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 12:32:23

Project Information:

Assessed By: Ben Marsh (STRO005374) **Building Type:** Semi-detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 100.44m² Plot Reference: Site Reference : **New Project** Plot 28

Plot 28 Address:

Client Details:

Name: 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

Fuel factor: 1.00 (mains gas)

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

Dwelling Carbon Dioxide Emission Rate (DER) 15.26 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.0 kWh/m²

OK 2 Fabric U-values

Element

Highest Average External wall 0.17 (max. 0.30) 0.17 (max. 0.70) OK Party wall 0.00 (max. 0.20) **OK** Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.11 (max. 0.35) OK Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 5.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Database: (rev 507, product index 017953): Main Heating system:

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant

Model: ecoTEC exclusive 835 Model qualifier: VUW 356/5-7 (H-GB)

(Combi)

Efficiency 89.7 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls Hot water controls:	TTZC by plumbing and on the cylinder thermostat No cylinder	electrical services	ок
Boiler interlock:	Yes		ОК
7 Low energy lights			
Percentage of fixed lights w Minimum	ith low-energy fittings	100.0% 75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (South East	st England):	Not assessed	?
10 Key features			
Roofs U-value Party Walls U-value		0.11 W/m²K 0 W/m²K	

Thermal Bridge Report

Property Details: Plot 28

Address: Plot 28 Located in: England

Region: South East England

Thermal bridges

Thermal bridges: User-defined = UD

Default = D Approved = A

User-defined (individual PSI-values) Y-Value = 0.0769

External Junctions Details:

Junction Type	PSI-Value	Length	Reference	Type
Other lintels (including other steel lintels)	0.3	9.8	E2	[A]
Sill	0.04	8.8	E3	[A]
Jamb	0.05	22.16	E4	[A]
Ground floor (normal)	0.16	20.1	E5	[A]
Intermediate floor within a dwelling	0.07	20.1	E6	[A]
Eaves (insulation at ceiling level)	0.06	11.2	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	19.2	E16	[A]

Party Junctions Details:				
Ground floor	0.16	9.3	P1	[D]
Intermediate floor within a dwelling	0	9.3	P2	[D]
Roof (insulation at ceiling level)	0.24	9.3	P4	[D]

Predicted Energy Assessment

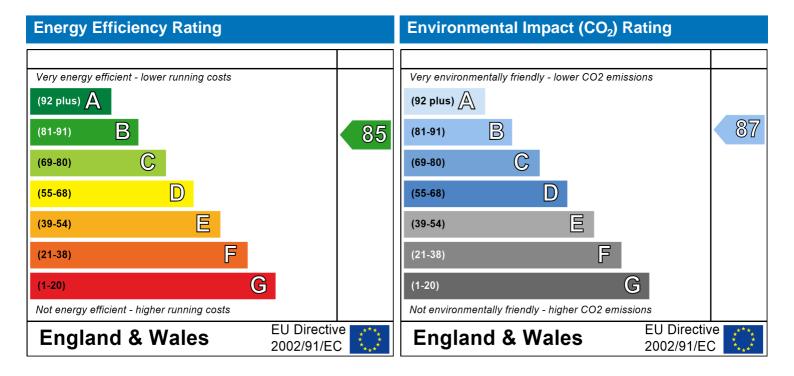


Plot 28

Dwelling type: Date of assessment: Produced by: Total floor area: Semi-detached House 19 October 2022 Ben Marsh 100.44 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: Plot 28

Address: Plot 28 Located in: England

Region: South East England

UPRN:

Date of assessment: 19 October 2022 Date of certificate: 21 October 2022

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Owner-occupied
No related party
Indicative Value Low

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

PCDF Version: 507

Property description:

Dwelling type: House

Detachment: Semi-detached

Year Completed: 2022

Floor Location: Floor area:

Floor 0 50.22 m² 2.4 m

Floor 1 50.22 m² 2.4 m

Living area: 24.5 m² (fraction 0.244)

Front of dwelling faces: Nor

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front	Manufacturer	Solid			PVC-U
Rear	SAP 2012	Windows	double-glazed	Yes	PVC-U
Front	SAP 2012	Windows	double-glazed	Yes	PVC-U

Storey height:

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
Front	mm	0.7	0	1.4	2.1	1
Rear	16mm or more	0.7	0.76	1.4	8.22	1
Front	16mm or more	0.7	0.76	1.4	3.64	1

Type-Name: Location: Orient: Width: Height: Name: Ext Walls Front 0 Rear Ext Walls Unspecified 0 0 Ext Walls Unspecified Front 0 0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>'S</u>						
Ext Walls	96.48	13.96	82.52	0.17	0	False	N/A
Cold Roof	50.22	0	50.22	0.11	0		N/A
Ground Floor	50.22			0.14			N/A
Internal Element	<u>s</u>						
Party Elements							
Party Wall	44.64						N/A

Thermal bridges:

SAP Input

Thermal bridges:	User-defin	ed (individual I	PSI-values)	Y-Value = 0.0769
[Approved] [Approved] [Approved] [Approved] [Approved] [Approved] [Approved] [Approved]	Length 9.8 8.8 22.16 20.1 20.1 11.2 0 19.2 9.3	Psi-valu 0.3 0.04 0.05 0.16 0.07 0.06 0.24 0.09 0.16	E2 E3 E4 E5 E6 E10 E12 E16 P1	Other lintels (including other steel lintels) Sill Jamb Ground floor (normal) Intermediate floor within a dwelling Eaves (insulation at ceiling level) Gable (insulation at ceiling level) Corner (normal) Ground floor
	9.3 9.3	0.10	P2 P4	Intermediate floor within a dwelling Roof (insulation at ceiling level)
Ventilation:				
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	Yes (As de Natural ve 0 0 3 0 2	signed) ntilation (extra	ict fans)	
Main heating system:				
Main heating system:	Gas boilers Fuel: main Info Sourc Database: Has integra Brand nam Model: ecc Model qua (Combi bo Systems w Central he	s and oil boiler s gas e: Boiler Datak (rev 507, proc al PFGHRD ne: Vaillant oTEC exclusive lifier: VUW 356 iler) rith radiators ating pump: 2 w temperature	s pase duct index 0 835 6/5-7 (H-GE	er
Main heating Control:	Dollo: III.e.	100.11		
Main heating Control:	Time and t services Control co	·	one control	by suitable arrangement of plumbing and electrical
Secondary heating system:				
Secondary heating system:	None			
Water heating: Water heating: Others:	Water cod Fuel :main No hot wa Flue Gas H	s gas ter cylinder leat Recovery (rev 507, pro	System:	

Electricity tariff: In Smoke Control Area: Standard Tariff

No

SAP Input

Conservatory: No conservatory

Low energy lights: 100%

Low rise urban / suburban

Terrain type: EPC language: English Wind turbine: No None Photovoltaics: No Assess Zero Carbon Home:

		llser I	Details:				
Assessor Name:	Ben Marsh	00011	Stroma N	umber:	STRO	005374	
Software Name:	Stroma FSAP 2012		Software			n: 1.0.5.58	
		Property	Address: Plo	ot 28			
Address :	Plot 28						
1. Overall dwelling dime	nsions:						
		Are	a(m²)	Av. Height	<u> </u>	Volume(m³))
Ground floor		:	50.22 (1a)	X 2.4	(2a) =	120.53	(3a)
First floor			50.22 (1b)	x 2.4	(2b) =	120.53	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+.	(1n)	00.44 (4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3	e)+(3n) =	241.06	(5)
2. Ventilation rate:							
	main secon heating hea	ndary ting	other	total		m³ per hou	r
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	ns		_	3	x 10 =	30	(7a)
Number of passive vents				0	x 10 =	0	(7b)
Number of flueless gas fi	res			0	x 40 =	0	(7c)
					Λir ch	anges per ho	
Infiltration due to chimney	ve flugs and fans - (6a)+(6h)+(7a)+(7h)+	(7c) =	00	, ,		(8)
•	een carried out or is intended, p			30 nue from (9) to (16)	÷ (5) =	0.12	(0)
Number of storeys in the	ne dwelling (ns)					0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
	25 for steel or timber fran		•			0	(11)
if both types of wall are pr deducting areas of openin	esent, use the value correspon gs); if equal user 0.35	ding to the grea	ter wall area (af	ter			
=	loor, enter 0.2 (unsealed)	or 0.1 (seal	ed), else ente	er O		0	(12)
If no draught lobby, ent	er 0.05, else enter 0					0	(13)
Percentage of windows	s and doors draught stripp	ped				0	(14)
Window infiltration			0.25 - [0.2 x (1	•		0	(15)
Infiltration rate				1) + (12) + (13) + (15		0	(16)
•	q50, expressed in cubic i	•		re metre of enve	lope area	5	(17)
If based on air permeabili				hilitaria baina waad		0.37	(18)
Number of sides sheltere	s if a pressurisation test has be d	en done or a de	gree air permea	bility is being used	ĺ	2	(19)
Shelter factor	u		(20) = 1 - [0.07	5 x (19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (2	(0) =		0.32	(21)
Infiltration rate modified for	or monthly wind speed						
Jan Feb	Mar Apr May	Jun Jul	Aug S	Sep Oct 1	Nov Dec		
Monthly average wind sp	eed from Table 7						

