Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.16 *Printed on 14 February 2023 at 15:23:39*

Project Information:

Assessed By: Harry Hinchcliffe (STRO034627) Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 99.55m²

Site Reference: 15592 - L1a Assessment Plot Reference: 15592 - L1a Assessment

Address: New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

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)

Target Carbon Dioxide Emission Rate (TER) 19.12 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

18.11 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 61.2 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.41 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Database: (rev 504, product index 017929):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35

(Combi)

Efficiency 89.6 % SEDBUK2009

Minimum 88.0 %

Secondary heating system: None

OK

Regulations Compliance Report

5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls	TTZC by plumbing an	nd electrical services	oK
Hot water controls:	No cylinder thermosta	at	
	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with lo	w-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valley	'):	Medium	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: South West		7.78m²	
Windows facing: North East		18.86m²	
Windows facing: South East		2.76m²	
Windows facing: North West		0.69m²	
Ventilation rate:		4.00	
10 Key features			
Roofs U-value		0.11 W/m²K	

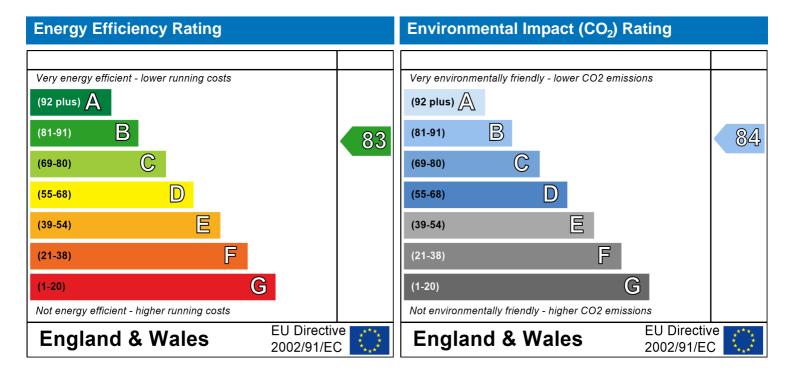
Predicted Energy Assessment



New Dwelling @ 34 Summer House Way Langley WD5 0DY Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 14 February 2023 Harry Hinchcliffe 99.55 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.

Developer Confirmation Report

Property Details: 15592 - L1a Assessment

Address: New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

Located in: England Region: Thames valley

UPRN:

Date of assessment: 14 February 2023 Date of certificate: 14 February 2023

Assessment type: New dwelling design stage

Transaction type: New dwelling

Thermal Mass Parameter: Indicative Value Low

Comments:

Property description:

Dwelling type: House
Detachment: Detached
Year Completed: 2023
Front of dwelling faces: North

Comments:

Opening types:

Name:	Type:	Frame Factor:	g-value:	U-Value:	Area:
Front Door	Solid	0.7	0	1.6	2.1
Front Windows	Windows	0.7	0.63	1.4	7.78
Rear Windows	Windows	0.7	0.63	1.4	18.86
SE Windows	Windows	0.7	0.63	1.4	2.76
NW Window	Windows	0.7	0.63	1.4	0.69

Overshading: Average or unknown

Comments:

Opaque Elements:

Type: U-Value: Kappa:

External Elements

External Walls

0.24 Please provide the U-Value calculation to justify the U-Value entered into the assessment.

N/A

Flat Roof

0.14 Please provide the U-Value calculation to justify the U-Value entered into the assessment.

N/A

Pitched Roof

0.11 Please provide the U-Value calculation to justify the U-Value entered into the assessment.

N/A

Developer Confirmation Report

Ground Floor 0.18 Please provide the U-Value calculation to justify the U-Value entered into the assessment.

Internal Elements (Area, Kappa) Party Elements (Area, Kappa)

N/A

Thermal bridges:

Thermal bridges:		User-defined	(individual PS	SI-value	es) Y-Value = 0.0746
		Length	Psi-value		
[Appro	oved]	18.94	0.3	E2	Other lintels (including other steel lintels)
[Appro	oved]	18.94	0.04	E3	Sill
[Appro	oved]	37.22	0.05	E4	Jamb
[Appro	oved]	29.75	0.16	E5	Ground floor (normal)
[Appro	oved]	31.3	0.07	E6	Intermediate floor within a dwelling
[Appro	oved]	31.3	0.06	E10	Eaves (insulation at ceiling level)

4.18 E14 [Approved] 31.8 0.09 E16 Corner (normal)

[Approved] 7.95 -0.09 Corner (inverted internal area greater than external area) E17

Flat roof

Comments:

If specific construction details have been adopted then please provide the associated checklists; signed and dated.

Pressure test: Yes (As designed)

Natural ventilation (extract fans) Ventilation:

Pressure test:

Comments:

Please provide the pressure test certificate, or certificates if the result is based on an average; signed and dated.

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Boiler Database

Database: (rev 504, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5

Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35

(Combi boiler) Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature <= 35°C

Boiler interlock: Yes Delayed start

Comments:

Developer Confirmation Report

Main heating Control:	
Main heating Control: Comments:	Time and temperature zone control by suitable arrangement of plumbing and electrical services
Secondary heating system:	
Secondary heating system: Comments:	None
Water heating:	
Water heating: Comments:	No hot water cylinder
	Solar panel: False
Others:	
Electricity tariff: Low energy lights:	Standard Tariff 100%
Terrain type: Wind turbine:	Low rise urban / suburban No
Photovoltaics: Comments:	None
Please provide the MCS certificate or cinclude any calculations to support a p	data sheet equivalent confirming the size of the array on the roof. This should proportioned amount included in the assessment.
Declaration:	
I confirm that the property has been bu Signed:	ilt to the above specification.
Date:	

SAP Input

Property Details: 15592 - L1a Assessment

Address: New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

Located in: England Region: Thames valley

UPRN:

Date of assessment: 14 February 2023 Date of certificate: 14 February 2023

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 504

Property description:

Dwelling type: House
Detachment: Detached
Year Completed: 2023

Floor Location: Floor area:

Floor 0 52.34 m² 2.39 m Floor 1 47.21 m² 2.65 m

Living area: 29.43 m² (fraction 0.296)

Front of dwelling faces: North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front Door	Manufacturer	Solid			PVC-U
Front Windows	Manufacturer	Windows	double-glazed	No	
Rear Windows	Manufacturer	Windows	double-glazed	No	
SE Windows	Manufacturer	Windows	double-glazed	No	
NW Window	Manufacturer	Windows	double-glazed	No	

Storey height:

1.4

0.69

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
Front Door	mm	0.7	0	1.6	2.1	1
Front Windows	16mm or more	0.7	0.63	1.4	7.78	1
Rear Windows	16mm or more	0.7	0.63	1.4	18.86	1
SE Windows	16mm or more	0.7	0.63	1.4	2.76	1

0.63

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front Door		External Walls	South West	0	0
Front Windows		External Walls	South West	0	0
Rear Windows		External Walls	North East	0	0
SE Windows		External Walls	South East	0	0
NW Window		External Walls	North West	0	0

0.7

Overshading: Average or unknown

16mm or more

Opaque Flements:

NW Window

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
<u>External Elemen</u>	<u>ts</u>						
External Walls	154.05	32.19	121.86	0.24	0	False	N/A
Flat Roof	4.67	0	4.67	0.14	0		N/A
Pitched Roof	47.5	0	47.5	0.11	0		N/A

SAP Input

Ground Floor 52.34 0.18 N/A

Internal Elements Party Elements

Thormal	bridges:
HIEHHai	ninges.

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0746

	Length	`Psi-value	,	
[Approved]	18.94	0.3	E2	Other lintels (including other steel lintels)
[Approved]	18.94	0.04	E3	Sill
[Approved]	37.22	0.05	E4	Jamb
[Approved]	29.75	0.16	E5	Ground floor (normal)
[Approved]	31.3	0.07	E6	Intermediate floor within a dwelling
[Approved]	31.3	0.06	E10	Eaves (insulation at ceiling level)
	4.18	0	E14	Flat roof
[Approved]	31.8	0.09	E16	Corner (normal)
[Approved]	7.95	-0.09	E17	Corner (inverted internal area greater than external area)

Pressure test: Yes (As designed)

Natural ventilation (extract fans) Ventilation:

Number of chimneys: 0 Number of open flues: 0 0 Number of fans: Number of passive stacks: 0 Number of sides sheltered: 1 Pressure test: 5

Boiler systems with radiators or underfloor heating Main heating system:

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Boiler Database

Database: (rev 504, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5

Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi boiler)

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature<=35°C

Boiler interlock: Yes Delayed start

Time and temperature zone control by suitable arrangement of plumbing and electrical Main heating Control:

services

Control code: 2110

Secondary heating system: None

From main heating system Water heating:

> Water code: 901 Fuel: mains gas No hot water cylinder Solar panel: False

Standard Tariff Electricity tariff: In Smoke Control Area: Unknown

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:

		User Details:				
Assessor Name:	Harry Hinchcliffe	Stroma Nu	mber:	STRO	034627	
Software Name:	Stroma FSAP 2012	Software V	ersion:	Versio	n: 1.0.5.16	
		Property Address: 1559		ment		
Address :	New Dwelling @, 34 Summ	ner House Way, Langle	y, WD5 0DY			
Overall dwelling dime	ensions:	A (0)	A 11 : 14	`		
Ground floor		Area(m²) 52.34 (1a)	Av. Height(r	n) (2a) = [Volume(m³)	(3a)
First floor		47.21 (1b)		$(2b) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$	125.11](3b)
	a)+(1b)+(1c)+(1d)+(1e)+(1		2.00	(20) -	125.11	(00)
·	a)+(1b)+(1b)+(1b)+(1b)+(1	,,		<i>(</i> -).		_
Dwelling volume		(3a)+	(3b)+(3c)+(3d)+(3e)	+(3n) =	250.2	(5)
2. Ventilation rate:	main		464-1			
	main seconda heating heating		total		m³ per houi	
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		0	x 10 =	0	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fi	res		0	x 40 =	0	(7c)
						_
				Air ch	anges per ho	ur
'	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$		0	÷ (5) =	0	(8)
Number of storeys in t	een carried out or is intended, proce ne dwelling (ns)	ea to (17), otnerwise continu	e trom (9) to (16)	Г	0	(9)
Additional infiltration	ic dwelling (113)			[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame of	or 0.35 for masonry con			0	(11)
	resent, use the value corresponding	•		L		」、 ′
	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			Ī	0	(13)
Percentage of windows	s and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14)	÷ 100] =	Ī	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 $(18) = (16)$		Ī	0.25	(18)
Air permeability value applie	es if a pressurisation test has been do	one or a degree air permeabi	lity is being used			
Number of sides sheltere	ed	(00) 4 [0.075	(40)]	-	1	(19)
Shelter factor		(20) = 1 - [0.075]		ļ	0.92	(20)
Infiltration rate incorporat	_	$(21) = (18) \times (20)$	=		0.23	(21)
Infiltration rate modified f		, , , , , , , , , , , , , , , , , , , 				
Jan Feb	Mar Apr May Jun	Jul Aug Se	p Oct No	ov Dec		
Monthly average wind sp	eed from Table 7					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
A II							(24.)	(00.)				_	
Adjusted infiltr		<u> </u>			1	i 	` 	<u>, , </u>	0.05		T 0.07	1	
Calculate effe	0.29 Ctive air	0.28 change i	0.25 rate for t	0.25 the appli	0.22 cable ca	0.22 S e	0.21	0.23	0.25	0.26	0.27]	
If mechanica	al ventila	ition:										() (2
If exhaust air h	eat pump (using Appe	endix N, (2	23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			() (2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (from	n Table 4h) =				() (2
a) If balance	ed mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mecha	anical ve	ntilation	without	heat red	covery (N	ИV) (24b	m = (22)	2b)m + (23b)	,	7	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00)	- \			
<u> </u>	n < 0.5 ×	(23b), t	hen (24)	c) = (23b)	o); other	wise (24)	c) = (22t)	o) m + 0.	$5 \times (230)$	o) o	0	1	(2
,					<u> </u>				0		0]	(2
d) If natural if (22b)r					ve input erwise (2				0.51				
(24d)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54]	(2
											!	_	
Effective air	change	rate - er	iter (24a) or (24k	b) or (24	c) or (24	d) in box	k (25)					
Effective air (25)m= 0.54	change 0.54	rate - er	o.53	0.53	o) or (24 0.52	c) or (24 0.52	d) in box 0.52	x (25) 0.53	0.53	0.53	0.54	1	(2
(25)m= 0.54	0.54	0.54	0.53	0.53	í `	ŕ `		` ´ 	0.53	0.53	0.54		(2
(25)m= 0.54 3. Heat losse	0.54	0.54 eat loss p	0.53 paramet	0.53 er:	0.52	0.52	0.52	0.53] e	
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3. Heat losse ELEMENT Doors	o.54 s and he Gros area	0.54 eat loss p	0.53 Daramet Openin	0.53 er:	0.52 Net Ar A ,r	0.52	0.52 U-valı W/m2	0.53 ue ek 0.04] = [A X U (W/		k-valu		A X k kJ/K
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3. Heat losse ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor	o.54 S and he Gros area 1 2 2 3 4	0.54 eat loss pass (m²)	0.53 Daramet Openir m	0.53 er:	0.52 Net Ar A ,r 2.1 7.78 18.86 2.76 0.69 52.34	0.52 rea m² x1	U-val W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18	0.53 ue eK = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/) 3.36 10.31 25 3.66 0.91 9.42120	K)	k-valu		A X k kJ/K (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
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3. Heat losse ELEMENT Doors Windows Type Roor Walls Roof Type1	0.54 S and he Gros area 1 2 2 2 3 3 4 4 154.6 47.6	0.54 eat loss pass (m²)	0.53 Daramet Openir m 32.1	0.53 er:	0.52 Net Ar A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67	0.52 rea m² x1/2 x1/4 x x 6 x x x	0.52 U-vally W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	0.53 UE O.04] = [0.04] = [0.04] = [0.04] = [A X U (W/) 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65	K)	k-valu		A X k kJ/K (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
3. Heat losse ELEMENT Doors Windows Type Roof Type1 Roof Type2	0.54 S and he Gros area 1 1 2 2 2 3 3 4 4 4 4.6	0.54 eat loss page (m²) 05 7 5 , m² ows, use e	0.53 Openin m 32.1 0 offective with the state of the	0.53 er: ngs n²	0.52 Net Ar A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	0.52 rea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	0.52 U-vali W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	0.53 UE O.04] = [0.04] = [0.04] = [0.04] = [A X U (W// 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	k-value kJ/m²-	K [A X k kJ/K (2 (2 (2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
3. Heat losse ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Roof Type1 Roof Type2 Total area of e * for windows and	0.54 Gros area 1 2 2 3 4 4 154. 4.67 47.9 Elements I roof winder as on both	0.54 eat loss pass (m²) 05 7 5 ows, use esides of in	0.53 Openir m 32.1 0 offective waternal wate	0.53 er: ngs n²	0.52 Net Ar A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	0.52 rea m² x1/ x1/ x1/ x1/ x1/ x1/ 4 x 6 x x ated using	0.52 U-vali W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	0.53 ue 2K = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W// 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	k-value kJ/m²-	K [A X k kJ/K (2 (2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
3. Heat losse ELEMENT Doors Windows Type Tloor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area Fabric heat los	0.54 S and he Gros area 1 1 2 2 2 3 3 4 4 4.6i 47.9 Elements I roof windows on both ss, W/K =	0.54 eat loss part los part los part loss part los p	0.53 Openir m 32.1 0 offective waternal wate	0.53 er: ngs n²	0.52 Net Ar A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	0.52 rea m² x1/ x1/ x1/ x1/ x1/ x1/ 4 x 6 x x ated using	0.52 U-vali W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	0.53 ue 2K = [0.04] = [0.04] = [0.04] = [A X U (W// 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K) IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	k-value kJ/m²-	K [A X k kJ/K (2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
3. Heat losse ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Tloor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area ** include the area	0.54 S and he Gros area 1 2 2 3 3 4 4 4.66 47.9 Elements Froof winder as on both ss, W/K = Cm = S(0.54 eat loss page (m²) 0.54 out loss page (m²) out loss page (m²) out loss page (m²) out loss page (m²)	0.53 Daramet Openir m 32.1 0 offective waternal wall U)	9	0.52 Net Ar A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculatitions	0.52 rea m² x1/ x1/ x1/ 4 x 6 x kated using	0.52 U-vali W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	0.53 ue 2K = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W// 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	k-value kJ/m²-	h 3.2	A X k kJ/K (2 (2 (2 (2 (2 (3 (3 (3 (3 (3 8.53 (3 (3 (3 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5

