg	/year							sum o	f (265)(2	271) =		1860.92	(272)

Dwelling CO2 Emission Rate

EI rating (section 14)

(272) ÷ (4) =

17.67	(273)
83	(274)

					User I	Details:						
Assessor Name:	Ber	n Marsh				Strom	a Num	ber:		STRO	005374	
Software Name:	Stro	oma FS	AP 201	2		Softwa	are Vei	rsion:		Versic	on: 1.0.5.58	
				P	roperty	Address	: Plot 7					
Address :	plot	7										
1. Overall dwelling dim	ensions	S:										
					Are	ea(m²)		Av. Hei	ight(m)	-	Volume(m ³))
Ground floor						53.32	(1a) x	2	2.4	(2a) =	127.97	(3a)
First floor						51.97	(1b) x	2	2.4	(2b) =	124.73	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	105.29	(4)			_		_
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	252.7	(5)
2. Ventilation rate:												
		main neating		econdar neating	У	other		total			m ³ per hou	•
Number of chimneys	Ē	0] + [0] + [0	=	0	X 4	40 =	0	(6a)
Number of open flues	Γ	0	<u> </u> + [0	<u> </u> + [0	- =	0	x	20 =	0	(6b)
Number of intermittent f	ans						- L	4	x ′	10 =	40	(7a)
Number of passive vent	s						Ē	0	x /	10 =	0	(7b)
Number of flueless gas	fires						Ē	0	x 4	40 =	0	(7c)
							L					
										Air ch	anges per ho	ur
Infiltration due to chimne	eys, flue	es and fa	ans = <mark>(6</mark>	a)+(6b)+(7	a)+(7b)+	(7c) =	Г	40		÷ (5) =	0.16	(8)
If a pressurisation test has				ed, proceed	d to (17),	otherwise	continue fr	om (9) to ((16)			_
Number of storeys in	the dwe	elling (ns	5)								0	(9)
Additional infiltration	0.05 (4	.	0.05.6				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: if both types of wall are							•	uction			0	(11)
deducting areas of oper				ponung to	uie gree		a (allel					
If suspended wooden	floor, e	enter 0.2	(unseal	led) or 0.	1 (seal	ed), else	enter 0				0	(12)
lf no draught lobby, e	nter 0.0	5, else e	enter 0								0	(13)
Percentage of window	ws and	doors dra	aught st	ripped							0	(14)
Window infiltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value	•	•			•		•	etre of e	nvelope	area	5	(17)
If based on air permeab	•										0.41	(18)
Air permeability value appl		essurisatio	on test has	s been don	e or a de	egree air pe	rmeability	is being us	sed			-
Number of sides shelter Shelter factor	red					(20) – 1 -	[0.075 x (1	9)1 -			2	(19)
	otina ob	altar faa	tor			(20) = 1		[0]] =			0.85	(20)
Infiltration rate incorpora	•			4		(21) = (10	, ∧ (∠0) =				0.35	(21)
Infiltration rate modified	Mar	Apr	d speed May		Jul	Δυσ	Sep	Oct	Nov	Dec		
				Jun	Jui	Aug	J Seh			Dec	l	
Monthly average wind s	·	I				0.7	4	4.0	4 5	4 7	l	
(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 F	actor (2	22a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjuste	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	nd wind s	peed) =	(21a) x	(22a)m						
	0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41			
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	•							(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), othe	rwise (23b) = (23a)			0		(23b)
						for in-use fa				, , ,					(23c)
			-	-	-	at recove				2b)m + (1	23b) × [1	l – (23c)			
, (24a)m=		0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	MV) (24b)m = (22	2b)m + (2	23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,						ve input v b); otherv				.5 × (23b)		-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,						ve input erwise (2				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)
Effe	ctive air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in boy	x (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. He	at losse	s and he	eat loss r	paramete	er:										
ELEN		Gros area	S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·		A X kJ/ł	