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (22a)m –	(22\m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infilt	ration rat	e (allowi	na for ek	nelter an	d wind s	need) –	(21a) v	(22a)m		•	•	•	
0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
Calculate effe		_	rate for t	he appli	cable ca	se	ļ.	!		!	!	J	
If mechanic			endix N (2	(23a) = (23a	a) × Fmv (e	equation (N	N5)) othe	rwise (23h) = (23a)			0	(23a)
If balanced wi		0		, ,	,	. `	,, .	,) = (20a)			0	(23b) (23c)
a) If balanc		-		_					2b)m + (23b) x [1 – (23c)		(230)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balanc	ed mech	anical ve	ntilation	without	heat rec	overy (N	лV) (24b	o)m = (22	2b)m + (23b)	•	•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole				•	•								
	m < 0.5 >	` 	<u> </u>	<u> </u>	<u> </u>	· ` `	ŕ	ŕ	· ·	í –	Ι ,	1	(24c)
(24c)m= 0	0 Lyantilati	0		0	0	0	0	0	0	0	0		(240)
d) If natura if (22b)	m = 1, th			•	•				0.5]				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effective ai	r change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat loss	es and he	eat loss r	naramet	or:									
		Jac 1000 p	Jaramet	υI.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
ELEMENT Doors	Gros	SS	Openin	gs									
	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K = [(W/				kJ/K
Doors	Gros area e 1	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2	2K = [0.04] = [(W/ 2.94				kJ/K (26)
Doors Windows Typ	Gros area e 1	SS	Openin	gs	A ,r	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	2K = [0.04] = [(W/ 2.94 10.9	K)			kJ/K (26) (27)
Doors Windows Typ Windows Typ	Gros area e 1	ss (m²)	Openin	gs ₁ ²	A ,r 2.1 8.22 3.64	x10 x10 x x1	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = [0.04] = [0.04] = [(W/ 2.94 10.9 4.83	K)			kJ/K (26) (27) (27)
Doors Windows Typ Windows Typ Floor	Gros area e 1 e 2	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 8.22 3.64 50.22	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = [- 0.04] = [- 0.04] = [= = [(W/ 2.94 10.9 4.83 7.0308	K)			(26) (27) (27) (28)
Doors Windows Typ Windows Typ Floor Walls	Gros area e 1 e 2 96.4	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 8.22 3.64 50.22 82.52	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17	2K = [0.04] = [0.04] = [= = [(W/ 2.94 10.9 4.83 7.0308 14.03	K)			(26) (27) (27) (28) (29)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall	Gros area e 1 e 2 96.4 50.2 elements	48 22 3, m ²	Openin m	gs ₁ 2	A ,r 2.1 8.22 3.64 50.22 82.52 50.22 196.9	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	2K = [0.04] = [0.04] = [(W/ 2.94 10.9 4.83 7.0308 14.03 5.52	K)	kJ/m²-		(26) (27) (27) (28) (29) (30)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an	Gros area e 1 e 2 96.4 50.2 elements	18 22 3, m ² 50ws, use e	Openin m 13.9 0	gs 6 indow U-ve	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calcula	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	2K = [0.04] = [0.04] = [(W/ 2.94 10.9 4.83 7.0308 14.03 5.52	K)	kJ/m²-		(26) (27) (27) (28) (29) (30) (31)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both	18 22 3, m ² 10ws, use e	13.9 0 effective winternal wal	gs 6 indow U-ve	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calcula	x1/2 x x 2 x x 2 x x 2 x atted using	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	2K = [- 0.04] = [(W/ 2.94 10.9 4.83 7.0308 14.03 5.52	K)	kJ/m²-		kJ/K (26) (27) (27) (28) (29) (30) (31) (32)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an ** include the area	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both	tales of interest of the state	13.9 0 effective winternal wal	gs 6 indow U-ve	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calcula	x1/2 x x 2 x x 2 x x 2 x atted using	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	$ \begin{array}{ccc} 2K & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & =$	2.94 10.9 4.83 7.0308 14.03 5.52 0	K)	kJ/m²-	X	kJ/K (26) (27) (27) (28) (29) (30) (31) (32)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an ** include the are Fabric heat lo	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both eas, W/K in Cm = Se	18 22 3, m ² 3 ows, use e sides of in = S (A x (A x k)	13.9 0 effective winternal wall	gs 12 6 Indow U-va Is and part	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 titions	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	$ \begin{array}{ccc} 2K & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & = & \\ & & = & \\ $	2.94 10.9 4.83 7.0308 14.03 5.52 0	K)	kJ/m²-	3.2	kJ/K (26) (27) (27) (28) (29) (30) (31) (32)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an ** include the are Fabric heat lo	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both eas, W/K in Cm = Si s parame	18 22 22 3, m ² 10 ws, use e 10 sides of in 10 = S (A x (A x k) 10 eter (TMF) 11 erer the de	13.9 13.9 0 effective winternal wall U) P = Cm = tails of the	gs 6 indow U-ve ls and part	A ,r 2.1 8.22 3.64 50.22 82.52 50.22 196.9 44.64 alue calculations	x1/2 x x2 x x2 x x2 x xated using	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	$ \begin{array}{ccc} 2K & = & \\ $	(W/ 2.94 10.9 4.83 7.0308 14.03 5.52 0 re)+0.04] a tive Value	K)	paragraph(32e) =	3.2 45.25 14754.	(26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an ** include the are Fabric heat lo Heat capacity Thermal mass	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both eas, W/K = C Cm = S(s parame essments whe ead of a de	48 22 3, m² cows, use e sides of interpretation (A x k) eter (TMF) eter the de tailed calculation (TMF)	13.90 13.90 offective winternal wall U) P = Cm - tails of the pulation.	gs 6 Indow U-valls and part - TFA) ir	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calculatitions	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	$ \begin{array}{ccc} 2K & = & \\ $	(W/ 2.94 10.9 4.83 7.0308 14.03 5.52 0 re)+0.04] a tive Value	K)	paragraph(32e) =	3.2 45.25 14754.	kJ/K (26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34) (35)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inst	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both eas on both eas on both ss, W/K: Cm = S(s parame essments whe ead of a de ges : S (L eal bridging	tows, use estables of interest the destated calcular XY) calcular XY	13.9 13.9 0 effective winternal wall U) P = Cm = tails of the ulation. culated to	gs 6 indow U-valls and part constructions	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 alue calculatitions n kJ/m²K ion are not opendix k	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	2K = [0.04] = [(W/ 2.94 10.9 4.83 7.0308 14.03 5.52 0 re)+0.04] a tive Value	K)	paragraph(32e) =	7 3.2 14754.	(26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34) (35)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall * for windows an ** include the are Fabric heat lo Heat capacity Thermal mass can be used inst Thermal bridg if details of them	Gros area e 1 e 2 96.4 50.2 elements d roof wind eas on both eas, W/K: r Cm = Si s parame essments whe ead of a de ges : S (L hal bridging eat loss	tows, use ender sides of interest the detailed calculated are not known as the same of the	13.9 13.9 0 effective winternal walk U) P = Cm - tails of the culation. culated cown (36) =	gs 6 indow U-ve Is and part construction using Ap 0.05 x (3)	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 alue calculatitions n kJ/m²K ion are not opendix k	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	$ \begin{array}{cccc} 2K & & & & & & \\ & & & & & & \\ & & & & &$	(W/ 2.94 10.9 4.83 7.0308 14.03 5.52 0 re)+0.04] a tive Value values of	K)	paragraph(32e) =	7 3.2 45.25 14754. 100	(26) (27) (27) (28) (29) (30) (31) (32) (33) (34) (35)

								ı				
(38)m= 46.32 46.07	45.82	44.65	44.43	43.41	43.41	43.22	43.8	44.43	44.87	45.34		(38)
Heat transfer coeffici						1		= (37) + (
(39)m= 106.71 106.46	106.21	105.04	104.82	103.8	103.8	103.61	104.19	104.82	105.26	105.73	405.04	7(20)
Heat loss parameter	(HLP), W	/m²K						Average = = (39)m ÷	Sum(39) ₁ . · (4)	12 /12=	105.04	(39)
(40)m= 1.06 1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		_
Number of days in m	onth (Tah	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
		<u> </u>	ļ	<u> </u>	<u> </u>	!	<u> </u>	<u> </u>		<u> </u>		
4. Water heating en	erav reau	irement								kWh/ye	ar:	
Assumed occupancy if TFA > 13.9, N =	1 + 1.76 >	([1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13		74		(42)
if TFA £ 13.9, N = Annual average hot v		ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		10	4.59		(43)
Reduce the annual averag	e hot water	usage by	5% if the a	lwelling is	designed			se target o		1.00		(10)
not more that 125 litres pe	r person pe	r day (all w т	rater use, I T	not and co	<u> </u>	1		ı	1			
Jan Feb	Mar	Apr	May	Jun	Jul Table 10 Y	Aug	Sep	Oct	Nov	Dec		
			· ·	1	ı	· <i>′</i>			l			
(44)m= 115.05 110.86	106.68	102.5	98.31	94.13	94.13	98.31	102.5	106.68	110.86	115.05	4055.07	7(44)
Energy content of hot water	er used - ca	lculated me	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1255.07	(44)
(45)m= 170.61 149.22	153.98	134.24	128.81	111.15	103	118.19	119.61	139.39	152.15	165.23		
If instantaneous water hea	tina at noin	t of use (no	n hot water	r storaga)	enter () in	hoves (16		Total = Su	m(45) ₁₁₂ =	=	1645.59	(45)
	-	· ·						20.04	00.00	04.70		(46)
(46)m= 25.59 22.38 Water storage loss:	23.1	20.14	19.32	16.67	15.45	17.73	17.94	20.91	22.82	24.78		(40)
Storage volume (litre	s) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community heating	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no store	d hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage loss:	doclared	occ fact	or ic kno	wo (k\\/k	2/d2v/):							(40)
a) If manufacturer's Temperature factor for			JI IS KIIO	WII (KVVI	i/uay).					0		(48)
Energy lost from water			oor			(48) x (49)	١ _			0		(49)
b) If manufacturer's	-	-		or is not		(40) X (49)	, =			0		(50)
Hot water storage los		•								0		(51)
If community heating		on 4.3										
Volume factor from T		. 2h							-	0		(52)
Temperature factor fi						(47) (54)	(50) (50)		0		(53)
Energy lost from wate Enter (50) or (54) in	_	e, KVVN/ye	ear			(47) x (51)) X (52) X (53) =		0		(54) (55)
Water storage loss ca	` ,	for each	month			((56)m = (55) × (41)ı	m		0		(55)
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedica							_				ix H	(00)
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
(57)111-	<u> </u>				L "	L <u> </u>			L "			(01)

Primary circuit I	loss (an	nual) fro	om Table	e 3							0		(58)
Primary circuit I	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by						. ,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss cald	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 requ	ired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 170.61	149.22	153.98	134.24	128.81	111.15	103	118.19	119.61	139.39	152.15	165.23		(62)
Solar DHW input ca	alculated	using App	endix G oı	· Appendix	ι——— ι Η (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional	lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(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 wa	iter heat	ter											
(64)m= 170.61	149.22	153.98	134.24	128.81	111.15	103	118.19	119.61	139.39	152.15	165.23		
			<u> </u>	ļ	<u> </u>	<u> </u>	Outp	out from w	ater heate	<u>I</u> r (annual)₁	12	1645.59	(64)
Heat gains from	n water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	า] + 0.8 ว	x [(46)m	+ (57)m	+ (59)m	1	
(65)m= 56.73	49.62	51.2	44.64	42.83	36.96	34.25	39.3	39.77	46.35	50.59	54.94		(65)
include (57)m	n in calc	culation o	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity h	eating	
5. Internal gai			` ′		,								
	·)·									
Metabolic gains Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 164.61	164.61	164.61	164.61	164.61	164.61	164.61	164.61	164.61	164.61	164.61	164.61		(66)
Lighting gains (ļ.	ļ	<u> </u>	ļ	<u> </u>	<u> </u>	1				, ,
(67)m= 63.81	56.68	46.09	34.9	26.09	22.02	23.8	30.93	41.52	52.71	61.52	65.59		(67)
Appliances gair			<u> </u>	<u> </u>		<u> </u>			ļ	01.02	00.00		(0.7)
· · · · · · · · · · · · · · · · · · ·	387.62	377.59	356.23	329.27	303.93	287.01	283.03	293.06	314.41	341.37	366.71		(68)
` '										341.37	300.71		(00)
Cooking gains (69)m= 54.2	54.2	ted in A	54.2	L, equai	54.2	54.2				54.2	54.2		(69)
` '			<u> </u>	04.2	34.2	04.2	54.2	54.2	54.2	34.2	04.2		(00)
Pumps and fan		<u> </u>			Ι ,		Ι ,	l ,	Ι ,	Ι ,	Ι .		(70)
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. eva		<u> </u>		<u> </u>					l				(74)
(71)m= -109.74		-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74		(71)
Water heating of	<u> </u>		i	i		i			•		i		
(72)m= 76.25	73.83	68.82	61.99	57.57	51.33	46.03	52.82	55.23	62.29	70.27	73.84		(72)
Total internal	gains =		ř	•	(66)	m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	m		
` '	630.21	604.57	565.2	525	489.36	468.91	478.85	501.88	541.5	585.24	618.22		(73)
6. Solar gains:													
Solar gains are ca		_					itions to co		ne applicat		ion.		
Orientation: A	ccess F able 6d	actor	Area m²		Flu Tal	x ole 6a	Т	g_ able 6b	T	FF able 6c		Gains (W)	
10	abic 00		111		iai	JIO 00	ı	abic ob	1.	ubio 00		(* *)	
	4 -												
Solar gains in w	vatts, ca	alculated 0	for eac	h month 0	0	0	$\frac{(83)m = S}{0}$	um(74)m 0	(82)m	0	0		(83)