		0 0	are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he								. ,	(36) =			107.07	(37)
Ventila	ation hea			i		_			` ,	`	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	44.87	44.73	44.6	43.95	43.83	43.28	43.28	43.17	43.49	43.83	44.08	44.33		(38)
Heat t	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	151.95	151.81	151.67	151.03	150.91	150.35	150.35	150.25	150.57	150.91	151.15	151.41		_
Heat le	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	151.03	(39)
(40)m=	1.53	1.52	1.52	1.52	1.52	1.51	1.51	1.51	1.51	1.52	1.52	1.52		
									,	Average =	Sum(40) ₁ .	12 /12=	1.52	(40)
Numb	er of day	s in mor	nth (Tab	le 1a)							Ι			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	gy requi	irement:								kWh/ye	ear:	
	ned occu FA > 13.9			[1 - AVD	(<u>-</u> 0 0003	40 v (TE	-13 Q)2)] + 0 (1013 v /	Γ Γ Δ -13		74		(42)
	FA £ 13.9		+ 1.70 X	[ı - exp	(-0.0003	49 X (11	A - 13.9)2)] + 0.C) X C 1 O	IFA - 13.	9)			
	al averag	•	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		99	.16		(43)
	the annua	_				_	_	to achieve	a water us	se target o				, ,
not mor	e that 125	litres per p	person per	day (all w	ater use, h	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08		
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,n	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1189.97	(44)
(45)m=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66		
				<u>. </u>							<u> </u>			_
If instan	taneous w								-	Fotal = Su	m(45) ₁₁₂ =		1560.23	(45)
	nanoodo w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,		Γotal = Su	m(45) ₁₁₂ =		1560.23	(45)
	24.26	21.22	ng at point 21.9	of use (no	hot water 18.32	storage),	enter 0 in 14.65	boxes (46,		Total = Su 19.82	m(45) ₁₁₂ =	23.5	1560.23	(45) (46)
Water	24.26 storage	21.22 loss:	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	· ·		1560.23	
Water	24.26	21.22 loss:	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64		1560.23	
Water Storag	24.26 storage ge volum munity h	21.22 loss: e (litres) eating a	21.9 includin	19.09 ng any so	18.32 Dlar or W	15.81 /WHRS :	14.65 storage	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46)
Storag If com Other	24.26 storage ge volum munity h	21.22 loss: e (litres) eating a	21.9 includin	19.09 ng any so	18.32 Dlar or W	15.81 /WHRS :	14.65 storage	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46)
Water Storag If com Other Water	24.26 storage ge volum munity h wise if no storage	21.22 loss: e (litres) eating a o stored loss:	21.9 including and no tath	19.09 ng any so ank in dwer (this in	18.32 blar or W relling, e	15.81 /WHRS : nter 110	storage litres in neous co	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46) (47)
Water Storag If com Other Water a) If n	24.26 storage ge volum munity h wise if no storage nanufact	21.22 loss: e (litres) eating a o stored loss: urer's de	21.9 including nd no tale hot water	19.09 Ing any so ank in dwer (this in oss factor)	18.32 blar or W relling, e	15.81 /WHRS : nter 110	storage litres in neous co	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48)
Water Storag If com Other Water a) If n	24.26 storage ge volum munity h wise if no storage nanufact erature fa	21.22 loss: e (litres) eating a stored loss: urer's de	21.9 including no tale hot water eclared lem Table	19.09 Ing any so ank in dwer (this in oss factor 2b	18.32 plar or W relling, e includes in	15.81 /WHRS : nter 110	storage litres in neous co n/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47)
Water Storag If com Other Water a) If n Tempo Energ	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro	21.22 loss: e (litres) eating a o stored loss: urer's de actor from	21.9 including nd no tale hot water eclared less torage	19.09 Ing any so ank in dwer (this in oss factor 2b	18.32 plar or Warelling, eacludes in the properties of the propert	15.81 /WHRS : nter 110 nstantan	storage litres in neous co n/day):	16.81 within sa (47)	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48)
Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa	24.26 storage ge volum munity havise if no storage manufact erature fay lost fromanufact ater storage that is to a storage manufact ater storage that is to a storage that is to a storage at the storage	21.22 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de	21.9 including no talent water the colored learned to storage eclared of factor fr	19.09 Ing any so ank in dwer (this in oss factor 2b explinder left)	18.32 Dlar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous con/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48) (49)
Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa If com	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h	21.22 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de age loss eating s	21.9 including not not a hot water eclared least storage eclared of factor free sections.	19.09 Ing any so ank in dwer (this in oss factor 2b explinder left)	18.32 Dlar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous con/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48) (49) (50) (51)
Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa If com Volum	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor	21.22 loss: e (litres) eating a o stored loss: urer's de actor from water urer's de age loss eating s from Tal	including and no tale hot water eclared less storage eclared of factor free sections and the sections are the sections and the sections are the sections and the sections are th	19.09 Ing any so ank in dwer (this in oss factors, kWh/ye cylinder I from Tablon 4.3	18.32 Dlar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous con/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64 47)	23.5	1560.23	(46) (47) (48) (49) (50) (51)
Water Storag If com Other Water a) If n Tempe b) If n Hot wa If com Volum Tempe	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor erature fa	21.22 loss: e (litres) eating a o stored loss: urer's de actor from urer's de age loss eating s from Tal actor from	including and no tale hot water eclared leastorage eclared of factor free sections ble 2a m Table	19.09 Ing any so ank in dwer (this in oss factors, kWh/ye cylinder I from Tabloon 4.3	olar or Welling, encludes in the property of t	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous co n/day): known:	16.81 within sa (47) ombi boild (48) x (49)	17.01 17.01 ame vessers) ente	19.82 sel er 'O' in (21.64 47)	23.5	1560.23	(46) (47) (48) (49) (50) (51)
Water Storag If com Other Water a) If n Tempe b) If n Hot wa If com Volum Tempe Energ	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor	21.22 loss: e (litres) eating a o stored loss: urer's de actor froi urer's de age loss eating s from Tal actor froi m water	including and no tale hot water leclared to factor from the second control of the second	19.09 Ing any so ank in dwer (this in oss factors, kWh/ye cylinder I from Tabloon 4.3	olar or Welling, encludes in the property of t	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous co n/day): known:	16.81 within sa (47) ombi boild	17.01 17.01 ame vessers) ente	19.82 sel er 'O' in (21.64	23.5	1560.23	(46) (47) (48) (49) (50) (51)