		Gros	S	Openin	gs		n²				<)				
ELEN Doors		Gros area	S	Openin	gs	A ,r	m²	W/m2	K	(W/I	<) 				<
ELEN Doors Windov	IENT	Gros area	S	Openin	gs	A ,r 2.14	m ² x	W/m2	K 0.04] = [(W/ł 2.14	<) 				(26)
ELEN Doors Windov Windov	IENT ws Type	Gros area e 1 e 2	S	Openin	gs	A ,r 2.14 5.53	m ² x x x ¹ x ¹	W/m2 1 /[1/(1.4)+	K 0.04] = [0.04] = [(W/ł 2.14 7.33	<) 				<(26) (27)
ELEN Doors Windov Windov	IENT ws Type ws Type	Gros area e 1 e 2	S	Openin	gs	A ,r 2.14 5.53 8.43	n ² x x1 x1 x1 x1	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	K 0.04] = [0.04] = [(W/H 2.14 7.33 11.18					<(26) (27) (27)
ELEN Doors Windov Windov Windov	IENT ws Type ws Type	Gros area e 1 e 2	ss (m²)	Openin	gs ²	A ,r 2.14 5.53 8.43 0.714	n ² x x1 x1 x1 x1 x2 x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04] = [0.04] = [0.04] = [(W/H 2.14 7.33 11.18 0.95					 (26) (27) (27) (27)
ELEN Doors Windov Windov Windov Floor	IENT ws Type ws Type	Gros area 9 1 9 2 9 3	52	Openin m	gs ²	A ,r 2.14 5.53 8.43 0.714 53.32	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316					 (26) (27) (27) (27) (27) (28)
ELEN Doors Windov Windov Floor Walls Roof	IENT ws Type ws Type ws Type	Gros area 9 1 9 2 9 3 143.	52 53 53 52	Openin m	gs ²	A ,r 2.14 5.53 8.43 0.714 53.32 126.7	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x x 1 x x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81					 (26) (27) (27) (27) (27) (28) (29)
ELEN Doors Window Window Floor Walls Roof Total a * for win	MENT ws Type ws Type ws Type area of e dows and	Gros area 4 1 2 2 3 3 143.1 51.9 Ilements	52 , m ²)	Openin m 16.8 0 ffective wi	gs 1 1 ndow U-va	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calcul	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76		kJ/m²-			 (26) (27) (27) (27) (27) (28) (29) (30)
ELEN Doors Windov Windov Floor Floor Walls Roof Total a * for win ** includ	MENT ws Type ws Type ws Type area of e dows and le the area	Gros area 4 1 4 2 4 3 143.1 51.9 1ements 7 roof windo as on both	52 , m ² , m ²	Openin m 16.8 0 ffective wi ternal wal	gs 1 1 ndow U-va	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calcul	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76		kJ/m²-		kJ/ł	 (26) (27) (27) (27) (27) (28) (29) (30)
ELEN Doors Window Window Floor Walls Roof Total a * for win ** includ Fabric	MENT ws Type ws Type ws Type area of e dows and le the area heat los	Gros area 4 1 4 2 4 3 143.1 51.9 1ements 7 roof windo as on both	52 (m ²) 52 , m ² ows, use e sides of in = S (A x	Openin m 16.8 0 ffective wi ternal wal	gs 1 1 ndow U-va	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calcul	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13 g formula 1	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76		kJ/m²-	K	kJ/ł	 (26) (27) (27) (27) (28) (29) (30) (31)
ELEN Doors Windov Windov Floor Walls Roof Total a * for win ** includ Fabric Heat ca	MENT ws Type ws Type ws Type area of e dows and le the area heat los apacity	Gros area a 1 a 2 a 3 a 3 a 1 a 3 a 3 a 1 a 3 a	52 (m ²) 52 , m ² 54 55 55 55 55 55 55 55 55 55 55 55 55	Openin m 16.8 0 ffective wi ternal walk U)	gs 12 I Indow U-va Is and par	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calcul	n ² x x1 x1 x1 x1 x2 x 1 x x 1 x x 1 x x 1 x x 1 x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13 g formula 1	$ \begin{array}{c} $	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76	 	kJ/m²-	K	kJ/ł	 (26) (27) (27) (27) (28) (29) (30) (31)