_	gains – i	nternal a	and solar	r (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	635.78	630.21	604.57	565.2	525	489.36	468.91	478.85	501.88	541.5	585.24	618.22		(84)
7 Ma	an inter	nal temr	perature	(heating	season)								
			neating p				from Tak	ole 0. Th	1 (°C)				21	(85)
-		_	٠.			•		JIC 0, 111	1 (0)				21	(00)
Utilisa		Feb	ains for l		May	r	Jul	Δυα	Con	Oct	Nov	Dec		
(86)m=	Jan 0.96	0.96	0.95	Apr 0.94	0.91	Jun 0.84	0.73	Aug 0.73	Sep 0.85	0.92	0.95	0.96		(86)
, ,		ļ		ļ		<u> </u>	ļ	ļ		0.92	0.93	0.90		(00)
		ı i	ature in		· `	i e	i	ì			ı		1	
(87)m=	18.85	18.96	19.23	19.63	20.08	20.53	20.78	20.77	20.46	19.91	19.33	18.83		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
=m(88)	20.03	20.03	20.04	20.05	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.96	0.95	0.94	0.93	0.89	0.79	0.63	0.65	0.81	0.91	0.94	0.96		(89)
Moar	intorna	l tompor	ature in	the rest	of dwalli	ing T2 (f	ollow sta	ne 3 to	7 in Tahl	o 9c)	Į.			
(90)m=	17.15	17.32	17.7	18.3	18.94	19.56	19.89	19.87	19.47	18.69	17.85	17.12		(90)
(00)	17.10	17.02		10.0	10.01	10.00	10.00	10.07			g area ÷ (4	<u> </u>	0.24	(91)
											J (,	0.24	(0.)
			ature (fo								1		ı	
(92)m=	17.57	17.72	18.07	18.62	19.22	19.8	20.11	20.09	19.71	18.99	18.21	17.54		(92)
	<u>adjustn</u>	nent to t	he mear	n internal	temper	ature fro	m Table	4e whe	ere appro	opriate				
		1		1			i			i	1		1	(00)
(93)m=	17.57	17.72	18.07	18.62	19.22	19.8	20.11	20.09	19.71	18.99	18.21	17.54		(93)
8. Sp	ace hea	17.72 ting requ	18.07 uirement	18.62	19.22	19.8	20.11	20.09	19.71	18.99				(93)
8. Sp Set T	ace hea i to the i	17.72 ting requ mean int	18.07 uirement ternal ter	18.62 mperatur	19.22 re obtain	19.8	20.11	20.09	19.71	18.99			culate	(93)
8. Sp Set T	ace hea	17.72 ting requ mean int factor fo	18.07 uirement ternal ter or gains	18.62 mperatur using Ta	19.22 re obtain ble 9a	19.8	20.11 ep 11 of	20.09 Table 9h	19.71 o, so tha	18.99 t Ti,m=(76)m an	d re-calc	culate	(93)
8. Sp Set T the ut	ace hear i to the ration Jan	ting requesting requesting interesting in the section for the section for the section in the sec	18.07 uirement ternal ter or gains Mar	18.62 mperatur using Ta Apr	19.22 re obtain	19.8	20.11	20.09	19.71	18.99			culate	(93)
8. Sp Set T the ut	ace head it to the utilisation Jan ation face	ting requirement into factor for general for general factor	uirement ternal ter or gains Mar ains, hm	18.62 mperatur using Ta Apr	19.22 re obtain able 9a May	19.8 ned at sto	20.11 ep 11 of Jul	20.09 Table 9l	19.71 o, so tha	18.99 t Ti,m=(76)m an Nov	d re-cald	culate	(93)
8. Sp Set T the ut Utilisa (94)m=	ace hear if to the restriction itilisation	ting requirement into factor for great 0.93	18.07 uirement ternal ter or gains Mar ains, hm 0.92	18.62 mperatur using Ta Apr 1: 0.9	19.22 re obtainable 9a May	19.8	20.11 ep 11 of	20.09 Table 9h	19.71 o, so tha	18.99 t Ti,m=(76)m an	d re-calc	culate	
8. Sp Set T the ut Utilisa (94)m=	ace hear if to the restriction itilisation	ting requirement into factor for great 0.93	uirement ternal ter or gains Mar ains, hm	18.62 mperatur using Ta Apr 1: 0.9	19.22 re obtainable 9a May	19.8 ned at sto	20.11 ep 11 of Jul	20.09 Table 9l	19.71 o, so tha	18.99 t Ti,m=(76)m an Nov	d re-cald	culate	
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m=	ace hear ito the ritilisation Jan ation factor of the control of	ting requirement into factor for greater f	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94	mperaturusing TaApr 1: 0.9 4)m x (84 510.3	19.22 re obtainable 9a May 0.86 4)m	19.8 ned at sto Jun 0.77 377.39	20.11 ep 11 of Jul 0.64	20.09 Table 9t Aug 0.65	19.71 D, so that Sep 0.79	18.99 t Ti,m=(Oct	76)m an Nov	Dec	culate	(94)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m=	ace hear ito the ritilisation Jan ation factor of the control of	ting requirement into factor for greater f	uirement ternal ter or gains Mar ains, hm 0.92 , W = (94)	mperaturusing TaApr 1: 0.9 4)m x (84 510.3	19.22 re obtainable 9a May 0.86 4)m	19.8 ned at sto Jun 0.77 377.39	20.11 ep 11 of Jul 0.64	20.09 Table 9t Aug 0.65	19.71 D, so that Sep 0.79	18.99 t Ti,m=(Oct	76)m an Nov	Dec	culate	(94)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Montl (96)m=	ace head it to the ritilisation factor facto	ting required the second secon	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7	mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1perature 8.9	19.22 Te obtainable 9a May 0.86 4)m 452.57 E from Ta 11.7	19.8 ned at sto Jun 0.77 377.39 able 8 14.6	20.11 ep 11 of Jul 0.64 298.85	20.09 Table 9l Aug 0.65 310.67	19.71 D, so that Sep 0.79 396.07	18.99 t Ti,m=(Oct 0.88 476.98	76)m an Nov 0.92 538.79	Dec 0.94 580.86	culate	(94) (95)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat	i to the ration factor	ting requirement into factor for grant for gra	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5	18.62 mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 perature 8.9 nal temperature	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature,	19.8 ned at sto Jun 0.77 377.39 able 8 14.6	20.11 ep 11 of Jul 0.64 298.85	20.09 Table 9l Aug 0.65 310.67	19.71 D, so that Sep 0.79 396.07	18.99 t Ti,m=(Oct 0.88 476.98	76)m an Nov 0.92 538.79	Dec 0.94 580.86	culate	(94) (95)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Montl (96)m= Heat (97)m=	ace head it to the ritilisation factor facto	ting required to the factor for graph of the factor fo	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern	mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1perature 8.9 1021.25	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature, 788.01	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04	19.71 D, so that Sep 0.79 396.07 14.1 - (96)m 584.7	18.99 t Ti,m=(Oct 0.88 476.98 10.6]	76)m an Nov 0.92 538.79 7.1	Dec 0.94 580.86	culate	(94) (95) (96)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Montl (96)m= Heat (97)m=	ace head it to the ritilisation factor facto	ting required to the factor for graph of the factor fo	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern	mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1perature 8.9 1021.25	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature, 788.01	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04	19.71 D, so that Sep 0.79 396.07 14.1 - (96)m 584.7	18.99 t Ti,m=(Oct 0.88 476.98 10.6]	76)m an Nov 0.92 538.79 7.1	Dec 0.94 580.86	culate	(94) (95) (96)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat (97)m= Space	i to the ratilisation Jan ation factor 0.94 ul gains, 594.76 hly avera 4.3 loss rate 1415.85 e heatin	ting requirement in the factor for great for mean interest for for great for mean for mean for mean for mean for mean for	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern 1229.38 ement fo	mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1: 8.9 1: 1021.25 10 each m	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature, 788.01 nonth, k	19.8 ned at sto Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/month	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83 th = 0.02	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0	19.71 Do, so that Sep 0.79 396.07 14.1 — (96)m 584.7)m — (95	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21	culate	(94) (95) (96)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat (97)m= Space (98)m=	ace head it to the retilisation factor facto	ting required to the second se	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern 1229.38 ement fo	nperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1perature 8.9 1021.25 1r each m 367.89	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature, 788.01 nonth, k\ 249.57	19.8 ned at sto Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/month	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83 th = 0.02	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0	19.71 Do, so that Sep 0.79 396.07 14.1 - (96)m 584.7 0m - (95) 0	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21	3621.3	(94) (95) (96) (97)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat (97)m= Space (98)m=	ace head it to the untilisation factor facto	ting required to the total transfer for graph of the total transfer for mean for mean for graph of the total transfer for mean for graph of the total transfer	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern 1229.38 ement fo	mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1perature 8.9 1021.25 1r each m 367.89	19.22 re obtainable 9a May 0.86 4)m 452.57 efrom Ta 11.7 erature, 788.01 nonth, kl 249.57	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/month 0	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83 th = 0.02	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0 Tota	19.71 Do, so that Sep 0.79 396.07 14.1 - (96)m 584.7)m - (95 0	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21		(94) (95) (96) (97)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat (97)m= Space (98)m= Space (98)m=	ace head it to the retilisation Jan attion face 0.94 and gains, 594.76 and some face 1415.85 are heating 610.89	ting requirement	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern 1229.38 ement fo	mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 1perature 8.9 1021.25 1r each m 367.89	19.22 re obtainable 9a May 0.86 4)m 452.57 efrom Ta 11.7 erature, 788.01 nonth, kl 249.57	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/month 0	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83 th = 0.02	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0 Tota	19.71 Do, so that Sep 0.79 396.07 14.1 - (96)m 584.7)m - (95 0	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21	3621.3	(94) (95) (96) (97)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat (97)m= Space (98)m= Space 9a. En	i to the ratilisation Jan ation factorisation factorisati	ting requirements	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern 1229.38 ement fo 499.73 ement in	18.62 mperaturusing Ta Apr 1: 0.9 4)m x (84 510.3 perature 8.9 nal tempe 1021.25 or each m 367.89 kWh/m² ividual h	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature, 788.01 nonth, kl 249.57	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/mont	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83 th = 0.02 0	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0 Tota	19.71 Do, so that Sep 0.79 396.07 14.1 - (96)m 584.7)m - (95 0	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21	3621.3 36.05	(94) (95) (96) (97) (98) (99)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Monttl (96)m= Heat (97)m= Space (98)m= Space 9a. En Space Fracti	ace heading to the reconstruction of special ace head according to the head according to th	ting requirements 17.72 ting requirements factor for g 0.93 hmGm 587.21 age exter 4.9 e for mean interpretation of the second of the s	18.07 uirement ternal ter or gains Mar ains, hm 0.92 557.7 ernal tem 6.5 an intern 1229.38 ement fo 499.73 ement in	18.62 mperaturusing Ta	19.22 re obtainable 9a May 0.86 4)m 452.57 e from Ta 11.7 erature, 788.01 nonth, kl 249.57 eating sy	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/mont	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m: 363.83 th = 0.02 0 ncluding	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0 Tota	19.71 Do, so that Sep 0.79 396.07 14.1 - (96)m 584.7 0m - (95 0	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21	3621.3 36.05	(94) (95) (96) (97) (98) (99)
8. Sp Set T the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space (98)m= Space Fracti Fracti	ace heading to the residual gains, action face 0.94 and gains, action face 1.3 and 1.4 and 1.5	ting requirements of the control of	18.07 uirement ternal ter or gains Mar ains, hm 0.92 , W = (94 557.7 ernal tem 6.5 an intern 1229.38 ement fo 499.73 ement in	18.62 mperaturusing Ta Apr i: 0.9 4)m x (84 510.3 perature 8.9 nal temperature 1021.25 or each m 367.89 kWh/m² ividual herecondary	19.22 re obtainable 9a May 0.86 4)m 452.57 efrom Ta 11.7 erature, 788.01 nonth, kl 249.57 equive ating sy/supple em(s)	19.8 ned at ste Jun 0.77 377.39 able 8 14.6 Lm , W = 539.68 Wh/mont	20.11 ep 11 of Jul 0.64 298.85 16.6 =[(39)m; 363.83 th = 0.02 0 ncluding	20.09 Table 9l Aug 0.65 310.67 16.4 x [(93)m 382.04 24 x [(97) 0 Tota	19.71 Do, so that Sep 0.79 396.07 14.1 - (96)m 584.7 Om - (95) 0 I per year	18.99 t Ti,m=(Oct 0.88 476.98 10.6] 879.54)m] x (4 299.51 (kWh/year	76)m an Nov 0.92 538.79 7.1 1169.83 1)m 454.35	Dec 0.94 580.86 4.2 1410.21	3621.3 36.05	(94) (95) (96) (97)