Water Storag	e loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder conta	ins dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5 ⁻	7)m = (56)	m where (H11) is fro	m Append	ı ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circu	ıit loss (ar	nnual) fro	m Table	3							0		(58)
Primary circu	iit loss cal	culated t	for each	month (59)m = ((58) ÷ 36	55 × (41)	m				•	
(modified I	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)	_		
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss o	alculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 14.14	12.76	14.11	13.61	14.03	13.54	13.97	14.01	13.58	14.07	13.66	14.13		(61)
Total heat re	quired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 175.9	1 154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		(62)
Solar DHW inpu	t calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	'	
(add addition	al lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (€)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter			-	-			-	-	-		
(64)m= 175.9	1 154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
	•	•					Outp	out from w	ater heate	r (annual)₁	12	1725.84	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	κ [(46)m	+ (57)m	+ (59)m]	_
(65)m= 57.32	50.23	52.07	45.72	44.12	38.43	35.96	40.76	41.1	47.46	51.38	55.62		(65)
include (57	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
,	gains (see		. ,	•	•		•				•	•	
	J (and 5a):									
	ine (Tahle):									
Jan	ins (Table		ts		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	Feb	e 5), Wat		May	Jun 164.12	Jul 164.12	Aug 164.12	Sep 164.12	Oct	Nov 164.12	Dec 164.12		(66)
(66)m= 164.1	Feb 2 164.12	5), Wat Mar 164.12	ts Apr 164.12	May 164.12	164.12	164.12	164.12	164.12	-				(66)
Jan (66)m= 164.1 Lighting gain	Feb 2 164.12 s (calcula	e 5), Wat Mar 164.12 ted in Ap	Apr 164.12 opendix	May 164.12 L, equat	164.12	164.12	164.12 Iso see	164.12 Table 5	164.12	164.12	164.12		` ,
(66)m= 164.1 Lighting gain (67)m= 56.97	Feb 2 164.12 s (calcula 50.6	e 5), Wat Mar 164.12 ted in Ap	Apr 164.12 opendix 31.15	May 164.12 L, equat 23.29	164.12 ion L9 o	164.12 r L9a), a 21.24	164.12 Iso see	164.12 Table 5	164.12 47.06				(66) (67)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g	Feb 2 164.12 s (calcula 50.6 tains (calcula	Mar 164.12 ted in Ap 41.15	Apr 164.12 ppendix 31.15	May 164.12 L, equat 23.29 dix L, eq	164.12 ion L9 o 19.66 uation L	164.12 r L9a), a 21.24 13 or L1	164.12 Iso see 27.61 3a), also	164.12 Table 5 37.06 see Ta	164.12 47.06 ble 5	164.12 54.92	164.12 58.55		(67)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47	Apr 164.12 ppendix 31.15 Append 354.24	May 164.12 L, equat 23.29 dix L, eq 327.43	164.12 ion L9 of 19.66 uation L 302.23	164.12 r L9a), a 21.24 13 or L1 285.4	164.12 Iso see 27.61 3a), also	164.12 Table 5 37.06 see Ta	164.12 47.06 ble 5 312.65	164.12	164.12		` ,
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45 ns (calcula	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47	Apr 164.12 ppendix 31.15 Append 354.24	May 164.12 L, equat 23.29 dix L, eq 327.43	164.12 ion L9 of 19.66 uation L 302.23	164.12 r L9a), a 21.24 13 or L1 285.4	164.12 Iso see 27.61 3a), also	164.12 Table 5 37.06 see Ta	164.12 47.06 ble 5 312.65	164.12 54.92	164.12 58.55		(67)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45 ns (calcula 54.15	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in A	Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat	164.12 ion L9 of 19.66 uation L 302.23 ion L15	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a)	164.12 Iso see 27.61 3a), also 281.44	164.12 Table 5 37.06 see Ta 291.42 ee Table	47.06 ble 5 312.65	164.12 54.92 339.46	58.55 364.66		(67) (68)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15 Pumps and f	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45 ns (calcula 54.15	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in A	Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15	164.12 ion L9 of 19.66 uation L 302.23 ion L15 54.15	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a)	164.12 lso see 27.61 3a), also 281.44 , also se 54.15	164.12 Table 5 37.06 see Ta 291.42 ee Table 54.15	47.06 ble 5 312.65 5 54.15	164.12 54.92 339.46 54.15	58.55 364.66 54.15		(67) (68) (69)
Jan (66)m= 164.1	Feb 2 164.12 s (calcular 50.6 ains (calcular 9 385.45 ns (calcular 54.15 ans gains 3	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in Ap 54.15 (Table 5	Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15 5a)	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15	164.12 ion L9 of 19.66 uation L 302.23 tion L15 54.15	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	164.12 Iso see 27.61 3a), also 281.44	164.12 Table 5 37.06 see Ta 291.42 ee Table	47.06 ble 5 312.65	164.12 54.92 339.46	58.55 364.66		(67) (68)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15 Pumps and f (70)m= 3 Losses e.g. 6	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45 as (calcula 54.15 ans gains 3 evaporatio	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in Ap 54.15 (Table 5	Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15 5a)	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15	164.12 ion L9 of 19.66 uation L 302.23 ion L15 54.15	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	164.12 Iso see 27.61 3a), also 281.44 , also se 54.15	164.12 Table 5 37.06 see Ta 291.42 ee Table 54.15	47.06 ble 5 312.65 5 54.15	164.12 54.92 339.46 54.15	58.55 364.66 54.15		(67) (68) (69)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15 Pumps and f (70)m= 3 Losses e.g. (71)m= -109.4	Feb 2 164.12 s (calcular 50.6 ains (calcular 9 385.45 as (calcular 54.15 ans gains 3 evaporation 1 -109.41	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in A 54.15 (Table 5 3 on (negat	Apr 164.12 ppendix 31.15 Append 354.24 ppendix 54.15 5a) 3	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15	164.12 ion L9 of 19.66 uation L 302.23 tion L15 54.15	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	164.12 lso see 27.61 3a), also 281.44 , also se 54.15	164.12 Table 5 37.06 see Ta 291.42 ee Table 54.15	47.06 ble 5 312.65 5 54.15	164.12 54.92 339.46 54.15	58.55 364.66 54.15		(67) (68) (69) (70)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15 Pumps and f (70)m= 3 Losses e.g. 6	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45 as (calcula 54.15 ans gains 3 evaporatio 1 -109.41 g gains (1	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in A 54.15 (Table 5 3 on (negat	Apr 164.12 ppendix 31.15 Append 354.24 ppendix 54.15 5a) 3	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15	164.12 ion L9 of 19.66 uation L 302.23 ion L15 54.15	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	164.12 Iso see 27.61 3a), also 281.44 , also se 54.15	164.12 Table 5 37.06 see Ta 291.42 ee Table 54.15	47.06 ble 5 312.65 5 54.15	164.12 54.92 339.46 54.15	58.55 364.66 54.15		(67) (68) (69) (70)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15 Pumps and f (70)m= 3 Losses e.g. 6 (71)m= -109.4 Water heatin (72)m= 77.05	Feb 2 164.12 s (calcula 50.6 ains (calcula 9 385.45 as (calcula 54.15 ans gains 3 evaporatio 1 -109.41 g gains (7 74.75	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in Ap 54.15 (Table 5 3 on (negat -109.41 Table 5) 69.99	Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15 5a) 3 tive valu	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15 3 es) (Tab	164.12 ion L9 of 19.66 uation L 302.23 ion L15 54.15 3 le 5) -109.41	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	164.12 Iso see 27.61 3a), also 281.44 , also se 54.15 3	164.12 Table 5 37.06 see Ta 291.42 ee Table 54.15 3 -109.41	164.12 47.06 ble 5 312.65 5 54.15 3 -109.41	164.12 54.92 339.46 54.15 3 -109.41	164.12 58.55 364.66 54.15 3 -109.41		(67) (68) (69) (70) (71)
Jan (66)m= 164.1 Lighting gain (67)m= 56.97 Appliances g (68)m= 381.4 Cooking gain (69)m= 54.15 Pumps and f (70)m= 3 Losses e.g. (71)m= -109.4 Water heatin	Feb 2 164.12 s (calcular 50.6 ains (calcular 9 385.45 as (calcular 54.15 ans gains 3 evaporation 1 -109.41 g gains (74.75 al gains =	e 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in Ap 54.15 (Table 5 3 on (negat -109.41 Table 5) 69.99	Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15 5a) 3 tive valu	May 164.12 L, equat 23.29 dix L, eq 327.43 L, equat 54.15 3 es) (Tab	164.12 ion L9 of 19.66 uation L 302.23 ion L15 54.15 3 le 5) -109.41	164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15 3	164.12 Iso see 27.61 3a), also 281.44 , also se 54.15 3	164.12 Table 5 37.06 see Ta 291.42 ee Table 54.15 3 -109.41	164.12 47.06 ble 5 312.65 5 54.15 3 -109.41	164.12 54.92 339.46 54.15 3 -109.41	164.12 58.55 364.66 54.15 3 -109.41		(67) (68) (69) (70) (71)

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

Orientation: Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	18.86	x	11.28	x	0.63	x	0.7	=	65.03	(75)
Northeast _{0.9x} 0.77	x	18.86	x	22.97	x	0.63	x	0.7	=	132.38	(75)
Northeast 0.9x 0.77	x	18.86	x	41.38	x	0.63	x	0.7	=	238.5	(75)
Northeast _{0.9x} 0.77	X	18.86	x	67.96	x	0.63	x	0.7	=	391.69	(75)
Northeast _{0.9x} 0.77	X	18.86	x	91.35	X	0.63	x	0.7	=	526.51	(75)
Northeast 0.9x 0.77	x	18.86	x	97.38	x	0.63	x	0.7	=	561.31	(75)
Northeast _{0.9x} 0.77	x	18.86	x	91.1	x	0.63	x	0.7	=	525.09	(75)
Northeast _{0.9x} 0.77	x	18.86	x	72.63	x	0.63	x	0.7	=	418.61	(75)
Northeast _{0.9x} 0.77	x	18.86	x	50.42	x	0.63	x	0.7	=	290.62	(75)
Northeast _{0.9x} 0.77	x	18.86	x	28.07	x	0.63	x	0.7	=	161.78	(75)
Northeast _{0.9x} 0.77	x	18.86	x	14.2	x	0.63	x	0.7	=	81.83	(75)
Northeast _{0.9x} 0.77	x	18.86	x	9.21	x	0.63	x	0.7	=	53.11	(75)
Southeast 0.9x 0.77	x	2.76	x	36.79	x	0.63	x	0.7	=	31.04	(77)
Southeast 0.9x 0.77	x	2.76	x	62.67	x	0.63	x	0.7	=	52.86	(77)
Southeast 0.9x 0.77	x	2.76	x	85.75	x	0.63	x	0.7	=	72.33	(77)
Southeast 0.9x 0.77	x	2.76	x	106.25	x	0.63	x	0.7	=	89.62	(77)
Southeast 0.9x 0.77	x	2.76	x	119.01	x	0.63	x	0.7	=	100.38	(77)
Southeast 0.9x 0.77	x	2.76	x	118.15	x	0.63	x	0.7	=	99.66	(77)
Southeast 0.9x 0.77	x	2.76	x	113.91	x	0.63	x	0.7	=	96.08	(77)
Southeast 0.9x 0.77	x	2.76	x	104.39	x	0.63	x	0.7	=	88.05	(77)
Southeast 0.9x 0.77	X	2.76	x	92.85	x	0.63	x	0.7	=	78.32	(77)
Southeast 0.9x 0.77	x	2.76	x	69.27	x	0.63	x	0.7	=	58.43	(77)
Southeast 0.9x 0.77	x	2.76	x	44.07	x	0.63	x	0.7	=	37.17	(77)
Southeast 0.9x 0.77	x	2.76	x	31.49	x	0.63	x	0.7	=	26.56	(77)
Southwest _{0.9x} 0.77	x	7.78	x	36.79		0.63	X	0.7	=	87.48	(79)
Southwest _{0.9x} 0.77	x	7.78	x	62.67]	0.63	x	0.7	=	149.02	(79)
Southwest _{0.9x} 0.77	x	7.78	x	85.75		0.63	X	0.7	=	203.89	(79)
Southwest _{0.9x} 0.77	X	7.78	X	106.25		0.63	X	0.7	=	252.63	(79)
Southwest _{0.9x} 0.77	X	7.78	x	119.01]	0.63	X	0.7	=	282.97	(79)
Southwest _{0.9x} 0.77	X	7.78	X	118.15		0.63	X	0.7	=	280.92	(79)
Southwest _{0.9x} 0.77	X	7.78	X	113.91		0.63	X	0.7	=	270.84	(79)
Southwest _{0.9x} 0.77	x	7.78	x	104.39		0.63	X	0.7	=	248.21	(79)
Southwest _{0.9x} 0.77	x	7.78	x	92.85		0.63	X	0.7	=	220.77	(79)
Southwest _{0.9x} 0.77	x	7.78	x	69.27		0.63	X	0.7	=	164.7	(79)
Southwest _{0.9x} 0.77	x	7.78	x	44.07]	0.63	x	0.7	=	104.79	(79)
Southwest _{0.9x} 0.77	x	7.78	x	31.49]	0.63	x	0.7	=	74.87	(79)
Northwest 0.9x 0.77	x	0.69	x	11.28	x	0.63	x	0.7	=	2.38	(81)
Northwest 0.9x 0.77	x	0.69	x	22.97	x	0.63	x	0.7] =	4.84	(81)
Northwest 0.9x 0.77	X	0.69	x	41.38	x	0.63	X	0.7	=	8.73	(81)