ELEN Doors Windov Windov Floor Floor Walls Roof Total a * for win ** includ Fabric Heat ci Therma For desig	MENT ws Type ws Type ws Type ws Type area of e dows and le the area heat los apacity al mass ign assess	Gros area 4 1 4 2 4 2 4 3 143.3 51.9 1700 f windown $1700 f windown 1700 f windown $	52 52 , m ² , m ² bws, use e sides of in = S (A x A x k) ter (TMF	Openin m 16.8 0 ffective wi ternal walk U) $P = Cm + \frac{1}{2}$ tails of the	gs 12 Indow U-va Is and part - TFA) ir	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calcul titions	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ [0.13 0.13 0.13 g formula 1 (26)(30)	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76 re)+0.04] a (30) + (32 tive Value:	2) + (32a)	kJ/m²-	K	kJ/ł	 (26) (27) (27) (27) (28) (29) (30) (31) (33) (34)
ELEN Doors Windov Windov Floor Floor Walls Roof Total a * for win ** includ Fabric Heat c Therma For desig can be u	MENT ws Type ws Type ws Type ws Type area of e dows and le the area heat los apacity al mass ign assess used instea al bridge	Gros area a 1 a 2 a 3 a 3 a 1 a 2 a 3 a 1 a 3 a 1 a 3 a	(m^2) (Openin m 16.8 0 ffective wi ternal walk U) $P = Cm + \frac{1}{2}$ tails of the ulation. culated of	gs 12 Indow U-va Is and part - TFA) ir construct using Ap	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calculutions h kJ/m²K titions	n ² x x ¹ x ¹ x ² x 1 x x x 1 x x t x x t t known pr	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ [0.13 0.13 0.13 g formula 1 (26)(30)	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76 re)+0.04] a (30) + (32 tive Value:	2) + (32a)	kJ/m²-	K	kJ/ł 09 3.28 0	 (26) (27) (27) (27) (28) (29) (30) (31) (33) (34)
ELEN Doors Windov Windov Floor Floor Walls Roof Total a * for win ** includ Fabric Heat ca Fabric Heat ca for desi can be u Therma	MENT ws Type ws Type ws Type ws Type area of e dows and le the area heat los apacity al mass ised instea al bridge of therma	Gros area a 1 a 2 a 3 a 3 a 1 a 2 a 3 a 1 a 2 a 3 a	52 52 52 77 52 52 52 52 52 52 52 52 52 52	Openin m 16.8 0 ffective wi ternal walk U) $P = Cm + \frac{1}{2}$ tails of the ulation. culated of	gs 12 Indow U-va Is and part - TFA) ir construct using Ap	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calculutions h kJ/m²K titions	n ² x x ¹ x ¹ x ² x 1 x x x 1 x x t x x t t known pr	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ [0.13 0.13 0.13 g formula 1 (26)(30)	$K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 2.14 7.33 11.18 0.95 6.9316 22.81 6.76 (w)+0.04] a (30) + (32 tive Values of	2) + (32a)	kJ/m²-	K	kJ/ł 09 3.28 0 87	 (26) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35) (36)
ELEN Doors Windov Windov Floor Walls Roof Total a * for win ** includ Fabric Heat c Therma <i>for desi</i> <i>can be u</i> Therma <i>if details</i>	MENT ws Type ws Type ws Type ws Type ws Type area of e dows and le the area abases and the area apacity al mass ised instea al bridge of therma abric he	Gros area a 1 a 2 a 3 a 1 a 2 a 3 a 1 a 2 a 3 a 1 a 3 a 1 a 3 a 1 a 3 a 3 a 3 a 1 a 3 a 3 a 3 a 1 a 3 a	$\frac{52}{52}$ $\frac{52}{7}$	Openin m 16.8 0 ffective wi ternal wal U) P = Cm ÷ tails of the ulation. culated to own (36) =	gs 1 1 Indow U-va Is and part - TFA) ir construct using Ap = 0.05 x (3	A ,r 2.14 5.53 8.43 0.714 53.32 126.7 51.97 248.8 alue calculutions h kJ/m²K titions	n ² x x ¹ x ¹ x ² x 1 x x x 1 x x t x x t t known pr	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ [0.13 0.13 0.13 g formula 1 (26)(30)	$K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/I) 2.14 7.33 11.18 0.95 6.9316 22.81 6.76 10)+0.04] a (30) + (32) tive Values of values of (36) =	2) + (32a)	kJ/m²-	K	kJ/ł 09 3.28 0 87	 (26) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35)