													_
	ncy of main spa		• .									90.6	(206)
Efficie	ncy of seconda	ry/suppl	ementar	y heating	g system	າ, % 						0	(208)
_ [Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space [heating require	ement (c	alculate	d above)	0	0	0	0	299.51	454.35	617.04	1	
(244)		<u> </u>			0	U	U	0	299.51	404.00	017.04]	(244)
(211)m [= {[(98)m x (20 674.27 576.52	551.58	406.06	275.46	0	0	0	0	330.58	501.49	681.06	1	(211)
L	07 1.27	001.00	100.00	270.10	Ů	_				211),5,1012		3997.02	(211)
Space	heating fuel (s	econdar	v). kWh/	month							•		 _`
•	m x (201)] } x 1		• /										
(215)m=	0 0	0	0	0	0	0	0	0	0	0	0		
							Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
	heating												
Output [from water hea	ter (calc 153.98	ulated a 134.24	bove) 128.81	111.15	103	118.19	119.61	139.39	152.15	165.23	1	
L Efficien	cy of water hea	<u> </u>	101.21	120.01		100	110.10	110.01	100.00	102.10	100.20	85	(216)
(217)m=	89.32 89.29	89.22	89.03	88.61	85	85	85	85	88.74	89.13	89.36		(217)
Fuel for	r water heating,	kWh/mo	nth									1	
(219)m	$= (64)m \times 100$) ÷ (217)	m								1	7	
(219)m=	191.02 167.11	172.59	150.78	145.36	130.77	121.18	139.05	140.71	157.07	170.72	184.91		_
A 1							rota	I = Sum(2		A/I- /		1871.28	(219)
	l totals heating fuel use	ed. main	system	1					K	Wh/year	•	kWh/year	
Space I	heating fuel use	•	system	1					K	wn/year		3997.02	
Space I Water h	heating fuel use	ed	·		ŧ				K	wn/year			
Space I Water h	heating fuel use neating fuel use lity for pumps, fa	d ans and	·		t				K	wn/year		3997.02	
Space I Water h Electric centra	heating fuel useneating fuel use eity for pumps, fall I heating pump	ans and	·		t				K	wn/year	30	3997.02	(230c)
Space I Water h Electric centra boiler	heating fuel useneating fuel use lity for pumps, fall I heating pump with a fan-assis	ed ans and : sted flue	electric	keep-ho	t		sum	of (230a).				3997.02 1871.28	(230c) (230e)
Space I Water h Electric centra boiler Total el	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the	ed ans and : sted flue	electric	keep-ho	t		sum	of (230a).	(230g) =		30	3997.02 1871.28	(230c) (230e) (231)
Space I Water h Electric centra boiler Total el Electric	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the lity for lighting	ans and : sted flue above, I	electric «Wh/yea	keep-ho		+ (232)					30	3997.02 1871.28 75 450.79	(230c) (230e) (231) (232)
Space I Water h Electric centra boiler Total el Electric Total de	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis ectricity for the lity for lighting elivered energy	ans and ted flue above, I	electric «Wh/yea ses (211	keep-hoʻ ur)(221)		+ (232).					30	3997.02 1871.28	(230c) (230e) (231)
Space I Water h Electric centra boiler Total el Electric Total de	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the lity for lighting	ans and ted flue above, I	electric «Wh/yea ses (211	keep-hoʻ ur)(221)	+ (231)				(230g) =		30	3997.02 1871.28 75 450.79 6394.09	(230c) (230e) (231) (232)
Space I Water h Electric centra boiler Total el Electric Total de	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis ectricity for the lity for lighting elivered energy	ans and ted flue above, I	electric «Wh/yea ses (211	keep-hoʻ ur)(221)	+ (231) Fu	el			(230g) =	rice	30	3997.02 1871.28 75 450.79 6394.09	(230c) (230e) (231) (232)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F	heating fuel use neating fuel use lity for pumps, fall l heating pump with a fan-assis ectricity for the lity for lighting elivered energy	ans and the sted flue above, I for all us vidual he	electric «Wh/yea ses (211 eating sy	keep-hoʻ ur)(221)	+ (231) Fu kW	el /h/year			(230g) = Fuel P (Table	rice 12)	30 45	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year	(230c) (230e) (231) (232) (338)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F	heating fuel use neating fuel use ity for pumps, fall heating pump with a fan-assis ectricity for the ity for lighting elivered energy fuel costs - indiv	ans and the sted flue above, I for all us vidual he	electric «Wh/yea ses (211 eating sy	keep-hoʻ ur)(221)	+ (231) Fu kW (211	el /h/year			(230g) = Fuel P (Table	rice 12)	30 45 x 0.01 =	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year 139.1	(230c) (230e) (231) (232) (338)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the lity for lighting elivered energy fuel costs - indivi	ans and the sted flue above, I for all us vidual he system 1	electric «Wh/yea ses (211 eating sy	keep-hoʻ ur)(221)	+ (231) Fu kW (211)	el /h/year i) x			(230g) = Fuel P (Table 3.4	rice 12)	30 45 × 0.01 = × 0.01 =	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year 139.1	(230c) (230e) (231) (232) (338) (240) (241)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the lity for lighting elivered energy fuel costs - individual heating - main se heating - main se heating - secon	ans and the sted flue above, I for all unividual here system 1 system 2 dary	electric kWh/yea ses (211 eating sy	keep-hoʻ ur)(221)	+ (231) Fu kW (211 (213)	el /h/year i) x 3) x 5) x			(230g) = Fuel P (Table 3.4	rice 12) 8	x 0.01 = x 0.01 = x 0.01 =	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year 139.1 0	(230c) (230e) (231) (232) (338) (240) (241) (242)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the lity for lighting elivered energy fuel costs - individual heating - main se heating - secon neating cost (other	ans and the sted flue above, I for all us vidual he system 1 system 2 dary her fuel)	electric «Wh/yea ses (211 eating sy	keep-hoʻ ur)(221)	+ (231) Fu kW (211 (213 (218)	el /h/year 1) x 3) x 5) x 9)			(230g) = Fuel P (Table 3.4 0 13.	rice 12) 8	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year 139.1 0 0 65.12	(230c) (230e) (231) (232) (338) (240) (241) (242) (247)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F	heating fuel use neating fuel use lity for pumps, fall heating pump with a fan-assis lectricity for the lity for lighting elivered energy fuel costs - individual heating - main se heating - secon neating cost (other), fans and elect	ans and the sted flue above, I for all us vidual he system 2 dary her fuel) ric keep-	electric kWh/yea ses (211 eating sy	keep-ho	+ (231) Fu kW (211 (213 (218 (218) (231	el /h/year 1) x 3) x 5) x 9)	(237b)	=	(230g) = Fuel P (Table 3.4 13.4 13.6	rice 12) 8	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year 139.1 0 0 65.12 9.89	(230c) (230e) (231) (232) (338) (240) (241) (242)
Space I Water h Electric centra boiler Total el Electric Total de 10a. F Space I Space I Space I Water h Pumps, (if off-pe	heating fuel use neating fuel use lity for pumps, fall I heating pump with a fan-assis lectricity for the lity for lighting elivered energy fuel costs - individual heating - main se heating - secon neating cost (other	ans and the sted flue above, I for all us vidual he system 2 dary her fuel) ric keep-	electric kWh/yea ses (211 eating sy	keep-ho	+ (231) Fu kW (211 (213 (218 (218) (231	el /h/year 1) x 3) x 5) x 9)	(237b)	=	(230g) = Fuel P (Table 3.4 13.4 13.6	rice 12) 8 19 8 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	3997.02 1871.28 75 450.79 6394.09 Fuel Cost £/year 139.1 0 0 65.12 9.89	(230c) (230e) (231) (232) (338) (240) (241) (242) (247)

Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (2	254) as needed		
, , , , ,	45)(247) + (250)(254) =		393.57 (255)
11a. SAP rating - individual heating syster	ms		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(2	55) x (256)] ÷ [(4) + 45.0] =		1.14 (257)
SAP rating (Section 12)			84.15 (258)
12a. CO2 emissions – Individual heating s	systems including micro-CHF		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	863.36 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	404.2 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	1267.55 (265)
Electricity for pumps, fans and electric keep	o-hot (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	233.96 (268)
Total CO2, kg/year		sum of (265)(271) =	1540.44 (272)
CO2 emissions per m ²		(272) ÷ (4) =	15.34 (273)
El rating (section 14)			86 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	4876.36 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	2282.96 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	7159.32 (265)
Electricity for pumps, fans and electric keep	o-hot (231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0 =	1383.93 (268)
'Total Primary Energy		sum of (265)(271) =	8773.51 (272)
		(070) (4)	

(272) ÷ (4) =

Primary energy kWh/m²/year

87.35

(273)