Northwest 0.9x	0.77	X	0.6	69	x	67	7.96	X		0.63	x	0.7	=	14.33	(81)
Northwest _{0.9x}	0.77	x	0.6	69	x [91	.35	x		0.63	x [0.7	=	19.26	(81)
Northwest _{0.9x}	0.77	x	0.6	69	x	97	7.38	X		0.63	x	0.7	=	20.54	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x [9	1.1	X		0.63	x [0.7	=	19.21	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x	72	2.63	X		0.63	x [0.7	=	15.32	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x	50).42	X		0.63	x	0.7	=	10.63	(81)
Northwest 0.9x	0.77	X	0.6	69	x	28	3.07	X		0.63	x	0.7	=	5.92	(81)
Northwest _{0.9x}	0.77	×	0.6	69	x \lceil	1	4.2	x		0.63	x	0.7		2.99	(81)
Northwest _{0.9x}	0.77	×	0.6	69	x \lceil	9	.21	x		0.63	_ x [0.7		1.94	(81)
_															
Solar gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	ım(74)m	(82)m				
(83)m= 185.93	339.1	523.45	748.27	929.12	962	2.43	911.23	770	.18	600.34	390.82	226.78	156.48		(83)
Total gains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (83	3)m ,	watts			•			•	•	
(84)m= 813.29	961.75	1121.91	1309.02	1450.98	144	9.54	1378.06	1245	5.88	1097.76	926.17	804.38	766.3		(84)
7. Mean inter	nal tem	perature	(heating	season)										
Temperature			`		<i>'</i>	rea fr	om Tab	ole 9.	. Th1	1 (°C)				21	(85)
Utilisation fac	ŭ	٠.			•			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	. (•)					(\
Jan	Feb	Mar	Apr	May	Ė.	un	Jul	Aı	ug	Sep	Oct	Nov	Dec	1	
(86)m= 0.94	0.92	0.88	0.79	0.68	_	54	0.43	0.4		0.67	0.84	0.92	0.95	-	(86)
` '			 	L T4 /6			0.040.7			. 0-1		<u> </u>]	
Mean interna (87)m= 18.19	18.52	19.07	19.75	20.33		v step	20.88	20.8	$\overline{}$	20.52	19.75	18.84	18.11	1	(87)
` '					l			l			19.75	10.04	10.11		(01)
Temperature		neating p	i	i e	_		from Ta	ble 9	9, Th	12 (°C)				7	
(88)m= 19.67	19.67	19.67	19.67	19.68	19	.68	19.68	19.0	68	19.68	19.68	19.67	19.67		(88)
Utilisation fac	ctor for g	ains for	rest of d	welling,	h2,n	n (se	e Table	9a)							
(89)m= 0.93	0.91	0.86	0.76	0.62	0.4	46	0.32	0.3	36	0.59	0.81	0.91	0.94]	(89)
Mean interna	l temper	rature in	the rest	of dwelli	na T	Γ2 (fo	llow ste	ns 3	to 7	' in Tabl	e 9c)		•	•	
(90)m= 16.01	16.49	17.26	18.2	18.98	<u> </u>	.45	19.61	19.	$\overline{}$	19.24	18.23	16.95	15.9	1	(90)
. ,	1		L	L	<u> </u>						LA = Livii	ng area ÷ (4	<u>1</u> 4) =	0.3	(91)
					,			,,							` ′
Mean interna		<u> </u>	1								40.00	1,754	40.50	1	(02)
(92)m= 16.65	17.09	17.79	18.66	19.38		.82	19.99	19.9		19.62	18.68	17.51	16.56		(92)
Apply adjustr	1	î .	i		_						•	17.00	40.44	1	(02)
(93)m= 16.5	16.94	17.64	18.51	19.23	19	.67	19.84	19.8	81	19.47	18.53	17.36	16.41		(93)
8. Space hea						-1 -1-	. 44 . (T - 1. 1	- 01	(l)		(70)	dan ad	. 1.4.	
Set Ti to the the utilisation			•		ied a	at ste	p 11 of	rabi	e 9b	, so tha	t 11,m=	(76)m an	d re-cal	culate	
Jan	Feb	Mar	Apr	May	l .ı	un	Jul	Aı	ug	Sep	Oct	Nov	Dec	1	
Utilisation fac			<u> </u>	ividy		<u> </u>	oui		ug į	ОСР		1407	_ <u></u>		
(94)m= 0.9	0.87	0.81	0.72	0.6	0.4	46	0.33	0.3	38	0.58	0.77	0.87	0.91]	(94)
Useful gains,			l	L 4)m				<u> </u>		ļ			<u> </u>	1	
(95)m= 734.02	835.77	914.08	948.08	873.52	663	3.73	454.8	468	.05	636.23	715.38	701.8	698.64]	(95)
Monthly aver	<u> </u>	l		l .	able	8		ı				1	<u> </u>	1	
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.	.4	14.1	10.6	7.1	4.2]	(96)
Heat loss rate	ļ.		<u> </u>	erature.	Lm .	, W =	[(39)m :	x [(93	 3)m-	I - (96)m ˈ	1	Į.	<u>I</u>	1	
(97)m= 1854.5	1	1	1451.35	r		2.75	487.01	512		808.12	1196.82	1550.63	1847.97]	(97)
			!	!						!			!	1	

Space heatin	ř ·		1		ı			ì	<u> </u>	<u> </u>			
8)m= 833.64	666.33	577.23	362.35	195.33	0	0	0 Tota	0	358.19 (kWh/year	611.16	855.1	4459.33	(98)
0			1-10/15 / 2	16			Tota	i per year	(Kvvii/yeai) = Sum(9	0)15,912 =		╡
Space heatin	• •			•				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			L	44.79	(99)
a. Energy red		nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heatir Fraction of sp	_	nt from se	econdar	y/supple	mentary	system					Г	0	(20
Fraction of sp	ace hea	nt from m	nain syst	em(s)		•	(202) = 1 -	- (201) =				1	(202
Fraction of to	tal heatii	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204
Efficiency of r	main spa	ace heat	ing syste	em 1							Ì	93.5	(20
Efficiency of s	seconda	ry/supple	ementar	y heating	g system	າ, %					Ī	0	(20
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space heatin	g require	ement (c	alculate	d above))	1	I		1				
833.64	666.33	577.23	362.35	195.33	0	0	0	0	358.19	611.16	855.1		
211)m = {[(98													(21
891.59	712.65	617.36	387.54	208.9	0	0	0 Tota	0 L (k\\/b/voc	383.09 ar) =Sum(2	653.65	914.55	4769.33	(21
Space heatin {[(98)m x (20	•		- /	month							L		
15)m= 0	0	00 + (20	0	0	0	0	0	0	0	0	0		
							Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(21
/ater heating	j												
utput from w	ater hea	ter (calc	ulated al		118.93	111.62	126.07	126.98	146.23	157.92	170.70		
fficiency of w			140.69	136.16	116.93	111.02	120.07	120.96	140.23	157.92	170.79	87.3	(21
17)m= 89.93	89.88	89.79	89.58	89.16	87.3	87.3	87.3	87.3	89.55	89.82	89.95	07.0	(21
uel for water	L heating,	kWh/mo	L onth										
219)m = (64)										.==			
19)m= 195.61	171.61	178.31	157.28	152.72	136.23	127.86	144.41 Tota	145.45 I = Sum(2	163.3	175.81	189.87	1938.47	(21
nnual totals								. • • • • • • • • • • • • • • • • • • •		Wh/year	<u> </u>	kWh/yea	
pace heating		ed, main	system	1					K	rvii, y cai		4769.33	
ater heating	fuel use	d									Ī	1938.47	Ħ
ectricity for p	oumps, fa	ans and	electric	keep-ho	t						L		_
central heatin	g pump:			-							30		(23
ooiler with a f	• •										45		(23
otal electricity			⟨Wh/vea	r			sum	of (230a).	(230g) =			75	(23
lectricity for li			, J O a	-				, ,	. 3,		L T	402.42	(23
otal delivered		for all	000 /011	\ (224\	. (224)	. (222)	(227h)	_			Ĺ	7185.22	=
TIST CIPTIVE FAC	ı enerav	TOT All US	ses (ZTT	ューフノコ	+ (/31)	+ (/3/)	(Z3/D)	=				7 185.22	(33

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 × 0.01	= 165.97 (240)
Space heating - main system 2	(213) x	0 x 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 x 0.01	= 0 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01	= 67.46 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01	9.89 (249)
(if off-peak tariff, list each of (230a) to (250a) to (250a)	230g) separately as applicable and (232)	apply fuel price according 13.19 × 0.01	
Additional standing charges (Table 12)		10.10	120 (251)
Appendix Q items: repeat lines (253) ar	od (254) as pooded		, ,
Total energy cost	(245)(247) + (250)(254) =		416.4 (255)
11a. SAP rating - individual heating sy	stems		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =		1.21 (257)
SAP rating (Section 12)			83.12 (258)
12a. CO2 emissions – Individual heati	ng systems including micro-CHP		
	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)			
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh	kg CO2/year
	kWh/year (211) x	kg CO2/kWh 0.216 =	kg CO2/year
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 = 0.519 = 0.216 =	kg CO2/year 1030.18 (261) 0 (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	kg CO2/kWh 0.216 = 0.519 = 0.216 =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	kg CO2/kWh 0.216 = 0.519 = 0.216 =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric lefter to the secondary.	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	kg CO2/kWh 0.216 = 0.519 = 0.519 = 0.519 = 0.519 =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric lefter to the lefter le	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric lefter to the Electricity for lighting Total CO2, kg/year CO2 emissions per m²	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272) 17.04 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric leftericity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272) 17.04 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric leftericity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (232) x Energy	kg CO2/kWh 0.216 = 0.519 = 0.519 = 0.519 = 0.519 = (272) ÷ (4) =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272) 17.04 (273) 84 (274) P. Energy
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric lefter for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x Energy kWh/year	kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 = (272) ÷ (4) = Primary factor	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272) 17.04 (273) 84 (274) P. Energy kWh/year
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric leader of the secondary Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x Energy kWh/year (211) x	kg CO2/kWh 0.216 = 0.519 = 0.519 = 0.519 = 0.519 = (272) ÷ (4) = Primary factor 1.22 =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272) 17.04 (273) 84 (274) P. Energy kWh/year 5818.59 (261)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric leader of the secondary of the sec	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x Energy kWh/year (211) x (215) x	kg CO2/kWh 0.216 = 0.519 = 0.519 = 0.519 = 0.519 = (272) ÷ (4) = Primary factor 1.22 = 3.07 = 1.22 =	kg CO2/year 1030.18 (261) 0 (263) 418.71 (264) 1448.88 (265) 38.93 (267) 208.86 (268) 1696.67 (272) 17.04 (273) 84 (274) P. Energy kWh/year 5818.59 (261) 0 (263)

Electricity for lighting (232) x 0 = 1235.43 (268) 'Total Primary Energy sum of (265)...(271) = 9649.2 (272) **Primary energy kWh/m²/year** (272) \div (4) = 96.93 (273)

		User Details:			
Assessor Name:	Harry Hinchcliffe	Stroma Nur	nber: STRO	0034627	
Software Name:	Stroma FSAP 2012	Software Ve	ersion: Versi	on: 1.0.5.16	
	Pro	operty Address: 15592	2 - L1a Assessment		
Address:	New Dwelling @, 34 Summer	r House Way, Langley	, WD5 0DY		
1. Overall dwelling dime	nsions:				
		Area(m²)	Av. Height(m)	Volume(m³)	
Ground floor		52.34 (1a) x	2.39 (2a) =	125.09 (3	3a)
First floor		47.21 (1b) x	2.65 (2b) =	125.11	Bb)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	99.55 (4)		_	
Dwelling volume		(3a)+(3	(3c)+(3c)+(3d)+(3e)+(3n) =	250.2 (5	5)
2. Ventilation rate:					
	main secondary heating heating	other	total	m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0 (6	Sa)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0 (6	Sb)
Number of intermittent far	ns		0 x 10 =	0 (7:	7a)
Number of passive vents			0 x 10 =	0 (7	7 b)
Number of flueless gas fil	res		0 x 40 =	0 (7	7 c)
			Air c	hanges per hour	
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(7a)$	u)+(7b)+(7c) =	0 ÷ (5) =	0 (8	<i>8)</i>
•	een carried out or is intended, proceed			0 (0,	')
Number of storeys in th	ne dwelling (ns)			0 (9)))
Additional infiltration			[(9)-1]x0.1 =	0 (1	10)
Structural infiltration: 0.	25 for steel or timber frame or 0	0.35 for masonry cons	struction	0 (1	11)
if both types of wall are pr deducting areas of openin	resent, use the value corresponding to t nas): if equal user 0.35	the greater wall area (after			
	loor, enter 0.2 (unsealed) or 0.1	(sealed), else enter ()	0 (1:	12)
If no draught lobby, ent	ter 0.05, else enter 0			0 (1:	13)
Percentage of windows	s and doors draught stripped			0 (14	14)
Window infiltration		0.25 - [0.2 x (14) ÷	- 100] =	0 (1	15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0 (1	16)
Air permeability value,	q50, expressed in cubic metres	per hour per square	metre of envelope area	5 (1	17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$		0.25 (1	18)
Air permeability value applies	s if a pressurisation test has been done	or a degree air permeabili	ty is being used		
Number of sides sheltere	d	(00) 4 [0.075]	(40)1	i	19)
Shelter factor		(20) = 1 - [0.075 x]			20)
Infiltration rate incorporat		$(21) = (18) \times (20) =$	=	0.23	21)
Infiltration rate modified for			<u> </u>	7	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec	J	
Monthly average wind sp	eed from Table 7			_	