(38)m=	49.86	49.54	49.23	47.77	47.5	46.23	46.23	45.99	46.72	47.5	48.05	48.63		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	118.82	118.5	, 118.19	116.73	116.46	115.18	115.18	114.95	115.67	116.46	117.01	117.59		
								1		Average =	Sum(39)1	12 /12=	116.73	(39)
		· · ·	HLP), W/	· · · · · ·				r	r	= (39)m ÷	r			
(40)m=	1.13	1.13	1.12	1.11	1.11	1.09	1.09	1.09	1.1	1.11	1.11	1.12		
Numbe	er of day	s in mo	nth (Tab	le 1a)						Average =	Sum(40)1	12 /12=	1.11	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ar:	
A			NI											
		ıpancy, ∣ 9, N = 1	м + 1.76 х	[1 - exp	(-0.0003	849 x (TF	-13.9)2)] + 0.0	0013 x (⁻	TFA -13.		78		(42)
	A £ 13.9							, , <u>-</u>						
			ater usag hot water							se taraet o		0.31		(43)
		-	person per	• •		-	-							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	110.34	106.32	102.31	98.3	94.29	90.28	90.28	94.29	98.3	102.31	106.32	110.34		
_								-			m(44) ₁₁₂ =	L	1203.67	(44)
Energy o		hot water	used - cal	culated mo	onthly = 4. I	190 x Vd,r I	n x nm x L I) kWh/mor I		ables 1b, 1 I	c, 1d)		
(45)m=	163.63	143.11	147.67	128.75	123.54	106.6	98.78	113.35	114.71	133.68	145.92	158.46		
lf instant	aneous w	ater heati	ng at point	of use (no	o hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1578.2	(45)
(46)m=	24.54	21.47	22.15	19.31	18.53	15.99	14.82	17	17.21	20.05	21.89	23.77		(46)
· · · ·	storage													
Storag	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 ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
			m Table				, , , .					0		(49)
			storage		ear			(48) x (49)) =			0		(50)
b) If m	anufact	urer's de	eclared o	cylinder l	oss fact		known:					•		()
			factor fr		e 2 (kW	h/litre/da	ıy)					0		(51)
	•	leating s from Ta	ee section ble 2a	on 4.3								0		(52)
			m Table	2b								0 0		(52)
			· storage		ear			(47) x (51)) x (52) x (53) =		0		(54)
•••		(54) in (5	-	, ,						,		0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primary circuit lo Primary circuit lo	•				59)m = ((58) ÷ 36	65 x (41)	m			0]	(58)
(modified by fa					,	,	,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcu	ulated for	each	month (61)m =	(60) ÷ 30	65 × (41))m						
(61)m= 50.96	46.03 5	50.96	48.48	48.05	44.52	46	48.05	48.48	50.96	49.32	50.96		(61)
Total heat require	ed for wa	ater he	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 214.58 1	89.14 1	98.63	177.22	171.58	151.12	144.79	161.4	163.18	184.64	195.24	209.42		(62)
Solar DHW input cal	culated usi	ng App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional li	nes if FG	HRS	and/or V	VWHRS	applies	, see Ap	pendix (G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output from wate	er heater												
(64)m= 214.58 1	89.14 1	98.63	177.22	171.58	151.12	144.79	161.4	163.18	184.64	195.24	209.42		
LI	I						Outp	out from w	ater heate	r (annual)₁	12	2160.95	(64)
Heat gains from	water he	ating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	-
		61.84	54.93	53.09	46.57	44.35	49.7	50.26	57.19	60.85	65.43	ĺ	(65)
include (57)m	in calcula	ation o	 of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	vater is fr	om com	r munitv h	neating	
5. Internal gain			. ,	-	,						, .	Je sin i g	
				/•									
Metabolic gains (Jan		, wat Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
		39.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17	139.17		(66)
									100.17	100.17	100.17	l	()
Lighting gains (ca		1111 AL 18.3	13.85	_, equat 10.36	8.74	9.45	12.28	16.48	20.93	24.42	26.04	1	(67)
					_					24.42	20.04	J	(07)
Appliances gains	<u> </u>				· · · · · ·		,		1	005 46	252.02	1	(69)
		60.43	245.7	227.11	209.63	197.96	195.21	202.13	216.86	235.46	252.93		(68)
Cooking gains (c			-	· ·	i	,			1			1	(00)
		36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92	36.92		(69)
Pumps and fans	<u> </u>		·									1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evap		(negat	tive valu	es) (Tab	le 5)								
(71)m= -111.34 -1	111.34 -1	11.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34	-111.34		(71)
Water heating ga	ains (Tab	ole 5)			_	-				-		_	
(72)m= 90.25 8	87.93 8	33.12	76.29	71.35	64.69	59.6	66.8	69.8	76.87	84.51	87.94		(72)
Total internal ga	ains =				(66)	m + (67)m	ı + (68)m +	+ (69)m +	(70)m + (7	1)m + (72)	m		
(73)m= 447.94 4	45.54 4	129.6	403.6	376.57	350.81	334.76	342.05	356.17	382.4	412.14	434.66		(73)
6. Solar gains:													
Solar gains are calc	culated usir	ng solai	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	ne applicat	le orientat	ion.		
Orientation: Acc		tor	Area		Flu			g_	_	FF		Gains	
Tal	ble 6d		m²		Tal	ole 6a	Т	able 6b	T	able 6c		(W)	
Solar gains in wa	atts, calc	ulated	for eac	n month			(83)m = S	um(74)m .	(82)m			1	
(83)m= 0	0	0	0	0	0	0	0	0	0	0	0		(83)