		User Details:				
Assessor Name:	Ben Marsh	Stroma Nui	mber:	STRO	005374	
Software Name:	Stroma FSAP 2012	Software V	ersion:	Versio	n: 1.0.5.58	
		Property Address: Plot 2	28			
Address :	Plot 28					
Overall dwelling dime	nsions:	A a (2)	A. Hainbala	-1	\/ a a / 2\	
Ground floor		Area(m²) 50.22 (1a) x	Av. Height(n	n) (2a) = [Volume(m³)	(3a)
First floor		50.22 (1b) x	2.4	(2b) =	120.53	` ☐(3b)
	a)+(1b)+(1c)+(1d)+(1e)+(1		2.7		120.00	
Dwelling volume	a).(10).(10).(10).(10)(1	,,	3b)+(3c)+(3d)+(3e)+	- (3n) = Γ	0.44.00	7(5)
		(54)1(55)1(36)1(3d)1(3c)1	(011) =	241.06	(5)
2. Ventilation rate:	main seconda	ary other	total		m³ per houi	
Number of chimneys	heating heating + 0	+ 0 =	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0	x 20 =	0](6b)
Number of intermittent fa			3	x 10 =	30	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fi			0	x 40 =	0	`
J				L		
				Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(6b)$	(7a)+(7b)+(7c) =	30	÷ (5) =	0.12	(8)
•	een carried out or is intended, proce	ed to (17), otherwise continue	from (9) to (16)	-		_
Number of storeys in the	ne dwelling (ns)		_		0	(9)
Additional infiltration	OF (an atrial and back and an array	0.05 ((9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame or resent, use the value corresponding to	•	struction	L	0	(11)
deducting areas of opening		· ·		_		_
If suspended wooden f	loor, enter 0.2 (unsealed) or (0.1 (sealed), else enter	0		0	(12)
If no draught lobby, en				Ţ	0	(13)
<u>-</u>	s and doors draught stripped				0	(14)
Window infiltration		0.25 - [0.2 x (14) -		Ţ	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per hour per square	metre of envelo	pe area [5	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] +$	+(8), otherwise (18) = (16)			0.37	(18)
Air permeability value applie	s if a pressurisation test has been do	one or a degree air permeabili	ty is being used	_		_
Number of sides sheltere	d	(00)	44.503		2	(19)
Shelter factor		$(20) = 1 - [0.075 \times 10^{-3}]$		<u> </u>	0.85	(20)
Infiltration rate incorporat		$(21) = (18) \times (20)$	=		0.32	(21)
Infiltration rate modified f	or monthly wind speed	, , ,	, , , , , , , , , , , , , , , , , , , 			
Jan Feb	Mar Apr May Jun	Jul Aug Ser	Oct No	v Dec		
Monthly average wind sp	eed from Table 7					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor (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		
Adjusted infiltr	ation rat	امرامین	na for ok	oltor on	طيينامط م	nood)	(210) v	(22a)m		!	!		
0.41	0.4	e (allowi	0.35	0.34	0.3	0.3	(2 Ta) X	0.32	0.34	0.36	0.37	1	
Calculate effe	· ·				l		0.20	0.02	0.01	0.00	0.07		
If mechanica												0	(23a)
If exhaust air h		0 11	, ,	, (, (• •	,, .) = (23a)			0	(23b)
If balanced with		-	-	_								0	(23c)
a) If balance	·				·	- 	- ` ` - 	ŕ	 	- 	``	÷ 100]	(5.4.)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	i				i	· · · ·			- 	· ·	ı	1	(2.41.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•	•				E (00k	. \			
(24c)m = 0	0.5 x	(23b), t	nen (240 0	(230) = (230)	o); otner	wise (24)	C) = (22)	0) m + 0.	5 × (231	0	0		(24c)
					<u> </u>		<u> </u>		0				(240)
d) If natural if (22b)r		on or wh en (24d):							0.5]				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effective air	change	rate - en	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)	<u> </u>	ļ.	ļ.	l	
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat losse	s and he	oot loop r	0 40 40 04							•	•		
				⊃r·									
ELEMENT	Gros	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
		SS	Openin	gs	Net Ar A ,r				A X U (W/				
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K = [(W/				kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m² x x1/2	W/m2	eK = [0.04] = [(W/ 2.94				kJ/K (26)
ELEMENT Doors Windows Type	Gros area	SS	Openin	gs	A ,r 2.1 8.22 3.64	m² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = [0.04] = [2.94 10.9 4.83	K) 			(26) (27) (27)
Doors Windows Type Windows Type Floor	Gros area e 1	ss (m²)	Openin m	gs ²	A ,r 2.1 8.22 3.64 50.22	x10 x10 x x1	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = [0.04] = [0.04] = [= [2.94 10.9 4.83 7.0308	K) 			(26) (27) (27) (28)
Doors Windows Type Windows Type Floor Walls	Gros area 1 2 2 96.4	SS (m²)	Openin m	gs ²	A ,r 2.1 8.22 3.64 50.22 82.52	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17	EK	(W// 2.94 10.9 4.83 7.0308 14.03	K) 			(26) (27) (27) (28) (29)
Doors Windows Type Windows Type Floor Walls Roof	Gros area 1 2 2 96.4 50.2	ss (m²)	Openin m	gs ²	A ,r 2.1 8.22 3.64 50.22 82.52 50.22	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = [0.04] = [0.04] = [= [2.94 10.9 4.83 7.0308	K) 			(26) (27) (27) (28) (29) (30)
Doors Windows Type Windows Type Floor Walls Roof Total area of e	Gros area 1 2 2 96.4 50.2	ss (m²)	Openin m	gs ²	A ,r 2.1 8.22 3.64 50.22 82.52 50.22	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	EK	(W// 2.94 10.9 4.83 7.0308 14.03 5.52	K) 			(26) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and	Gros area 1 1 2 2 96.4 50.2 Elements	18 22 m² ows, use e	Openin m 13.9 0	gs 3 indow U-ve	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calcul	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	eK = [0.04] = [0.04] = [(W// 2.94 10.9 4.83 7.0308 14.03 5.52	k)	kJ/m²-l		(26) (27) (27) (28) (29) (30)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area	Gros area 1 1 2 2 96.4 50.2 Selements	18 22 22 ows, use e	13.9 0 ffective winternal wall	gs 3 indow U-ve	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calcul	x1/2 x x 2 x 2 x 2 x 2 x 2 4 x x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	EK	(W// 2.94 10.9 4.83 7.0308 14.03 5.52	k)	kJ/m²-l	3.2	(26) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	Gros area 1 1 2 2 96.4 50.2 Elements 1 roof wind as on both ss, W/K:	is (m²)	13.9 0 ffective winternal wall	gs 3 indow U-ve	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calcul	x1/2 x x 2 x 2 x 2 x 2 x 2 4 x x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	$ \begin{array}{ccc} 2K & = & & \\ 0.04] & = & & \\ 0.04] & = & & \\ 0.04] & = & & \\ & = & & \\ & = & & \\ & = & & \\ & & & $	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (e)+0.04] &	K)	kJ/m²-l	3.2	(26) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity	Gros area e 1 e 2 96.4 50.2 elements froof winder as on both ss, W/K: Cm = S(18 18 22 3, m ² ows, use e sides of in = S (A x (A x k)	13.9 0 ffective winternal wall	gs p 6 ndow U-va ls and pan	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 titions	x1/2 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11	$ \begin{array}{ccc} 2K & = & & \\ 0.04] & = & & \\ 0.04] & = & & \\ 0.04] & = & & \\ & & = & \\ & & = & \\ & & & = & \\ & & & \\ & & & & \\ & & & & \\ & & & & $	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (e)+0.04] &	K)	kJ/m²-l	1 3.2 45.25 14754.0	(26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	Gros area 1 1 2 2 96.4 50.2 Selements 1 roof winder as on both as on both cases, W/K: Cm = So	iss (m²) is m²	13.9 13.9 0 offective with ternal walk U) P = Cm -	gs 6 ndow U-ve ls and pan	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 Alue calculations	x1/x1/2 x x2/2 x x/2 x x2/2 x x/2 x x/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	2K $= [$ $0.04] = [$ $0.04] = [$ $0.04] = [$ $= [$	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (e)+0.04] at tive Value	K)	paragraph(32e) =	3.2	(26) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste	Gros area 1 1 2 2 96.4 50.2 Elements I roof winder as on both	as (m²) as	13.9 13.9 0 Iffective winternal wall U) P = Cm - tails of the culation.	gs ndow U-va ls and pan - TFA) ir construct	A ,r 2.1 8.22 3.64 50.22 50.22 196.9 44.64 alue calculations kJ/m²K ion are not	x1/2 x x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	2K $= [$ $0.04] = [$ $0.04] = [$ $0.04] = [$ $= [$	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (e)+0.04] at tive Value	K)	paragraph(32e) =	1 3.2 45.25 14754.0	kJ/K (26) (27) (27) (28) (29) (30) (31) (32) (33) 6 (34) (35)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge	Gros area e 1 96.4 50.2 elements I roof winder as on both as on both cs, W/K: Cm = S(parame ad of a de es : S (L	is (m²) is	13.9 13.9 0 offective winternal wall U) P = Cm = tails of the ulation. culated to	gs andow U-vals and pan TFA) ir constructions	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 alue calculatitions n kJ/m²K ion are not opendix I	x1/2 x x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	2K $= [$ $0.04] = [$ $0.04] = [$ $0.04] = [$ $= [$	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (e)+0.04] at tive Value	K)	paragraph(32e) =	1 3.2 45.25 14754.0	(26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of thermal	Gros area e 1 96.4 50.2 elements froof winder as on both as, W/K: Cm = S(parame sments whe ad of a de es: S (L al bridging	is (m²) is	13.9 13.9 0 offective winternal wall U) P = Cm = tails of the ulation. culated to	gs andow U-vals and pan TFA) ir constructions	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 alue calculatitions n kJ/m²K ion are not opendix I	x1/2 x x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	eK = [0.04] = [0.04] = [(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (a) + 0.04] a tive Values of	K)	paragraph(32e) =	45.25 14754.0 100	(26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34) (35)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric he	Gros area e 1 96.4 50.2 elements I roof wind as on both as on both cs, W/K: Cm = S(parame sments wh ad of a de es: S (L al bridging at loss	iss (m²) is	13.9 13.9 0 Iffective wing ternal walk the standard of the culation. culated to own (36) =	gs indow U-value TFA) in construction using Ap = 0.05 x (3)	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 alue calculatitions n kJ/m²K ion are not opendix I	x1/2 x x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	2K $= [$ $0.04] = [$ $0.04]$	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (a) + (3) +	K)	paragraph(32e) =	3.2 45.25 14754.0	kJ/K (26) (27) (27) (28) (29) (30) (31) (32) (33) 6 (34) (35)
ELEMENT Doors Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of thermal	Gros area e 1 96.4 50.2 elements I roof wind as on both as on both cs, W/K: Cm = S(parame sments wh ad of a de es: S (L al bridging at loss	iss (m²) is	13.9 13.9 0 Iffective wing ternal walk the standard of the culation. culated to own (36) =	gs indow U-value TFA) in construction using Ap = 0.05 x (3)	A ,r 2.1 8.22 3.64 50.22 82.52 196.9 44.64 alue calculatitions n kJ/m²K ion are not opendix I	x1/2 x x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.14 0.17 0.11 0 // formula 1 (26)(30)	2K $= [$ $0.04] = [$ $0.04]$	(W// 2.94 10.9 4.83 7.0308 14.03 5.52 0 (a) + (3) +	K)	paragraph(32e) =	45.25 14754.0 100	(26) (27) (27) (28) (29) (30) (31) (32) (33) (6) (34) (35)

	,												
(38)m= 46.32	46.07	45.82	44.65	44.43	43.41	43.41	43.22	43.8	44.43	44.87	45.34		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 106.71	106.46	106.21	105.04	104.82	103.8	103.8	103.61	104.19	104.82	105.26	105.73		_
Heat loss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	105.04	(39)
(40)m= 1.06	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		_
\\	:	-41- / T -1-	la 4a\					/	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Number of day		<u>`</u>		Mov	lun	lul	۸۰۰۵	Con	Oot	Nov	Doo		
Jan (41)m= 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(41)III= 31	20	31	30	31	30	31	31	30	31	30	31		(41)
4.344.4.1.											1.2011./		
4. Water heat	ting enei	gy requi	rement:								kWh/ye	ear:	
Assumed occu											74		(42)
if TFA > 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
if TFA £ 13.9 Annual averag	,	ater usad	ne in litre	s ner da	av Vd av	erane –	(25 x N)	+ 36		10	4.59		(43)
Reduce the annua									se target o		4.59		(40)
not more that 125	litres per p	person per	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
44)m= 115.05	110.86	106.68	102.5	98.31	94.13	94.13	98.31	102.5	106.68	110.86	115.05		
Energy content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd n	пхптхГ)Tm / 3600			m(44) ₁₁₂ =		1255.07	(44)
(45)m= 170.61	149.22	153.98	134.24	128.81	111.15	103	118.19	119.61	139.39	152.15	165.23		
43)111= 170.01	149.22	155.50	134.24	120.01	111.13	103	110.19			m(45) ₁₁₂ =	L	1645.59	(45)
lf instantaneous พ	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		i otai – Su	111(43)112 -		1043.33	(.0)
(46)m= 25.59	22.38	23.1	20.14	19.32	16.67	15.45	17.73	17.94	20.91	22.82	24.78		(46)
Nater storage	loss:										<u> </u>		
Storage volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
f community h	•			-			. ,						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
Nater storage a) If manufact		oclared l	oss facto	or ie kna	wn (k\//k	/day/):					0		(40)
Temperature f				טווא פו וכ	wii (Kvvi	i/uay).					0		(48)
•							(40) × (40)				0		(49)
Energy lost fro b) If manufact		_	-		or is not		(48) x (49)	=			0		(50)
Hot water stor			•								0		(51)
f community h	neating s	ee secti	on 4.3										
/olume factor											0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
nergy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (. , .	•									0		(55)
	loss cal	culated f	or each	month			((56)m = (55) × (41)r	m	_			
Water storage													
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
	-						-	-			_	ix H	(56)