3.7

3.4

3.1

3

3.4

3.6

3.3

3.6

3.9

3.9

Wind Facto	or (22a)m =	(22)m ÷	4										
(22a)m= 0.9	0.98	1	0.92	0.85	0.78	0.85	0.75	0.85	0.9	0.82	0.9]	
Adjusted in	filtration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.2	1 1	0.23	0.21	0.2	0.18	0.2	0.17	0.2	0.21	0.19	0.21]	
	<i>effective air</i> nical ventila	•	rate for t	he appli	cable ca	se	•						(220)
	air heat pump		endix N (2	3h) = (23a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h	n) = (23a)			0	(23a)
	with heat reco	0 11		, ,	,	. `	,, .	`) = (20a)			0	(23b)
	nced mech	•	-	_					2h)m + (′23h) x [1 – (23c)	0 - 1001	(23c)
(24a)m= 0	1	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If bala	nced mech	anical ve	entilation	without	heat red	covery (N	иV) (24b	m = (22)	2b)m + (23b)	1	J	
(24b)m= 0		0	0	0	0	0	0	0	0	0	0]	(24b)
c) If who	le house ex	tract ven	tilation o	or positiv	e input v	ventilatio	n from o	outside	!	· ·		•	
if (22	2b)m < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22l	o) m + 0	.5 × (23k	o)	_		
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,	ıral ventilatio 2b)m = 1, th				•				0.51				
(24d)m= 0.5	- '	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52]	(24d)
Effective	air change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)				J	
(25)m= 0.5	53 0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52]	(25)
2 Heatle												_	
.5 Hear 10	sses and he	eat loss r	paramete	er.									
S. Heat 10	I T Gros	SS	oaramete Openin	gs	Net Ar		U-val		ΑXU		k-value		ΑXk
ELEMEN	_	SS		gs	A ,r	n²	W/m2	2K	(W/		k-value kJ/m²-		kJ/K
ELEMEN Doors	IT Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/ 3.36				kJ/K (26)
ELEMEN Doors Windows T	IT Gros area Type 1	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2 1.6 /[1/(1.4)+	2K = - 0.04] =	(W/ 3.36 10.31				kJ/K
ELEMEN Doors Windows T Windows T	T Gros area ype 1 ype 2	SS	Openin	gs	A ,r	m ² x x1/3 x1/3	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+	2K = 0.04] = 0.04] =	(W/ 3.36				kJ/K (26)
Doors Windows T Windows T Windows T	Type 1 Type 2 Type 3	SS	Openin	gs	A ,r 2.1 7.78	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31				kJ/K (26) (27)
Doors Windows T Windows T Windows T Windows T	Type 1 Type 2 Type 3	SS	Openin	gs	A ,r 2.1 7.78 18.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31 25				kJ/K (26) (27) (27)
Doors Windows T Windows T Windows T Windows T Floor	Type 1 Type 2 Type 3	SS	Openin	gs	A ,r 2.1 7.78 18.86 2.76	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31 25 3.66	K)			kJ/K (26) (27) (27) (27)
Doors Windows T Windows T Windows T Windows T	Type 1 Type 2 Type 3	ss (m²)	Openin	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31 25 3.66 0.91	K)			kJ/K (26) (27) (27) (27) (27)
Doors Windows T Windows T Windows T Windows T Floor	Type 1 Type 2 Type 3 Type 4	ss (m²)	Openin m	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0	(W/ 3.36 10.31 25 3.66 0.91 9.42120	K)			kJ/K (26) (27) (27) (27) (27) (28)
ELEMEN Doors Windows T Windows T Windows T Floor Walls	Type 1 Type 2 Type 3 Type 4 Type 4	os (m²)	Openin m	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8	x1/2 x1/2 x1/4 x x1/4 x x1/4 x x x1/4 x x x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24	eK = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25	K)			kJ/K (26) (27) (27) (27) (27) (28)
Doors Windows T Windows T Windows T Windows T Floor Walls Roof Type Roof Type	Type 1 Type 2 Type 3 Type 4 Type 4	05 7	32.19 0	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	EK = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65	K)			kJ/K (26) (27) (27) (27) (27) (28) (29)
Doors Windows T Windows T Windows T Windows T Floor Walls Roof Type Roof Type Total area * for windows	Type 1 Type 2 Type 3 Type 4 Ty	05 7 5 , m ²	Openin m 32.19 0 0 effective wi	gs p	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	x1/2 x1/2 x1/4 x x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	EK = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (27) (28) (29) (30)
Doors Windows T Windows T Windows T Windows T Windows T Floor Walls Roof Type Roof Type Total area * for windows ** include the	Type 1 Type 2 Type 3 Type 4 Ty	05 7 5 , m ² ows, use e	32.19 0 0 offective winternal wall	gs p	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
Doors Windows T Windows T Windows T Windows T Floor Walls Roof Type Roof Type Total area * for windows ** include the Fabric head	Type 1 Type 2 Type 3 Type 4 Tel: 154. The standard of wind areas on both	05 7 5 , m ² ows, use e sides of in	32.19 0 0 offective winternal wall	gs p	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²•	n 3.2	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
Doors Windows T Windows T Windows T Windows T Windows T Floor Walls Roof Type Roof Type Total area * for windows ** include the Fabric hear Heat capac	Type 1 Type 2 Type 3 Type 4 Type 5 Type 4 Type 7 Ty	05 7 5 , m ² ows, use e sides of in = S (A x (A x k)	32.19 0 0 oriffective winternal walk	gs 2 9 Indow U-ve	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcultitions	x1/2 x1/2 x1/4 x x1/4 x x x1/4 x x x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	EK = 0.04] =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²•	1 3.2 87.8	(26) (27) (27) (27) (28) (29) (30) (31)
Doors Windows T Windows T Windows T Windows T Windows T Floor Walls Roof Type Roof Type Total area * for windows ** include the Fabric head Heat capac Thermal m For design as	Type 1 Type 2 Type 3 Type 4 Tel 4.6 Type 4 Type 4 Type 4 Type 4 Type 4 Type 4 Type 3 Type 4 Type 4 Type 3 Type 4 Type 5 Type 5 Type 5 Type 5 Type 7 T	05 7 5 , m ² ows, use e sides of in = S (A x (A x k) otter (TMF) ere the de	32.19 0 0 effective with ternal walk U) $P = Cm = 0$ tails of the	gs p ndow U-va ls and pan	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculatitions	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11 formula 1 (26)(30	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22 ue)+0.04] a	as given ir 2) + (32a)	kJ/m²-	7 3.2 87.8 13538.	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
Doors Windows T Windows T Windows T Windows T Floor Walls Roof Type Total area * for windows ** include the Fabric head Heat capac Thermal m For design as can be used if	Type 1 Type 2 Type 3 Type 4 Type 5 Type 4 Type 5 Type 5 Type 5 Type 7 Ty	oss (m²) 7 5 , m² ows, use e sides of in = S (A x k) eter (TMF) ere the de tailed calculations.	32.19 32.19 0 0 offective winternal walk U) P = Cm - tails of the culation.	gs 2 Indow U-valls and part - TFA) ir constructi	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculations n kJ/m²K	x1/x1/x1/xx/6 x x x 6 x x x 6 atted using	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11 formula 1 (26)(30	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22 ue)+0.04] a	as given ir 2) + (32a)	kJ/m²-	7 3.2 87.8 13538.	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (31)

if details of therm	nal bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he	eat loss							(33) +	(36) =			107.07	(37)
Ventilation he	at loss ca	alculated	monthl	у	ī	1	г	(38)m	= 0.33 × (25)m x (5)) T	•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 43.38	43.38	43.49	43.17	42.88	42.61	42.88	42.52	42.88	43.07	42.79	43.07		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 150.46	150.46	150.57	150.25	149.95	149.68	149.95	149.6	149.95	150.15	149.86	150.15		
		\							_	Sum(39) ₁	12 /12=	150.08	(39)
Heat loss par		- 	r —	1 . 5 .				· · ·	= (39)m ÷	<u>` </u>		Ī	
(40)m= 1.51	1.51	1.51	1.51	1.51	1.5	1.51	1.5	1.51	1.51	1.51	1.51	4.54	7(40)
Number of da	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.51	(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 hea	ating ene	rgy requi	irement:								kWh/ye	ear:	
A sourced a se		N I										Ī	(40)
Assumed occ if TFA > 13			:[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)1 + 0.0	0013 x (ΓFA -13.		.74		(42)
if TFA £ 13				((,	, ,1	,		- /			
Annual avera).16		(43)
Reduce the annu	_				_	-	o acriieve	a water us	se largel o	ı			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage			<u> </u>					Оср	001	I NOV	Dec		
(44)m= 109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08		
()	1							l		m(44) ₁₁₂ =		1189.97	(44)
Energy content of	of hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66		
									Total = Su	m(45) ₁₁₂ =	=	1560.23	(45)
If instantaneous	water heati	ng at point	of use (no	not water	r storage),	enter 0 in	boxes (46)) to (61)	T	1	1	Ī	
(46)m= 24.26	21.22	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64	23.5		(46)
Water storage Storage volur) includir	na anv sa	olar or W	/WHRS	storane	within sa	ame ves	امء		0		(47)
If community	` '		•			•		21110 100	001		0		(47)
Otherwise if r	_			_			` '	ers) ente	er '0' in (47)			
Water storage			`					,	`	,			
a) If manufac	cturer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fr		_	-				(48) x (49)) =			0		(50)
b) If manufac			-									I	4
Hot water sto If community	-			ie Z (KVV	n/iitre/da	ay)					0		(51)
Volume factor	_		UII 7.U								0		(52)
Temperature			2b							-	0		(53)
Energy lost fr	om water	storage	, kWh/ve	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,				, ,	•		—	0		(55)
												•	