(84)m=	447.94	445.54	429.6	403.6	376.57	350.81	334.76	342.05	356.17	382.4	412.14	434.66		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area i	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	1	1	0.99	0.96	0.96	0.99	1	1	1		(86)
Mean	interna	l tempera	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.62	19.69	19.85	20.09	20.36	20.65	20.83	20.82	20.6	20.25	19.91	19.62		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.98	19.98	19.98	19.99	20	20.01	20.01	20.01	20	20	19.99	19.99		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	wellina.	h2.m (se	e Table	9a)						
(89)m=	1	1	1	1	1	0.98	0.9	0.91	0.98	1	1	1		(89)
Mean	interna	l tempera	ature in	the rest	of dwelli	na T2 (fe	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.12	18.22	18.45	18.82	19.22	19.64	19.88	19.87	19.56	19.06	18.55	18.12		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.18	(91)
Mean	interna	l tempera	ature (fo	r the wh	ole dwel	llina) = fl	LA x T1	+ (1 – fL	A) x T2					
(92)m=	18.39	18.48	18.7	19.04	19.42	19.81	20.05	20.04	19.75	19.27	18.79	18.38		(92)
Apply	adjustn	nent to th	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.39	18.48	18.7	19.04	19.42	19.81	20.05	20.04	19.75	19.27	18.79	18.38		(93)
8. Sp	ace hea	ting requ	uirement											
		nean int		•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calo	culate	
the ut	Jan	factor fo Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g			iviay	Juli	Jui	Aug	Sep	001	INOV	Dec		
(94)m=	1	1	1	1	0.99	0.97	0.9	0.91	0.98	1	1	1		(94)
Usefu	Il gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	447.55	445.08	428.99	402.58	374.16	341.74	302.04	311.63	349.14	380.85	411.55	434.34		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		e for mea		· · ·				- ,	· ,	-			I	(07)
(97)m=		1608.95	1441.77	1184.02	898.89	600.62	397.54	418.1	653.05	1009.37	1367.56	1667.56		(97)
•		g require					i	_ , ,			· · · · · · · · · · · · · · · · · · ·	047 54	l	
(98)m=	912.19	782.12	753.51	562.63	390.4	0	0	0 Toto	0 I per year	467.62	688.33	917.51	5474.31	(98)
•								Tota	i per year	(KVVII/year) = Sum(9	O) 15,912 =		4
•		g require			•								51.99	(99)
		luiremen	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
-	e heatir on of sr	1g: bace hea	t from s	econdar	/sunnle	mentary	system						0	(201)
		ace hea				y		(202) = 1 -	- (201) =				1	(201)
		tal heatir		-					02) × [1 – ((203)] =			1	(202)
riacti		u neall	19 11011	main sys				() (- -		/1			1	(207)