Primary	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
-						' '	(58) ÷ 36	, ,						
` r							ter heati			1	 	1	ı	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	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	eat requ	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=	170.61	149.22	153.98	134.24	128.81	111.15	103	118.19	119.61	139.39	152.15	165.23		(62)
Solar DH	IW input o	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter '0	if no sola	r contribut	ion to wate	er heating)	ı	
(add ad	dditiona	l 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	from wa	ater hea	iter											
(64)m=	170.61	149.22	153.98	134.24	128.81	111.15	103	118.19	119.61	139.39	152.15	165.23		
L				!			!	Outp	out from w	ater heate	r (annual)	12	1645.59	(64)
Heat ga	ains froi	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	า] + 0.8 :	x [(46)m	+ (57)m	+ (59)m	1	_
(65)m=	56.73	49.62	51.2	44.64	42.83	36.96	34.25	39.3	39.77	46.35	50.59	54.94	_	(65)
ı inclu	de (57)ı	m in cal	culation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity h	eating	
	. ,		e Table 5	` ,	•	,		3				· ,	Jan 9	
					/•									
wetabc	Jan	Feb	5), Wat Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	137.18	137.18	137.18	137.18	137.18	137.18	137.18	137.18	137.18	137.18	137.18	137.18		(66)
L			ļ		ļ	ļ.	r L9a), a			1 .0	1 .0	1		
(67)m=	25.53	22.67	18.44	13.96	10.43	8.81	9.52	12.37	16.61	21.09	24.61	26.24		(67)
L			ļ		<u> </u>	<u> </u>				<u> </u>	24.01	20.24		(0.)
(68)m=		259.7	252.98	238.67	220.61	203.64	13 or L1	189.63	196.35	210.66	228.72	245.7		(68)
` ' L											220.72	245.7		(00)
		·		 	 		or L15a)			1	00.70	00.70	1	(69)
(69)m=	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72		(09)
· .			(Table	 								Γ.	I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
			n (nega		- 								ı	
(71)m=	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74		(71)
Water I		gains (T	Table 5)									,	•	
(72)m=	76.25	73.83	68.82	61.99	57.57	51.33	46.03	52.82	55.23	62.29	70.27	73.84		(72)
Total i	nternal	gains =	:		_	(66))m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72))m		
(73)m=	425.96	423.36	407.39	381.78	355.77	330.93	315	321.97	335.34	361.19	390.75	412.93		(73)
	ar gains													
_			_	r flux from	Table 6a		iated equa	itions to co	onvert to th	ne applicat		tion.		
Orienta		Access F able 6d		Area m²		Flu	ıx ble 6a	т	g_ able 6b	т	FF able 6c		Gains	
	ı	avie 00		111~		ıdı	ui c ua	ı	avie on	1	abie 00		(W)	
ĭ			alculated	ì	1	î e	<u> </u>	(83)m = S		1	<u> </u>	<u> </u>	l	(02)
(83)m=	0	0	0	0	0	0	0	0	0	0	0	0		(83)

	ains – i	ntemai a	and solar	(84)m =	= (73)m -	+ (83)m	, wans							
(84)m=	425.96	423.36	407.39	381.78	355.77	330.93	315	321.97	335.34	361.19	390.75	412.93		(84)
7 Me	an inter	nal temr	perature	(heating	season	<u> </u>	•							
			neating p				from Tah	ole 9 Th	1 (°C)				21	(85)
-		_	٠.			_)ic 5, 111	1 (0)				21	(00)
Utilisa			ains for l			· ·		۸۰۰۰	Con	Ost	Nov	Daa		
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(06)
(86)m=	0.98	0.98	0.98	0.97	0.96	0.92	0.85	0.86	0.93	0.97	0.98	0.99		(86)
Mean	interna	I temper	ature in	living are	ea T1 (fc	llow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	18.5	18.62	18.9	19.34	19.83	20.33	20.65	20.63	20.25	19.63	19.01	18.48		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
88)m=	20.03	20.03	20.04	20.05	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling	h2 m (se	e Table	9a)						
(89)m=	0.98	0.98	0.98	0.97	0.95	0.89	0.78	0.79	0.91	0.96	0.98	0.98		(89)
		<u> </u>					<u> </u>							, ,
		· ·	ature in		i	<u> </u>	1	i				10.00		(00)
90)m=	16.65	16.82	17.24	17.88	18.59	19.32	19.75	19.72	19.2	18.31	17.4	16.62		(90)
									I	LA = Livin	g area ÷ (4	+) =	0.24	(91)
Mean	interna	I temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
92)m=	17.1	17.26	17.64	18.24	18.9	19.57	19.97	19.94	19.45	18.63	17.79	17.07		(92)
Apply	adjustr	nent to t	he mean	internal	temper	ature fro	m Table	4e. whe	ere appro	priate				
02)								,		-				
93)m=	17.1	17.26	17.64	18.24	18.9	19.57	19.97	19.94	19.45	18.63	17.79	17.07		(93)
1		<u> </u>	17.64 uirement		18.9	19.57	i			•	17.79	17.07		(93)
8. Spa	L ace hea i to the i	ı ting requ mean int	uirement ternal ter	mperatur	re obtain		19.97	19.94	19.45	18.63			ulate	(93)
8. Spa	L ace hea i to the i	ı ting requ mean int	uirement	mperatur using Ta	re obtain able 9a	ed at ste	19.97 ep 11 of	19.94 Table 9b	19.45 o, so tha	18.63	76)m an	d re-calc	ulate	(93)
8. Spa Set Ti the ut	ace hea i to the ilisation Jan	ting requesting requestions to the time and	uirement ternal ter or gains Mar	mperatur using Ta Apr	re obtain		19.97	19.94	19.45	18.63 t Ti,m=(ulate	(93)
8. Spa Set Ti the ut	ace hea i to the ilisation Jan	ting requesting requestions to the time and	uirement ternal ter or gains	mperatur using Ta Apr	re obtain able 9a	ed at ste	19.97 ep 11 of	19.94 Table 9b	19.45 o, so tha	18.63 t Ti,m=(76)m an	d re-calc	ulate	(93)
8. Spa Set Ti the ut Utilisa 94)m=	i to the dilisation Jan ation factors	mean int factor for Feb ctor for g	uirement ternal ter or gains Mar ains, hm	mperatur using Ta Apr :: 0.95	re obtain able 9a May	ed at ste	19.97 ep 11 of Jul	19.94 Table 9t	19.45 o, so tha	18.63 t Ti,m=(76)m an Nov	d re-calc	ulate	
8. Spa Set Ti the ut Utilisa 94)m= Usefu	i to the dilisation Jan ation factors	mean int factor for Feb ctor for g	ternal ter or gains Mar ains, hm	mperatur using Ta Apr :: 0.95	re obtain able 9a May	ed at ste	19.97 ep 11 of Jul	19.94 Table 9t	19.45 o, so tha	18.63 t Ti,m=(76)m an Nov	d re-calc	ulate	
8. Spanson Set Tithe ut Utilisa 94)m= Usefu 95)m=	i to the cilisation Jan ation factors 0.97 Il gains, 413.81	mean interpretation for gradient for gradien	wirement ternal ter or gains Mar ains, hm 0.96 , W = (94	mperaturusing Ta Apr : 0.95 4)m x (84	ne obtainable 9a May 0.93 4)m 330.94	Jun 0.87 288.72	19.97 ep 11 of Jul 0.77	19.94 Table 9t Aug 0.78	19.45 Do, so that Sep 0.89	18.63 t Ti,m=(** Oct	76)m an Nov	Dec	ulate	(94)
8. Spa Set Ti the ut Utilisa 94)m= Usefu 95)m= Month	i to the cilisation Jan ation factors 0.97 Il gains, 413.81	mean interpretation for gradient for gradien	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94	mperaturusing Ta Apr : 0.95 4)m x (84	ne obtainable 9a May 0.93 4)m 330.94	Jun 0.87 288.72	19.97 ep 11 of Jul 0.77	19.94 Table 9t Aug 0.78	19.45 Do, so that Sep 0.89	18.63 t Ti,m=(** Oct	76)m an Nov	Dec	ulate	(94)
8. Spa Set Ti the ut Utilisa 94)m= Usefu 95)m= Month	i to the rilisation Jan ation factor 0.97 Il gains, 413.81 nly avers	mean interpretation factor for gradient of the control of the cont	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94 392.92	mperaturusing Ta Apr : 0.95 4)m x (84 364.21	ne obtain able 9a May 0.93 4)m 330.94 e from Ta	Jun 0.87 288.72 able 8 14.6	19.97 ep 11 of Jul 0.77 243.69	19.94 Table 9t Aug 0.78 252.02	19.45 D, so that Sep 0.89 297.39	18.63 t Ti,m=('Oct 0.94 340.63	76)m an Nov 0.96	Dec 0.97 402.1	ulate	(94)
8. Spanners Set Tithe ut Utilisa 94)m= Usefu 95)m= Month 96)m= Heat	i to the rillisation Jan ation factor 0.97 Il gains, 413.81 hly aver. 4.3	mean interpretation for grant for gr	wirement ternal ter gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5	mperature sal temperature	ne obtain able 9a May 0.93 4)m 330.94 e from Ta	Jun 0.87 288.72 able 8 14.6	19.97 ep 11 of Jul 0.77 243.69	19.94 Table 9t Aug 0.78 252.02	19.45 D, so that Sep 0.89 297.39	18.63 t Ti,m=('Oct 0.94 340.63	76)m an Nov 0.96	Dec 0.97 402.1	ulate	(94)
8. Spa Set Ti the ut Utilisa 94)m= Usefu 95)m= Month 96)m= Heat	i to the cilisation Jan ation factor 0.97 Il gains, 413.81 nly avera 4.3 loss rate 1365.74	mean interfactor for grant	ternal ter per gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an intern	mperaturusing Ta Apr 30.95 4)m x (84 364.21 perature 8.9 al tempe	ne obtain hable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26	Jun 0.87 288.72 able 8 14.6 Lm , W =	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m:349.86	19.94 Table 9h Aug 0.78 252.02 16.4 x [(93)m 367.1	19.45 Do, so that Sep 0.89 297.39 14.1 - (96)m 557.76	18.63 t Ti,m=(' Oct 0.94 340.63 10.6]	76)m and Nov 0.96 376.82 7.1	Dec 0.97 402.1	ulate	(94) (95) (96)
8. Spanners Set Tithe ut Utilisa 94)m= Usefu 95)m= Month 96)m= Heat 97)m= Space	i to the cilisation Jan ation factor 0.97 Il gains, 413.81 nly avera 4.3 loss rate 1365.74	mean interfactor for grant	wirement ternal ter gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an internal ternal	mperaturusing Ta Apr 30.95 4)m x (84 364.21 perature 8.9 al tempe	ne obtain hable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26	Jun 0.87 288.72 able 8 14.6 Lm , W =	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m:349.86	19.94 Table 9h Aug 0.78 252.02 16.4 x [(93)m 367.1	19.45 Do, so that Sep 0.89 297.39 14.1 - (96)m 557.76	18.63 t Ti,m=(' Oct 0.94 340.63 10.6]	76)m and Nov 0.96 376.82 7.1	Dec 0.97 402.1	ulate	(94) (95) (96)
8. Space Set Ti the ut Utilisa 94)m= Usefu 95)m= Month 96)m= Heat 97)m= Space	i to the rillisation Jan ation factor of the street of th	mean interpretation for grant for gr	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an intern 1183.67 ement fo	mperaturusing Ta Apr 1: 0.95 4)m x (84 364.21 1 perature 8.9 1 al tempe 980.81 r each m	ne obtain able 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 1 754.26	Jun 0.87 288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m: 349.86 th = 0.02	19.94 Table 9h Aug 0.78 252.02 16.4 x [(93)m 367.1 24 x [(97) 0	19.45 Do, so that Sep 0.89 297.39 14.1 - (96)m 557.76 0 0	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1	ulate 4288.79	(94) (95) (96)
8. Spanners Set Tithe ut Utilisa 94)m= Usefu 95)m= Month 96)m= Heat 97)m= Space 98)m=	i to the cilisation Jan ation factor 0.97 Il gains, 413.81 Aly avers 4.3 loss rate 1365.74 e heatin 708.23	mean interfactor for grant	wirement ternal ter or gains Mar ains, hm 0.96 ye (94 392.92 ernal tem 6.5 an internal ternal	mperature using Ta Apr : 0.95 4)m x (84 364.21 perature 8.9 al tempe 980.81 r each m 443.95	ne obtain able 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26 nonth, k\ 314.95	Jun 0.87 288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m: 349.86 th = 0.02	19.94 Table 9h Aug 0.78 252.02 16.4 x [(93)m 367.1 24 x [(97) 0	19.45 Do, so that Sep 0.89 297.39 14.1 - (96)m 557.76 0 0	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4' 372.82	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1	4288.79	(94) (95) (96) (97)
8. Space Set Tithe ut Utilisa 94)m= Usefu 95)m= Month 96)m= Heat 97)m= Space 98)m=	i to the iilisation Jan ation factorial gains, 413.81 Alloss rate 1365.74 e heatin 708.23	mean interfactor for grant for for mean for for mean for for mean for for grant for for grant for for grant for gr	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an intern 1183.67 ement fo	mperature support of the control of	ne obtainable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26 nonth, k\ 314.95	288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m: 349.86 th = 0.02 0	19.94 Table 9h Aug 0.78 252.02 16.4 x [(93)m 367.1 24 x [(97) 0 Tota	19.45 Do, so that Sep 0.89 297.39 14.1 — (96)m 557.76 0 I per year	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4' 372.82	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1		(94) (95) (96) (97)
8. Space Set Tithe ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space (98)m=	ace head in to the millisation face of the millisation	mean interfactor for grant	wirement ternal ter or gains Mar ains, hm 0.96 ye (94 392.92 ernal tem 6.5 an internal ternal	mperature support of the control of	ne obtainable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26 nonth, k\ 314.95	288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m: 349.86 th = 0.02 0	19.94 Table 9h Aug 0.78 252.02 16.4 x [(93)m 367.1 24 x [(97) 0 Tota	19.45 Do, so that Sep 0.89 297.39 14.1 — (96)m 557.76 0 I per year	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4' 372.82	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1	4288.79	(94) (95) (96) (97)
8. Space Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space (98)m= Space (9a. End	i to the rillisation Jan ation factors 0.97 Il gains, 413.81 nly avers 4.3 loss rate 1365.74 e heatin 708.23 e heatin ergy rece e heatin	mean interpretation for gradient for gradien	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an intern 1183.67 ement fo 588.31	mperature as a sividual here	re obtainable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26 nonth, k\ 314.95	Jun 0.87 288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m: 349.86 th = 0.02 0	19.94 Table 9th Aug 0.78 252.02 16.4 x [(93)m-367.1 24 x [(97) 0 Tota	19.45 Do, so that Sep 0.89 297.39 14.1 — (96)m 557.76 0 I per year	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4' 372.82	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1	4288.79	(94) (95) (96) (97) (98) (99)
8. Space Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space (98)m= Space Fracti	i to the rillisation Jan ation factorial gains, 413.81 alloss rate 1365.74 e heatin 708.23 e heatin ergy received and of special gains, and a second a second and a second and a second and a second and a second an	mean interfactor for great for mean interfactor for great for for great for mean interfactor for great for mean interfactor for great for mean interfactor for mean interfactor for great for mean interfactor for great fo	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an intern 1183.67 ement fo 588.31	mperature using Ta Apr 1: 0.95 4)m x (84 364.21 perature 8.9 nal tempe 980.81 r each m 443.95 kWh/m² ividual he	re obtainable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26 nonth, k\ 314.95 eating sy	Jun 0.87 288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m: 349.86 th = 0.02 0 ncluding	19.94 Table 9th Aug 0.78 252.02 16.4 x [(93)m-367.1 24 x [(97) 0 Tota	19.45 297.39 14.1 - (96)m 557.76 0 I per year	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4' 372.82	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1	4288.79 42.7	(94) (95) (96) (97) (98) (99)
Set Tithe ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat (97)m= Space (98)m= Space 9a. En Fracti Fracti	i to the rilisation Jan ation factor 0.97 Il gains, 413.81 All gains rate 1365.74 The heatin 708.23 The heatin argy recommends for of specific on of specific control of specific	mean interfactor for great for mean interfactor for great for for great for mean interfactor for great	uirement ternal ter or gains Mar ains, hm 0.96 , W = (94 392.92 ernal tem 6.5 an intern 1183.67 ement fo 588.31	mperature as a secondary anal systems and a	re obtainable 9a May 0.93 4)m 330.94 e from Ta 11.7 erature, 754.26 nonth, k\ 314.95 eating sy y/supple em(s)	Jun 0.87 288.72 able 8 14.6 Lm , W = 515.69 Wh/mont	19.97 ep 11 of Jul 0.77 243.69 16.6 =[(39)m; 349.86 th = 0.02 0 ncluding	19.94 Table 9th Aug 0.78 252.02 16.4 x [(93)m-367.1 24 x [(97) 0 Tota	19.45 297.39 14.1 - (96)m 557.76 0 I per year	18.63 t Ti,m=(' Oct 0.94 340.63 10.6] 841.74)m] x (4' 372.82 (kWh/year	76)m and Nov 0.96 376.82 7.1 1125.14 1)m 538.79	Dec 0.97 402.1 4.2 1361.1	4288.79	(94) (95) (96) (97) (98) (99)