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circui	t loss (ar	nnual) fro	m Table	3							0		(58)
Primary circui	t loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 14.14	12.76	14.11	13.61	14.03	13.54	13.97	14.01	13.58	14.07	13.66	14.13		(61)
Total heat rec	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add additiona	al lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (3)		_			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
							Outp	out from wa	ater heate	r (annual) ₁	12	1725.84	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m= 57.32	50.23	52.07	45.72	44.12	38.43	25.00	40.70	44.4					(65)
		02.07	45.72	44.12	36.43	35.96	40.76	41.1	47.46	51.38	55.62		(03)
include (57)	m in cal				<u> </u>	<u> </u>	ļ			<u> </u>		eating	(03)
include (57)		culation o	of (65)m	only if c	<u> </u>	<u> </u>	ļ			<u> </u>		eating	(03)
5. Internal g	ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	ļ			<u> </u>		eating	(03)
· ·	ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	ļ			<u> </u>		eating	(03)
5. Internal g	ains (see	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	(66)
5. Internal g Metabolic gai	ains (see ns (Table Feb 164.12	e Table 5 e 5), Wat Mar 164.12	of (65)m and 5a ts Apr 164.12	only if constant of the consta	Jun 164.12	Jul 164.12	Aug 164.12	or hot w Sep 164.12	ater is fr	om com	munity h	eating	
5. Internal g Metabolic gain Jan (66)m= 164.12	ains (see ns (Table Feb 164.12	e Table 5 e 5), Wat Mar 164.12	of (65)m and 5a ts Apr 164.12	only if constant of the consta	Jun 164.12	Jul 164.12	Aug 164.12	or hot w Sep 164.12	ater is fr	om com	munity h	eating	
5. Internal g Metabolic gain Jan (66)m= 164.12 Lighting gains	ns (Table Feb 164.12 (calcula	E Table 5 E 5), Wat Mar 164.12 ted in Ap	of (65)m 6 and 5a ts Apr 164.12 opendix 31.15	only if constraints only if constraints only if constraints on the constraint on the constraints on the constraint on the constraints of the constraints on the constraint on of the constraint on the constraint of the constraint on t	Jun 164.12 ion L9 o	Jul 164.12 r L9a), a 21.24	Aug 164.12 Iso see	Sep 164.12 Table 5 37.06	Oct 164.12	Nov	Dec	eating	(66)
5. Internal g Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97	ns (Table Feb 164.12 (calcula	E Table 5 E 5), Wat Mar 164.12 ted in Ap	of (65)m 6 and 5a ts Apr 164.12 opendix 31.15	only if constraints only if constraints only if constraints on the constraint on the constraints on the constraint on the constraints of the constraints on the constraint on of the constraint on the constraint of the constraint on t	Jun 164.12 ion L9 o	Jul 164.12 r L9a), a 21.24	Aug 164.12 Iso see	Sep 164.12 Table 5 37.06	Oct 164.12	Nov	Dec	eating	(66)
5. Internal g Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga	res (Table Feb 164.12 (calcula 50.6 sins (calcula 385.45	culation of Table 5 (a) Wat Mar 164.12 ted in Ap 41.15 culated in 375.47	of (65)m and 5a ts Apr 164.12 opendix 31.15 Appendix 354.24	only if construction in the construction in th	Jun 164.12 ion L9 o 19.66 uation L 302.23	Jul 164.12 r L9a), a 21.24 13 or L1 285.4	Aug 164.12 Iso see 27.61 3a), also	Sep 164.12 Table 5 37.06 see Tal 291.42	Oct 164.12 47.06 ble 5 312.65	Nov 164.12 54.92	Dec 164.12 58.55	eating	(66) (67)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49	res (Table Feb 164.12 (calcula 50.6 sins (calcula 385.45	culation of Table 5 (a) Wat Mar 164.12 ted in Ap 41.15 culated in 375.47	of (65)m and 5a ts Apr 164.12 opendix 31.15 Appendix 354.24	only if construction in the construction in th	Jun 164.12 ion L9 o 19.66 uation L 302.23	Jul 164.12 r L9a), a 21.24 13 or L1 285.4	Aug 164.12 Iso see 27.61 3a), also	Sep 164.12 Table 5 37.06 see Tal 291.42	Oct 164.12 47.06 ble 5 312.65	Nov 164.12 54.92	Dec 164.12 58.55	eating	(66) (67)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains	res (Table Feb 164.12 (calcula 50.6 s) (calcula 385.45 s) (calcula 54.15	culation of Table 5 2 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in A 54.15	of (65)m s and 5a ts Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15	only if constructions only if constructions only if constructions on the construction of the construction	Jun 164.12 ion L9 of 19.66 uation L 302.23	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a)	Aug 164.12 Iso see 27.61 3a), also 281.44	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table	Oct 164.12 47.06 ble 5 312.65	Nov 164.12 54.92	Dec 164.12 58.55	eating	(66) (67) (68)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains (69)m= 54.15	res (Table Feb 164.12 (calcula 50.6 s) (calcula 385.45 s) (calcula 54.15	culation of Table 5 2 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in A 54.15	of (65)m s and 5a ts Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15	only if constructions only if constructions only if constructions on the construction of the construction	Jun 164.12 ion L9 of 19.66 uation L 302.23	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a)	Aug 164.12 Iso see 27.61 3a), also 281.44	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table	Oct 164.12 47.06 ble 5 312.65	Nov 164.12 54.92	Dec 164.12 58.55	eating	(66) (67) (68)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains (69)m= 54.15 Pumps and fa	reb 164.12 (calcula 50.6 ains (calcula 54.15 ans gains 3	culation of Table 5 2 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in Ap 54.15 (Table 5	of (65)m ts Apr 164.12 ppendix 31.15 Appendix 54.24 ppendix 54.15 5a) 3	only if construction only if c	Jun 164.12 ion L9 of 19.66 uation L 302.23 tion L15 54.15	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	Aug 164.12 Iso see 27.61 3a), also 281.44), also se 54.15	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table 54.15	Oct 164.12 47.06 ble 5 312.65 5 54.15	Nov 164.12 54.92 339.46	Dec 164.12 58.55 364.66 54.15	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances gains (68)m= 381.49 Cooking gains (69)m= 54.15 Pumps and fains (70)m= 3	res (Table Feb 164.12 (calcula 50.6 ains (calcula 54.15 as gains 3 vaporatio	culation of Table 5 2 5), Wat Mar 164.12 ted in Ap 41.15 culated in 375.47 ated in Ap 54.15 (Table 5	of (65)m ts Apr 164.12 ppendix 31.15 Appendix 54.24 ppendix 54.15 5a) 3	only if construction only if c	Jun 164.12 ion L9 of 19.66 uation L 302.23 tion L15 54.15	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	Aug 164.12 Iso see 27.61 3a), also 281.44), also se 54.15	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table 54.15	Oct 164.12 47.06 ble 5 312.65 5 54.15	Nov 164.12 54.92 339.46	Dec 164.12 58.55 364.66 54.15	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains (69)m= 54.15 Pumps and fa (70)m= 3 Losses e.g. e	res (Table Feb 164.12 (calcula 50.6 ains (calcula 54.15 as (calcula 54.15 as yaporatic -109.41	culation of the Europe Solution of the Europe	of (65)m ts Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15 5a) 3 tive valu	only if construction only if c	Jun 164.12 ion L9 of 19.66 uation L 302.23 tion L15 54.15	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	Aug 164.12 Iso see 27.61 3a), also 281.44 , also se 54.15	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table 54.15	Oct 164.12 47.06 ble 5 312.65 5 54.15	Nov 164.12 54.92 339.46	Dec 164.12 58.55 364.66 54.15	eating	(66) (67) (68) (69) (70)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains (69)m= 54.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -109.41	res (Table Feb 164.12 (calcula 50.6 ains (calcula 54.15 as (calcula 54.15 as yaporatic -109.41	culation of the Europe Solution of the Europe	of (65)m ts Apr 164.12 opendix 31.15 Append 354.24 opendix 54.15 5a) 3 tive valu	only if construction only if c	Jun 164.12 ion L9 of 19.66 uation L 302.23 tion L15 54.15	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	Aug 164.12 Iso see 27.61 3a), also 281.44 , also se 54.15	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table 54.15	Oct 164.12 47.06 ble 5 312.65 5 54.15	Nov 164.12 54.92 339.46	Dec 164.12 58.55 364.66 54.15	eating	(66) (67) (68) (69) (70)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains (69)m= 54.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -109.41 Water heating	res (Table Feb 164.12 (calcula 50.6 ains (calcula 54.15 as (calcula 54.15 as gains 3 vaporatio 74.75	culation of the Coulation of the Coulati	of (65)m ts Apr 164.12 ppendix 31.15 Appendix 54.15 5a) 3 tive valu -109.41	only if constructions	Jun 164.12 ion L9 o 19.66 uation L 302.23 tion L15 54.15 3 ble 5) -109.41	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	Aug 164.12 Iso see 27.61 3a), also 281.44), also se 54.15 3	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table 54.15 3 -109.41	Oct 164.12 47.06 ble 5 312.65 5 -109.41 63.79	Nov 164.12 54.92 339.46 54.15 3	Dec 164.12 58.55 364.66 54.15 3	eating	(66) (67) (68) (69) (70) (71)
Metabolic gain Jan (66)m= 164.12 Lighting gains (67)m= 56.97 Appliances ga (68)m= 381.49 Cooking gains (69)m= 54.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -109.41 Water heating (72)m= 77.05	res (Table Feb 164.12 (calcula 50.6 ains (calcula 54.15 as (calcula 54.15 as gains 3 avaporatio 74.75 gains (Table Feb 164.12 as (calcula 54.15 as gains 3 avaporatio 74.75 as (calcula 54.15 as gains 64.15 as gains 64	culation of the Coulation of the Coulati	of (65)m ts Apr 164.12 ppendix 31.15 Appendix 54.15 5a) 3 tive valu -109.41	only if constructions	Jun 164.12 ion L9 o 19.66 uation L 302.23 tion L15 54.15 3 ble 5) -109.41	Jul 164.12 r L9a), a 21.24 13 or L1 285.4 or L15a) 54.15	Aug 164.12 Iso see 27.61 3a), also 281.44), also se 54.15 3	Sep 164.12 Table 5 37.06 see Tal 291.42 ee Table 54.15 3 -109.41	Oct 164.12 47.06 ble 5 312.65 5 -109.41 63.79	Nov 164.12 54.92 339.46 54.15 3	Dec 164.12 58.55 364.66 54.15 3	eating	(66) (67) (68) (69) (70) (71)

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

Orientation: Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	x	18.86	x	12.93	x	0.63	x	0.7	=	74.52	(75)
Northeast _{0.9x} 0.77	x	18.86	x	24.22	x	0.63	x	0.7	=	139.61	(75)
Northeast 0.9x 0.77	x	18.86	x	43.36	x	0.63	x	0.7	<u> </u>	249.91	(75)
Northeast _{0.9x} 0.77	x	18.86	x	72.26	x	0.63	x	0.7] =	416.52	(75)
Northeast _{0.9x} 0.77	x	18.86	x	94.65	x	0.63	x	0.7] =	545.55	(75)
Northeast 0.9x 0.77	x	18.86	x	108.13	x	0.63	x	0.7	=	623.24	(75)
Northeast _{0.9x} 0.77	x	18.86	x	99.28	x	0.63	x	0.7	=	572.24	(75)
Northeast _{0.9x} 0.77	x	18.86	x	80.36	x	0.63	x	0.7	=	463.16	(75)
Northeast 0.9x 0.77	x	18.86	x	56.56	x	0.63	x	0.7	=	326.01	(75)
Northeast _{0.9x} 0.77	x	18.86	x	31.11	x	0.63	x	0.7	=	179.29	(75)
Northeast _{0.9x} 0.77	x	18.86	x	16.69	x	0.63	x	0.7	=	96.21	(75)
Northeast _{0.9x} 0.77	x	18.86	x	10.44	x	0.63	x	0.7	=	60.16	(75)
Southeast 0.9x 0.77	x	2.76	x	40.57	x	0.63	x	0.7	=	34.22	(77)
Southeast 0.9x 0.77	x	2.76	x	63.28	x	0.63	x	0.7	=	53.37	(77)
Southeast 0.9x 0.77	x	2.76	x	85.85	x	0.63	x	0.7	=	72.41	(77)
Southeast 0.9x 0.77	x	2.76	x	108.59	x	0.63	x	0.7	=	91.59	(77)
Southeast 0.9x 0.77	x	2.76	x	119.53	x	0.63	x	0.7	=	100.82	(77)
Southeast 0.9x 0.77	x	2.76	x	127.75	x	0.63	x	0.7	=	107.75	(77)
Southeast 0.9x 0.77	x	2.76	x	120.63	x	0.63	x	0.7	=	101.75	(77)
Southeast 0.9x 0.77	x	2.76	x	111.38	x	0.63	x	0.7	=	93.95	(77)
Southeast 0.9x 0.77	x	2.76	x	99.66	x	0.63	x	0.7	=	84.06	(77)
Southeast 0.9x 0.77	x	2.76	x	73.37	x	0.63	x	0.7	=	61.89	(77)
Southeast 0.9x 0.77	x	2.76	x	49.78	x	0.63	x	0.7	=	41.99	(77)
Southeast 0.9x 0.77	x	2.76	x	34.39	x	0.63	x	0.7	=	29.01	(77)
Southwest _{0.9x} 0.77	X	7.78	x	40.57]	0.63	X	0.7	=	96.47	(79)
Southwest _{0.9x} 0.77	X	7.78	x	63.28]	0.63	x	0.7	=	150.45	(79)
Southwest _{0.9x} 0.77	X	7.78	x	85.85]	0.63	X	0.7	=	204.12	(79)
Southwest _{0.9x} 0.77	X	7.78	x	108.59]	0.63	X	0.7	=	258.18	(79)
Southwest _{0.9x} 0.77	X	7.78	x	119.53]	0.63	X	0.7	=	284.21	(79)
Southwest _{0.9x} 0.77	X	7.78	X	127.75]	0.63	X	0.7	=	303.74	(79)
Southwest _{0.9x} 0.77	X	7.78	X	120.63]	0.63	X	0.7	=	286.83	(79)
Southwest _{0.9x} 0.77	X	7.78	x	111.38]	0.63	X	0.7	=	264.83	(79)
Southwest _{0.9x} 0.77	X	7.78	x	99.66]	0.63	X	0.7	=	236.97	(79)
Southwest _{0.9x} 0.77	X	7.78	x	73.37]	0.63	X	0.7	=	174.46	(79)
Southwest _{0.9x} 0.77	X	7.78	x	49.78]	0.63	x	0.7	=	118.35	(79)
Southwest _{0.9x} 0.77	X	7.78	x	34.39]	0.63	x	0.7	=	81.78	(79)
Northwest 0.9x 0.77	X	0.69	x	12.93	x	0.63	x	0.7	=	2.73	(81)
Northwest 0.9x 0.77	X	0.69	x	24.22	x	0.63	x	0.7] =	5.11	(81)
Northwest 0.9x 0.77	X	0.69	×	43.36	×	0.63	X	0.7	=	9.14	(81)