Total gains – internal and solar (84)m = (73)m + (83)m, watts

Efficie	ency of	main spa	ace heat	ting syste	em 1								93.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g syster	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g requir	ement (o	calculate	d above)		-				1	1		
	912.19	782.12	753.51	562.63	390.4	0	0	0	0	467.62	688.33	917.51		
(211)m	n = {[(98)m x (20	04)] } x 1	100 ÷ (20	<u> </u>								1	(211)
	976.65	837.38	806.75	602.39	417.99	0	0	0	0	500.66	736.97	982.35		_
_			_					lota	al (kWh/yea	ar) = Sum(2)	211) _{15,1012}	2	5861.14	(211)
•		g fuel (s 01)] } x 1		y), kWh/ איאי	month									
= {[(90 (215)m=			00 ÷ (20		0	0	0	0	0	0	0	0]	
(,									l (kWh/yea	-			0	(215)
Water	heating	a												
		-	ter (calc	ulated a	bove)									
	214.58	189.14	198.63	177.22	171.58	151.12	144.79	161.4	163.18	184.64	195.24	209.42		_
		ater hea	ı — —	·									80.3	(216)
(217)m=		88.24	88.09	87.76	87.06	80.3	80.3	80.3	80.3	87.29	87.96	88.34		(217)
		heating, m x 100												
. ,	243.06	214.34	225.49	201.95	197.09	188.2	180.31	201	203.22	211.52	221.97	237.08]	
							1	Tota	al = Sum(2)	19a) ₁₁₂ =			2525.22	(219)
Annua	I totals									k	Wh/year		kWh/year	r
Space	heating	fuel use	ed, main	system	1								5861.14	
Water	heating	fuel use	ed										2525.22	
Electric	city for p	oumps, f	ans and	electric	keep-hot	t								_
centra	al heatir	ng pump	:									30		(2300
boiler	with a	an-assis	sted flue									45		(2306
Total e	lectricit	y for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting											447.38	(232)
Total d	lelivered	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				8908.75	(338)
12a. (CO2 err	nissions -	– Individ	lual heat	ing syste	ems incl	uding mi	cro-CHF)					
	EnergyEmission factorkWh/yearkg CO2/kWh										Emissions kg CO2/yea			
Space	heating	ı (main s	ystem 1)		(21	1) x			0.2	16	=	1266.01	(261)
Space	heating	(secon	dary)			(21	5) x			0.5	19	=	0	(263)
Water heating						(21	9) x			0.2	16	=	545.45	(264)
Space	and wa	ter heat	ng			(26	1) + (262)	+ (263) + ((264) =				1811.45	(265)
Electricity for pumps, fans and electric keep-hot						t (23	1) x			0.5	19	=	38.93	(267
Electric	city for I	ighting				(23	2) x			0.5	19	=	232.19	(268)
Total C	CO2, kg	/year							sum o	f (265)(271) =		2082.57	(272)

TER =

19.78 (273)