Efficiency of main space heating system 1							90.6	(206)
Efficiency of secondary/supplementary heating s	system, %						0	(208)
Jan Feb Mar Apr May	Jun .	lul Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)	<u> </u>	<u> </u>		070.00	500.70	740.5	1	
708.23 608.23 588.31 443.95 314.95	0	0 0	0	372.82	538.79	713.5		4
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $	0	0 0	0	411.51	594.69	787.52]	(211)
701.72 071.00 040.00 400.01 047.00			l (kWh/yea				4733.77	(211)
Space heating fuel (secondary), kWh/month					10, 1012			` ′
$= \{[(98)m \times (201)]\} \times 100 \div (208)$								
(215)m= 0 0 0 0 0	0	0 0	0	0	0	0		_
		Tota	al (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating Output from water heater (calculated above)								
	111.15 1	03 118.19	119.61	139.39	152.15	165.23]	
Efficiency of water heater	•	•					85	(216)
(217)m= 89.46 89.44 89.38 89.24 88.9	85	85 85	85	89	89.3	89.49		(217)
Fuel for water heating, kWh/month								
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 190.72 $	130.77 12	1.18 139.05	140.71	156.61	170.38	184.63]	
		Tota	al = Sum(2	19a) ₁₁₂ =			1868.5	(219)
Annual totals				k\	Wh/year		kWh/year	
Space heating fuel used, main system 1							4733.77	╛
Water heating fuel used							1868.5	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							450.79	(232)
Total delivered energy for all uses (211)(221) +	(231) + (2	232)(237b)	=				7128.06	(338)
12a. CO2 emissions – Individual heating system	ns includin	g micro-CHF)					
	Energ	IV		Emice	ion fac	tor	Emissions	
	kWh/y	•		kg CO		.01	kg CO2/ye	
Space heating (main system 1)	(211)	(0.2	16	=	1022.49	(261)
Space heating (secondary)	(215)	<		0.5	19	=	0	(263)
Water heating	(219)	•		0.2	16	=	403.6	(264)
Space and water heating	(261) +	(262) + (263) +	(264) =		_		1426.09	(265)
Electricity for pumps, fans and electric keep-hot	(231)	<		0.5	19	=	38.93	(267)
Electricity for lighting	(232)	(0.5	19	=	233.96	(268)
Total CO2, kg/year								·
Total CO2, kg/year			sum o	f (265)(2	271) =		1698.98	(272)

Dwelling CO2 Emission Rate

 $(272) \div (4) =$

16.92 (273)

El rating (section 14)

84 (274)

		User Details:		
Assessor Name:	Ben Marsh	Stroma Nun	nber: STR	O005374
Software Name:	Stroma FSAP 2012	Software Ve		ion: 1.0.5.58
	Pro	operty Address: Plot 2	8	
Address :	Plot 28			
1. Overall dwelling dime	ensions:			
		Area(m²)	Av. Height(m)	Volume(m³)
Ground floor		50.22 (1a) x	2.4 (2a) =	120.53 (3a)
First floor		50.22 (1b) x	2.4 (2b) =	120.53 (3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	100.44 (4)		
Dwelling volume		(3a)+(3	b)+(3c)+(3d)+(3e)+(3n) =	241.06 (5)
2. Ventilation rate:				
	main secondary heating heating	other	total	m³ per hour
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	ns		4 x 10 =	40 (7a)
Number of passive vents	;		0 x 10 =	0 (7b)
Number of flueless gas fi	ires		0 x 40 =	0 (7c)
			A :	
Inditantian due to alcience	(Co) (Ch) (70)		changes per hour
•	ys, flues and fans = (6a)+(6b)+(7a neen carried out or is intended, proceed		$\frac{40}{\text{from (9) to (16)}}$ \div (5) =	0.17 (8)
Number of storeys in the		(,,	(5) ()	0 (9)
Additional infiltration	3 ([(9)-1]x0.1 =	
Structural infiltration: 0	.25 for steel or timber frame or (0.35 for masonry cons	truction	0 (11)
if both types of wall are po deducting areas of openin	resent, use the value corresponding to t	he greater wall area (after		
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0)	0 (12)
If no draught lobby, en	ter 0.05, else enter 0			0 (13)
Percentage of windows	s and doors draught stripped			0 (14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	0 (15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0 (16)
Air permeability value,	q50, expressed in cubic metres	per hour per square r	netre of envelope area	5 (17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)		0.42 (18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeabilit	y is being used	
Number of sides sheltere	ed		4.5%	2 (19)
Shelter factor		$(20) = 1 - [0.075 \times]$		0.85 (20)
Infiltration rate incorporat	_	(21) = (18) x (20) =	:	0.35 (21)
Infiltration rate modified f	or monthly wind speed	, ,	1 1	_
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec	
Monthly average wind sp	eed from Table 7			_

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (22a)m = (22)m ÷ 4	
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.45	
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	23a)
	23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]	
	24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	0.45)
(24b)
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
	24c)
d) If natural ventilation or whole house positive input ventilation from loft	,
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.6 0.6 0.59 0.58 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59	24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m =	25)
3. Heat losses and heat loss parameter:	
ELEMENT GrossOpeningsNet AreaU-valueA X Uk-valueA X karea (m²)m²A ,m²W/m2K(W/K)kJ/m²·KkJ/m²·K	
Doors	26)
Windows Type 1 8.22 $x^{1/[1/(1.4) + 0.04]} = 10.9$	27)
Windows Type 2 3.64 $x^{1/[1/(1.4) + 0.04]} = 4.83$ (2)	27)
Floor $50.22 \times 0.13 = 6.5286$ (2	28)
Walls 96.48 13.96 82.52 x 0.18 = 14.85	29)
Roof 50.22 0 50.22 x 0.13 = 6.53	30)
Total area of elements, m ² 196.92	31)
Party wall 44.64 x 0 = 0	32)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions	
	33)
Heat capacity Cm = $S(A \times k)$ ((28)(30) + (32) + (32a)(32e) = 14754.06 (32a)	34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250	35)
For decimens and the design of the construction are not become provided the indication and are CTAD in Table 46	00,
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.	00)
can be used instead of a detailed calculation.	36)
can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31)	36)
can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31)	