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Northwest _{0.9x}	0.77	Х	0.6	9	x	7	2.26	X		0.63	X	0.7	=		15.24	(81)
Northwest 0.9x	0.77	X	0.6	9	x	9	4.65	X		0.63	х	0.7	=		19.96	(81)
Northwest 0.9x	0.77	X	0.6	9	x	10	08.13	X		0.63	х	0.7	=	:	22.8	(81)
Northwest 0.9x	0.77	X	0.6	9	x	9	9.28	X		0.63	x	0.7	-	:	20.94	(81)
Northwest 0.9x	0.77	X	0.6	9	x	8	0.36	X		0.63	x	0.7	-		16.94	(81)
Northwest 0.9x	0.77	X	0.6	9	x	5	6.56	X		0.63	х	0.7	-		11.93	(81)
Northwest 0.9x	0.77	X	0.6	9	x	3	1.11	X		0.63	x [0.7			6.56	(81)
Northwest 0.9x	0.77	X	0.6	9	x	1	6.69	X		0.63	x [0.7		:	3.52	(81)
Northwest 0.9x	0.77	X	0.6	9	x	1	0.44	X		0.63	x	0.7	-	:	2.2	(81)
Solar gains in	watts, ca	alculated	for eacl	n month		_		(83)m	n = Su	ım(74)m .	(82)m	_		_		
(83)m= 207.93	348.54	535.59	781.53	950.54	10	57.53	981.75	838	.89	658.97	422.19	260.07	173.1	5		(83)
Total gains – ir	nternal a	nd solar	(84)m =	(73)m	+ (8	33)m	, watts					_		_		
(84)m= 835.29	971.19	1134.05	1342.28	1472.4	15	44.64	1448.59	1314	4.58	1156.38	957.55	837.67	782.9 ⁻	7		(84)
7. Mean inter	nal temp	erature	(heating	season)											
Temperature	during h	eating p	eriods ir	the livi	ng a	area f	rom Tab	ole 9,	, Th′	I (°C)					21	(85)
Utilisation fac	tor for g	ains for I	iving are	a, h1,m	(se	ee Ta	ble 9a)									
Jan	Feb	Mar	Apr	May	Γ,	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	;		
(86)m= 0.94	0.92	0.87	0.77	0.64	С).47	0.35	0.3	38	0.62	0.82	0.91	0.95			(86)
Mean internal	temper	ature in	living are	ea T1 (fo	ollo:	w ste	ns 3 to 7	in T	able	. 9c)			•	_		
(87)m= 18.32	18.6	19.2	19.88	20.45	_	0.82	20.94	20.	$\overline{}$	20.63	19.89	18.97	18.23			(87)
Tomporoturo	during b	ooting n	oriodo ir	root of	طيد	ممنالم	from To	ا مام د	 > Th)2 (°C)		1	l			
Temperature (88)m= 19.68	19.68	19.68	19.68	19.68	_	9.68	19.68	19.		19.68	19.68	19.68	19.68			(88)
` '								L	<u> </u>		.0.00	1 .0.00	1 .0.00			()
Utilisation fac								r –	<u>,, </u>	0.50	0.70	1 00	0.04	7		(00)
(89)m= 0.93	0.9	0.84	0.74	0.58).38	0.23	0.2		0.53	0.78	0.9	0.94			(89)
Mean internal	<u> </u>				Ť			i 			e 9c)	,		_		
(90)m= 16.2	16.6	17.46	18.38	19.14	1:	9.55	19.66	19.	65	19.37	18.43	17.14	16.07			(90)
										f	LA = Livii	ng area ÷ (4	4) =		0.3	(91)
Mean internal	temper	ature (fo	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fL	A) × T2						
(92)m= 16.82	17.2	17.97	18.83	19.53	1:	9.93	20.04	20.	03	19.75	18.86	17.68	16.71			(92)
Apply adjustm	nent to th	ne mean	internal	temper	atu	re fro	m Table	4e,	whe	re appro	priate	-		_		
(93)m= 16.67	17.05	17.82	18.68	19.38	1	9.78	19.89	19.	88	19.6	18.71	17.53	16.56			(93)
8. Space hear																
Set Ti to the r					ed	at ste	ep 11 of	Tabl	le 9b	, so tha	t Ti,m=	(76)m an	d re-ca	lculate	9	
the utilisation Jan	Feb	Mar	Apr	May	Г	Jun	Jul	Λ.		Sep	Oct	Nov	Dec	П		
Utilisation fac				iviay	<u></u>	Juli	Jui	A	ug	Sep	Oct	INOV	Dec			
(94)m= 0.9	0.86	0.8	0.7	0.57		0.39	0.25	0.2	28	0.53	0.75	0.86	0.91			(94)
Useful gains,												1 3.33				
(95)m= 748.07	839.65	910.69	943.56	834.56	59	95.86	359.22	367	.55	607.66	716.8	720.84	709.4			(95)
Monthly avera	age exte	rnal tem	perature	from T	able	 e 8		· · · · ·				1				
(96)m= 4.6	5.1	7	9.4	12.4	_	15.4	17.4	17.	.3	14.7	11.1	7.4	4.5			(96)
Heat loss rate	for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(9	3)m-	- (96)m]			_		
(97)m= 1816.31	1797.26	1629.56	1393.59	1045.96	65	55.24	372.83	385	.52	734.2	1142.41	1517.89	1810.5	7		(97)
														_		

Space heating	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m= 794.77	643.51	534.84	324.02	157.28	0	0	0	0	316.65	573.88	819.27		
	-	-	<u>-</u>		-	_	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	4164.22	(98)
Space heating	g require	ement in	kWh/m²	² /year								41.83	(99)
9a. Energy red	quiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heatir	_										r		_
Fraction of sp					mentary	-		4			ļ	0	(201)
Fraction of sp			-	` ,			(202) = 1 -		(222)		ļ	1	(202)
Fraction of to		•	-				(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficiency of r			•								ļ	93.5	(206)
Efficiency of s	seconda	ry/suppl	ementar	y heating	g systen	າ, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating	g require 643.51	ement (c	alculate	d above)	0	0	0	0	316.65	573.88	819.27		
					0	U	U	0	310.03	373.00	019.21		(044)
$(211)m = \{[(98) \\ 850.03]$	688.24	572.02	346.54	168.22	0	0	0	0	338.67	613.77	876.22		(211)
									ar) =Sum(2			4453.72	(211)
Space heating	g fuel (s	econdar	y), kWh/	month							L		
$= \{[(98) \text{m x } (20)]\}$	•		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating		tor (oolo	ulated al	hovo)									
Output from wa	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
Efficiency of w	ater hea	ıter	!						ļ			87.3	(216)
(217)m= 89.9	89.86	89.74	89.51	88.99	87.3	87.3	87.3	87.3	89.46	89.79	89.93		(217)
Fuel for water	-												
(219)m = (64) (219)m = 195.66	m x 100) ÷ (217) 178.4	m 157.41	153.01	136.23	127.86	144.41	145.45	163.45	175.88	189.91		
(),		<u> </u>	<u> </u>					I = Sum(2				1939.32	(219)
Annual totals									k\	Wh/year		kWh/yea	
Space heating	fuel use	ed, main	system	1						-		4453.72	
Water heating	fuel use	d										1939.32	
Electricity for p	oumps, f	ans and	electric	keep-ho	t						•		
central heatin	g pump	:									30		(230c)
boiler with a f	an-assis	sted flue									45		(230e)
Total electricity	y for the	above, I	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for li	ighting										j	402.42	(232)
Total delivered	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=			ļ	6870.46	(338)
10a. Fuel cos	sts - <u>indi</u> v	vidual he	eating sy	stems:							L		

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.74 × 0.0	01 = 166.57 (240)
Space heating - main system 2	(213) x	0 x 0.0	0 (241)
Space heating - secondary	(215) x	20.43 × 0.0	0 (242)
Water heating cost (other fuel)	(219)	3.74 × 0.0	01 = 72.53 (247)
Pumps, fans and electric keep-hot	(231)	0 x 0.0	01 = 15.32 (249)
(if off-peak tariff, list each of (230a) to (23 Energy for lighting	30g) separately as applicable and a	apply fuel price according x 0.0	
Additional standing charges (Table 12)			95 (251)
Appendix Q items: repeat lines (253) and	l (254) as needed		
	(245)(247) + (250)(254) =		431.64 (255)
11a. SAP rating - individual heating syst	tems		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)	$[(255) \times (256)] \div [(4) + 45.0] =$		1.18 (257)
SAP rating (Section 12)			83.57 (258)
12a. CO2 emissions – Individual heating	g systems including micro-CHP		
	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	962 (261)
Space heating (main system 1) Space heating (secondary)	•		
	(211) x	0.216	962 (261)
Space heating (secondary)	(211) x (215) x	0.216 = 0.519 = 0.216 =	962 (261)
Space heating (secondary) Water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264)	0.216 = 0.519 = 0.216 =	962 (261) 0 (263) 418.89 (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264)	0.216 = 0.519 = 0.216 = =	962 (261) 0 (263) 418.89 (264) 1380.9 (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric ke	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric kee	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric ke Electricity for lighting Total CO2, kg/year	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric kee Electricity for lighting Total CO2, kg/year Dwelling CO2 Emission Rate	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272) 16.36 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric ke Electricity for lighting Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272) 16.36 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric ke Electricity for lighting Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) eep-hot (231) x (232) x	0.216 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272) 16.36 (273) 85 (274) P. Energy
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric kee Electricity for lighting Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14) 13a. Primary Energy	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x s (232) x	0.216 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272) 16.36 (273) 85 (274) P. Energy kWh/year
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric kee Electricity for lighting Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14) 13a. Primary Energy Space heating (main system 1)	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x s (232) x Energy kWh/year (211) x	0.216 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272) 16.36 (273) 85 (274) P. Energy kWh/year 5433.53 (261)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric kee Electricity for lighting Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14) 13a. Primary Energy Space heating (main system 1) Space heating (secondary)	(211) x (215) x (219) x (261) + (262) + (263) + (264) ep-hot (231) x (232) x s (232) x Energy kWh/year (211) x (215) x	0.216 = 0.519	962 (261) 0 (263) 418.89 (264) 1380.9 (265) 38.93 (267) 208.86 (268) 1628.68 (272) 16.36 (273) 85 (274) P. Energy kWh/year 5433.53 (261) 0 (263)

Electricity for lighting (232) x 0 = 1235.43 (268) 'Total Primary Energy sum of (265)...(271) = 9265.19 (272) **Primary energy kWh/m²/year** (272) \div (4) = 93.07 (273)

		User Details:				
Assessor Name:	Harry Hinchcliffe	Stroma Nu	mber:	STRO	034627	
Software Name:	Stroma FSAP 2012	Software V	ersion:	Versio	n: 1.0.5.16	
	F	Property Address: 1559	2 - L1a Assessn	nent		
Address :	New Dwelling @, 34 Summ	ner House Way, Langle	y, WD5 0DY			
1. Overall dwelling dime	nsions:					
Ground floor		Area(m²) 52.34 (1a) x	Av. Height(n	n) (2a) = [Volume(m³)	(3a)
First floor				-		Ⅎ
	-) . (4 -) . (4 -) . (4 -) (4 -)	47.21 (1b) x	2.65	(2b) =	125.11	(3b)
·	a)+(1b)+(1c)+(1d)+(1e)+(1	,		_		_
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+	+(3n) =	250.2	(5)
2. Ventilation rate:	main cocondo	m. othor	total		m3 nor hou	
	main seconda heating heating	ry other	total	_	m³ per hou	_
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)
				A ! I		
1.66	(0-)-(0 -)-(0	7-1.77.1.4		-	anges per ho	_
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced		30 se from (9) to (16)	÷ (5) =	0.12	(8)
Number of storeys in the		ou to (11), outor mod continue	7 110111 (0) 10 (10)	Γ	0	(9)
Additional infiltration	5 ([(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 for masonry con	struction		0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value corresponding t	to the greater wall area (after				
	loor, enter 0.2 (unsealed) or (0.1 (sealed), else enter	0	Γ	0	(12)
If no draught lobby, en	,	, ,		<u> </u>	0	(13)
• •	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) =	<u> </u>	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	ne or a degree air permeabil	ity is being used	-		_
Number of sides sheltere	d				1	(19)
Shelter factor		(20) = 1 - [0.075)			0.92	(20)
Infiltration rate incorporat	ing shelter factor	$(21) = (18) \times (20)$	=	[0.34	(21)
Infiltration rate modified f	or monthly wind speed	1 1				
Jan Feb	Mar Apr May Jun	Jul Aug Se	o 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

(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	
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.44	
Calculate effective air change rate for the applicable case If mechanical ventilation:	(23
If mechanical ventilation: 0 If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0	(23i
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	(23)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]	(230
(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	
(24b)m= 0 0 0 0 0 0 0 0 0 0 0	(24
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)m= 0 0 0 0 0 0 0 0 0 0 0 0	(240
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	(240
	(240
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.6 0.59 0.59 0.57 0.57 0.55 0.55 0.56 0.57 0.57 0.58	(25)
	(20)
3. Heat losses and heat loss parameter:	
	Χk ⁄κ
area (m²)	11
area (m²) m^2 A , m^2 W/m2K (W/K) kJ/m²·K kJ. Doors 2.1 x 1 = 2.1	(26)
Doors $2.1 x 1 = 2.1$ Windows Type 1 $5.89 x^{1/[1/(1.4) + 0.04]} = 7.81$	(26) (27)
Doors	(26) (27) (27)
Doors	(26) (27) (27) (27)
Doors	(26) (27) (27) (27) (27)
Doors	(26) (27) (27) (27) (27)
Doors 2.1 x 1 = 2.1 Windows Type 1 5.89 $x1/[1/(1.4) + 0.04] = 7.81$ Windows Type 2 14.28 $x1/[1/(1.4) + 0.04] = 18.93$ Windows Type 3 2.09 $x1/[1/(1.4) + 0.04] = 2.77$ Windows Type 4 0.52 $x1/[1/(1.4) + 0.04] = 0.69$ Floor 52.34 x 0.13 = 6.8042 Walls 154.05 24.88 129.17 x 0.18 = 23.25	(26) (27) (27) (27) (27) (28) (29)
Doors 2.1	(26) (27) (27) (27) (27) (28) (29) (30)
Doors 2.1	(26) (27) (27) (27) (28) (29) (30)
Doors 2.1	(26) (27) (27) (27) (27) (28) (29) (30)
Doors 2.1	(26) (27) (27) (27) (28) (29) (30) (31)
Doors 2.1 x 1 = 2.1	(26) (27) (27) (27) (28) (29) (30) (31)
Doors 2.1	(26) (27) (27) (27) (28) (29) (30) (31)
Doors 2.1 x 1 = 2.1	(26) (27) (27) (27) (28) (29) (30) (31)
Doors 2.1	(26) (27) (27) (27) (28) (29) (30) (31)