(00) 47.00	47.54	47.00	45.70	45.50	44.00	44.00	14.00	44.75	45.50	40.07			(20)
(38)m= 47.86	47.54	47.23	45.79	45.52	44.26	44.26	44.03	44.75	45.52	46.07	46.64		(38)
Heat transfer c	0efficiei 102.79	102.48	101.04	100.77	99.51	99.51	99.28	(39)m 99.99	100.77	38)m 101.31	101.89		
(59)111= 105.1	102.79	102.40	101.04	100.77	99.01	99.01	99.20			Sum(39) ₁	 	101.04	(39)
Heat loss para	meter (ŀ	HLP), W	m²K						= (39)m ÷				 _`
(40)m= 1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	1	1	1.01	1.01		_
Number of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.01	(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. Water heat	ing ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occu	nancy	N									.74		(42)
if TFA > 13.9), N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		.74		(42)
if TFA £ 13.9 Annual average	•	ater usad	ne in litre	es ner da	av Vd av	erage =	(25 x N)	+ 36		00	0.36		(43)
Reduce the annua	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		7.30		(40)
not more that 125		person per T	, ,	ater use, l	not and co	<u> </u>							
Jan Hot water usage in	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	105.32	101.35	97.37		1	1	· <i>′</i>	97.37	101.35	105.32	100.2		
(44)m= 109.3	105.32	101.35	97.37	93.4	89.42	89.42	93.4	l		m(44) ₁₁₂ =	109.3	1192.32	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		` ′
(45)m= 162.08	141.76	146.28	127.53	122.37	105.6	97.85	112.28	113.63	132.42	144.55	156.97		
If instantaneous w	ater heati	na at noint	of use (no	hot water	r storaga)	enter∩in	hoves (16		Γotal = Su	m(45) ₁₁₂ =	=	1563.31	(45)
			,	1	, , , , , , , , , , , , , , , , , , ,	1	, ,	, , ,	10.00	24.60	22.55		(46)
(46)m= 24.31 Water storage	21.26 loss:	21.94	19.13	18.36	15.84	14.68	16.84	17.04	19.86	21.68	23.55		(40)
Storage volume	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			. ,						
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufacti		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b			• •					0		(49)
Energy lost from	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufacti			-								_		(54)
Hot water stora	_			e z (KVV	n/iitre/ua	iy)					0		(51)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost from		-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	•						,			0		(55)
Water storage						1	((56)m = (
(56)m= 0 If cylinder contains	0 dedicate	0 d solar sto	0	0 = (56)m	0	0 H11)1 ÷ (5)	0) else (5	0 7\m = (56)	0 m where (0 H11) is fro	0 Appendix	, Ц	(56)
						1						X 1 1	(57)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primary circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primary circuit	•	,			(59)m =	(58) ÷ 36	65 × (41)	m					
(modified by					• •		, ,		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= 50.96	46.03	50.96	48.02	47.59	44.1	45.57	47.59	48.02	50.96	49.32	50.96		(61)
	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	. 0 85 x	(45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 213.04	187.79	197.24	175.55	169.96	149.7	143.42	159.88	161.64	183.38	193.86	207.93]	(62)
Solar DHW input of	calculated	using App	endix G o	r Appendix	ι κ Η (negati	ıve quantity	/) (enter '0	if no sola	r contribut	ion to wate	ı er heating)		
(add additiona											0,		
(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	ı	(63) (G2
Output from w	ater hea	ter											
(64)m= 213.04	187.79	197.24	175.55	169.96	149.7	143.42	159.88	161.64	183.38	193.86	207.93]	
` ,	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Outr	out from w	I ater heate	<u>I </u>	12	2143.39	(64)
Heat gains from	m water	heating	kWh/m	onth 0 2	5 ′ [0 85	× (45)m				,			J` ′
(65)m= 66.63	58.64	61.38	54.41	52.59	46.14	43.93	49.23	49.79	56.77	60.39	64.93]	(65)
include (57)	l	l	<u> </u>	l	l	l	l	<u>l</u>	l	l	l	l seating	, ,
` '			. ,	•	yiii idei i	3 111 1116 1	aweiling	OI HOL W	alei is ii	OIII COIII	indinity i	leating	
5. Internal ga).									
Metabolic gain				May	1	1	Λ	Con		Nov	l Daa]	
(66)m= 137.18	Feb 137.18	Mar 137.18	Apr 137.18	May 137.18	Jun 137.18	Jul 137.18	Aug 137.18	Sep 137.18	Oct 137.18	Nov 137.18	Dec 137.18		(66)
` '	ļ.	<u> </u>	<u> </u>	Į	!		<u> </u>	<u> </u>	137.10	137.10	137.10		(00)
Lighting gains	r `	 	. 	· ·	1		1	1	T 04 00	T 04 04	T 00 04	1	(67)
(67)m= 25.53	22.67	18.44	13.96	10.43	8.81	9.52	12.37	16.61	21.09	24.61	26.24		(67)
Appliances ga	<u> </u>		- 									1	(00)
(68)m= 257.04	259.7	252.98	238.67	220.61	203.64	192.29	189.63	196.35	210.66	228.72	245.7		(68)
Cooking gains	<u> </u>	· '		 		·				,	,	1	
(69)m= 36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72	36.72		(69)
Pumps and fai	ns gains	(Table 5	5a)									<u>.</u>	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)				-				
(71)m= -109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74	-109.74		(71)
Water heating	gains (T	Table 5)											
(72)m= 89.56	87.26	82.5	75.57	70.68	64.08	59.04	66.17	69.15	76.3	83.88	87.27		(72)
Total internal	gains =	:			(66))m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72))m		
(73)m= 439.28	436.79	421.07	395.35	368.88	343.67	328.01	335.33	349.25	375.2	404.36	426.36		(73)
6. Solar gains	S:	•	-	•	•	•	-	-	•	•	•		
Solar gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	ne applicat	ole orientat	tion.		
Orientation: A			Area		Flu		_	g_	_	FF		Gains	
٦	Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	
Solar gains in	watts, ca	alculated	for eac	h 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)

Total g	gains – i	nternal a	and solar	· (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	439.28	436.79	421.07	395.35	368.88	343.67	328.01	335.33	349.25	375.2	404.36	426.36		(84)
7 Me	an inter	nal temr	perature	(heating	season)		•	•					
			neating p				from Tak	ale 0 Th	1 (°C)				21	(85)
		•	٠.			_		JIC 5, 111	11 (0)				21	(00)
UtiliSe	Jan	Feb	ains for l			Jun	Jul	l Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	ıvıaı 1	Apr 1	May 1	0.99	0.94	0.95	0.99	1	1	1		(86)
, ,		<u> </u>		<u> </u>		ļ	ļ	<u>!</u>	<u> </u>	<u> </u>	'	'		(00)
Mean		· ·	ature in		· `	ì	i	i	· ·			ı	I	
(87)m=	19.77	19.83	19.98	20.21	20.45	20.71	20.88	20.87	20.67	20.35	20.04	19.77		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.06	20.06	20.07	20.08	20.08	20.09	20.09	20.09	20.09	20.08	20.08	20.07		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling	h2 m (se	ee Table	9a)		•	•			
(89)m=	1	1	1	1	0.99	0.97	0.87	0.89	0.98	1	1	1		(89)
					. (. . 11	L TO //	- 11	0	7 ' - T - 1. 1	L	<u> </u>			
		· ·	ature in	i		· ` `	i	i –	1	· ·	400	40.4		(00)
(90)m=	18.4	18.49	18.71	19.04	19.41	19.79	20.01	19.99	19.73	19.26	18.8 g area ÷ (4	18.4		(90)
									'	ILA = LIVIII	y area - (4	+) =	0.24	(91)
Mean	interna	I temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.73	18.82	19.02	19.33	19.66	20.02	20.22	20.21	19.96	19.53	19.1	18.73		(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate			•	
(93)m=	18.73	18.82	19.02	19.33	19.66	20.02	20.22	20.21	19.96	19.53	19.1	18.73		(93)
8. Sp	ace hea	ting requ	uirement											
			ternal ter			ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the u		1	or gains	_									1	
1.14:1: -	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation rac	tor for g	ains, hm	1:	0.99	0.97	0.89		0.98	1	1	4		(94)
(94)m=		<u> </u>				0.97	0.69	0.9	0.98	ı	ı	1		(34)
(95)m=	438.9	436.36	W = (94)	394.33	366.33	333.47	290.84	300.54	341.4	373.58	403.78	426.06		(95)
							290.64	300.54	341.4	373.36	403.76	420.00		(55)
(96)m=	4.3	4.9	ernal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern								l '	7.2		(00)
			1282.78			538.97	359.99	377.97	585.52	899.71	1215.62	1480.71		(97)
` '		ļ	ement fo	l .			<u> </u>	ļ	ļ	ļ		1.00.71		()
(98)m=	780.73	668.18	641.55	474.69	324.47	0	0.02	0	0	391.44	584.52	784.66		
(00)=	700.70	000.10	011.00	11 1.00	02 1.11							l	4650.24	(98)
_	Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =											_		
Spac	Space heating requirement in kWh/m²/year										46.3	(99)		
9a. En	ergy red	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	•										ı		_
Fract	Fraction of space heat from secondary/supplementary system											0	(201)	
Fraction of space heat from main system(s) $(202) = 1 - (201) =$									1	(202)				
Fract	Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$									1	(204)			
				-										

Efficiency of main space heating system 1							93.4	(206)
Efficiency of secondary/supplementary heating s	0	(208)						
	<u> </u>	T Aug	Con	Oct	Nov	Doo	L	
Jan Feb Mar Apr May Space heating requirement (calculated above)	Jun Jul	Aug	Sep	Oct	I NOV	Dec] Kvvii/ye	aı
780.73 668.18 641.55 474.69 324.47	0 0	0	0	391.44	584.52	784.66		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	•	•					•	(211)
835.9 715.4 686.89 508.23 347.4	0 0	0	0	419.1	625.83	840.1		
		Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4978.85	(211)
Space heating fuel (secondary), kWh/month								
$= \{[(98)m \times (201)]\} \times 100 \div (208)$ $(215)m = 0 $	0 0	0	0	0	0	0]	
(2.5)			l (kWh/yea				0	(215)
Water heating								
Output from water heater (calculated above)			ı	1			1	
	149.7 143.4	2 159.88	161.64	183.38	193.86	207.93	00.0	7(216)
Efficiency of water heater (217)m= 88.03 87.97 87.8 87.43 86.65	80.3 80.3	80.3	80.3	86.91	87.65	88.08	80.3	(216)
Fuel for water heating, kWh/month	00.0	00.0	00.0	00.01	07.00	00.00		(=,
(219) m = (64) m x $100 \div (217)$ m					1		1	
(219)m= 242.02 213.46 224.64 200.79 196.14 1	86.42 178.0		201.3 Il = Sum(2°	210.99	221.17	236.07		7
Annual totale	2510.7	(219)						
Annual totals Space heating fuel used, main system 1	kWh/year 4978.85	7						
Water heating fuel used							2510.7	=
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30]	(230c)
boiler with a fan-assisted flue						45]]	(230e)
	75	_						
Total electricity for the above, kWh/year	75	(231)						
Electricity for lighting	450.79	(232)						
Total delivered energy for all uses (211)(221) +	` ' '						8015.34	(338)
12a. CO2 emissions – Individual heating system	s including	micro-CHF)					
	Energy kWh/yea	Energy kWh/year			ion fac 2/kWh	Emissions kg CO2/year		
Space heating (main system 1)	(211) x			0.2	16	=	1075.43	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	542.31	(264)
Space and water heating	(261) + (26	2) + (263) + ((264) =				1617.74	(265)
Space and water neating								
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for pumps, fans and electric keep-hot	(231) x (232) x			0.5		=	38.93	_
•			sum o	0.5 0.5 f (265)(2	19		38.93 233.96 1890.63	(267) (268) (272)

TER = 18.82 (273)