Total f	s or therma	ii briugirig	are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he								(33) +	(36) =			82.01	(37)
Ventila	ation hea	it loss ca	alculated	l monthly	y —				` '	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	49.14	48.83	48.54	47.13	46.87	45.64	45.64	45.42	46.12	46.87	47.4	47.96		(38)
Heat t	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	131.15	130.85	130.55	129.14	128.88	127.66	127.66	127.43	128.13	128.88	129.41	129.97		
Heat l	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) ₁ . · (4)	12 /12=	129.14	(39)
(40)m=	1.32	1.31	1.31	1.3	1.29	1.28	1.28	1.28	1.29	1.29	1.3	1.31		
									,	Average =	Sum(40) ₁ .	12 /12=	1.3	(40)
Numb	er of day	s in mor	nth (Tab	le 1a)							ī			_
	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. W	ater heat	ing ener	gy requi	irement:								kWh/ye	ear:	
	ned occu			[1 ove	(0 0003	140 v /TF	-A 42.0°	\2\1 · 0 (0012 v /	FFA 10		74		(42)
	FA > 13.9 FA £ 13.9		+ 1.76 X	[1 - ехр	(-0.0003	349 X (11	-A -13.9)2)] + 0.0	013 X (IFA -13.	.9)			
	al averag	•	ater usad	ae in litre	s per da	ıv Vd.av	erage =	(25 x N)	+ 36		90	.16		(43)
	the annua									se target o		.10		(.0)
not mor	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
(44)m=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08		
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1189.97	(44)
>	404.70	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66		
(45)m =	1 101./01						000							
(45)m=	161.76	141.40		<u> </u>			!		_	L Total – Su	l m(45), ,,, ==		1560 23	(45)
, ,	ntaneous w		ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Γotal = Su	I m(45) ₁₁₂ =		1560.23	(45)
If instan	ntaneous w		ng at point	of use (no) hot water 0	storage),	enter 0 in	boxes (46,		Total = Su	m(45) ₁₁₂ =	0	1560.23	(45) (46)
If instant (46)m=	ntaneous w	rater heatii 0						` '	to (61)		· , ,		1560.23	
If instant (46)m= Water	ntaneous w	ater heatii 0 loss:	0	0	0	0	0	0	0 to (61)	0	0		1560.23	
If instant (46)m= Water Storage	otaneous w 0 storage	o loss:	0 includin	o ng any so	o olar or W	0 /WHRS	o storage	0 within sa	0 to (61)	0	0	0	1560.23	(46)
If instant (46)m= Water Storag	otaneous w 0 storage ge volum	o loss: e (litres) eating a	0 includin	0 ng any so	olar or W	0 /WHRS nter 110	o storage	0 within sa (47)	0 nme ves	0 sel	0	0	1560.23	(46)
If instant (46)m= Water Storag If com Other Water	otaneous w 0 storage ge volum munity h wise if no	o loss: e (litres) eating a stored loss:	0 includir nd no ta	o ng any so ank in dw er (this in	0 olar or W relling, e	0 /WHRS nter 110 nstantar	o storage litres in neous co	0 within sa (47)	0 nme ves	0 sel	0	0	1560.23	(46)
If instant (46)m= Water Storag If com Other Water	otaneous w o storage ge volum munity h wise if no	o loss: e (litres) eating a stored loss:	0 includir nd no ta	o ng any so ank in dw er (this in	0 olar or W relling, e	0 /WHRS nter 110 nstantar	o storage litres in neous co	0 within sa (47)	0 nme ves	0 sel	47)	0	1560.23	(46)
If instant (46)m= Water Storag If com Other Water a) If n	otaneous w 0 storage ge volum munity h wise if no	o loss: e (litres) eating a o stored loss: urer's de	o including the notate of the contract of the	ong any so ank in dw er (this ir	0 olar or W relling, e	0 /WHRS nter 110 nstantar	o storage litres in neous co	0 within sa (47)	0 nme ves	0 sel	47)	0	1560.23	(46) (47)
If instant (46)m= Water Storag If com Other Water a) If n Tempe	staneous w storage ge volum munity h wise if no storage nanufact	oloss: e (litres) eating a stored loss: urer's de	including nd no tath the water lectured lem Table	o ong any so ank in dw er (this in oss facto	oblar or Welling, endinger is known	0 /WHRS nter 110 nstantar	o storage litres in neous co n/day):	0 within sa (47)	0 to (61) 0 mme vessers) ente	0 sel	47)	0	1560.23	(46) (47) (48)
If instant (46)m= Water Storag If com Other Water a) If n Tempe Energ b) If n	ataneous w storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact	o loss: e (litres) eating a stored loss: urer's de actor fro m water urer's de	including nd no tale hot water leclared lem Table storage eclared to	og any so ank in dw er (this ir oss facto 2b , kWh/ye	oblar or Welling, encludes in or is known ear	0 /WHRS nter 110 nstantar wn (kWh	storage litres in neous con/day):	o within sa (47) mbi boild	0 to (61) 0 mme vessers) ente	0 sel	47)	0	1560.23	(46) (47) (48) (49) (50)
If instant (46)m= Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa	ataneous w o storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora	o loss: e (litres) eating a stored loss: urer's de actor fro m water urer's de age loss	including nd no tale hot water eclared lem Table storage eclared of factor fr	og any so ank in dw er (this in oss facto 2b c, kWh/ye cylinder l	oblar or Welling, encludes in or is known ear	0 /WHRS nter 110 nstantar wn (kWh	storage litres in neous con/day):	o within sa (47) mbi boild	0 to (61) 0 mme vessers) ente	0 sel	47)	0	1560.23	(46) (47) (48) (49)
If instant (46)m= Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa If com	staneous w storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h	o loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de age loss eating s	including nd no tale hot water eclared less storage eclared of factor free sections.	og any so ank in dw er (this in oss facto 2b c, kWh/ye cylinder l	oblar or Welling, encludes in or is known ear	0 /WHRS nter 110 nstantar wn (kWh	storage litres in neous con/day):	o within sa (47) mbi boild	0 to (61) 0 mme vessers) ente	0 sel	47)	0	1560.23	(46) (47) (48) (49) (50) (51)
If instant (46)m= Water Storag If com Other Water a) If n Tempo Energ b) If n Hot wa If com Volum	ataneous w storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor	o loss: e (litres) eating a stored loss: urer's de actor fro m water urer's de age loss eating s from Tal	including nd no tale hot water leclared less storage eclared of factor free sections of the section of the sect	ong any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	oblar or Welling, encludes in or is known ear	0 /WHRS nter 110 nstantar wn (kWh	storage litres in neous con/day):	o within sa (47) mbi boild	0 to (61) 0 mme vessers) ente	0 sel	47)	0	1560.23	(46) (47) (48) (49) (50) (51) (52)
If instant (46)m= Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa If com Volum Tempe	storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor erature fa	oloss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de age loss eating s from Tal	including nd no tale hot water leclared less storage eclared of factor free sections are mable.	ong any so ank in dw er (this in oss facto 2b c, kWh/ye cylinder l om Tabl on 4.3	oblar or Welling, encludes in or is known ear oss factor e 2 (kW)	0 /WHRS nter 110 nstantar wn (kWh	storage litres in neous con/day):	within sa (47) mbi boild (48) x (49)	o to (61) o me vessers) ente	o sel er 'O' in (47)	0	1560.23	(46) (47) (48) (49) (50) (51) (52) (53)
If instant (46)m= Water Storag If com Other Water a) If n Tempo Energ b) If n Hot wa If com Volum Tempo Energ	ataneous w storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor	o loss: e (litres) eating a stored loss: urer's de actor fro m water urer's de age loss eating s from Tal actor fro m water	including and no tale to the colored of the colored	ong any so ank in dw er (this in oss facto 2b c, kWh/ye cylinder l om Tabl on 4.3	oblar or Welling, encludes in or is known ear oss factor e 2 (kW)	0 /WHRS nter 110 nstantar wn (kWh	storage litres in neous con/day):	o within sa (47) mbi boild	o to (61) o me vessers) ente	o sel er 'O' in (47)	0	1560.23	(46) (47) (48) (49) (50) (51) (52)

Water Storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (an	nual) fro	om Table	3							0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	5 × (41)	m				•	
(modified by	factor fr	om Tabl	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss cal	culated	for each	month (61)m =	(60) ÷ 36	65 × (41)	m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat 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= 137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16		(62)
Solar DHW input of	alculated	using App	endix G or	Appendix	H (negati	ve quantity) (enter '0	if no sola	r contributi	on to wate	er heating)	•	
(add additional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter										•	
(64)m= 137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16		
							Outp	out from wa	ater heate	· (annual)₁	12	1326.2	(64)
Heat gains fror	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	_
(65)m= 34.37	30.06	31.02	27.05	25.95	22.39	20.75	23.81	24.1	28.08	30.66	33.29		(65)
include (57)r	n in calc	culation (of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga				•	•						•		
Metabolic gain	·												
Jan	Feb	Mar											
(66)m= 136.77	136.77	iviai	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting going		136.77		May 136.77	Jun 136.77	Jul 136.77	Aug 136.77	Sep 136.77	Oct	Nov 136.77	Dec 136.77		(66)
Lighting gains		-	Apr 136.77	136.77	136.77	136.77	136.77	136.77					(66)
(67)m= 22.79		136.77	Apr 136.77	136.77	136.77	136.77	136.77	136.77					(66) (67)
(67)m= 22.79	(calculat	136.77 ted in Ap 16.46	Apr 136.77 opendix 12.46	136.77 L, equat	136.77 ion L9 oi 7.86	136.77 r L9a), a 8.5	136.77 Iso see	136.77 Table 5	136.77	136.77	136.77		, ,
, <u>, , , , , , , , , , , , , , , , , , </u>	(calculat	136.77 ted in Ap 16.46	Apr 136.77 opendix 12.46	136.77 L, equat	136.77 ion L9 oi 7.86	136.77 r L9a), a 8.5	136.77 Iso see	136.77 Table 5	136.77	136.77	136.77		, ,
(67)m= 22.79 Appliances gai (68)m= 255.6	(calculat 20.24 ns (calc 258.25	136.77 ted in Ap 16.46 ulated in 251.57	Apr 136.77 ppendix 12.46 Append 237.34	136.77 L, equat 9.31 dix L, eq 219.38	136.77 ion L9 or 7.86 uation L 202.5	136.77 r L9a), a 8.5 13 or L1 191.22	136.77 Iso see 11.04 3a), also	136.77 Table 5 14.82 see Tal 195.25	136.77 18.82 ole 5 209.48	136.77 21.97	136.77 23.42		(67)
(67)m= 22.79 Appliances gai	(calculat 20.24 ns (calc 258.25	136.77 ted in Ap 16.46 ulated in 251.57	Apr 136.77 ppendix 12.46 Append 237.34	136.77 L, equat 9.31 dix L, eq 219.38	136.77 ion L9 or 7.86 uation L 202.5	136.77 r L9a), a 8.5 13 or L1 191.22	136.77 Iso see 11.04 3a), also	136.77 Table 5 14.82 see Tal 195.25	136.77 18.82 ole 5 209.48	136.77 21.97	136.77 23.42		(67)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68	(calculate 20.24 ns (calculate 258.25 (calculate 36.68	136.77 ted in Ap 16.46 ulated in 251.57 tted in Ap 36.68	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68	136.77 L, equat 9.31 dix L, eq 219.38 L, equat	136.77 ion L9 of 7.86 uation L 202.5 ion L15	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a)	136.77 Iso see 11.04 3a), also 188.57	136.77 Table 5 14.82 see Tal 195.25 ee Table	136.77 18.82 ble 5 209.48	136.77 21.97 227.44	23.42 244.32		(67) (68)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains	(calculate 20.24 ns (calculate 258.25 (calculate 36.68	136.77 ted in Ap 16.46 ulated in 251.57 tted in Ap 36.68	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68	136.77 L, equat 9.31 dix L, eq 219.38 L, equat	136.77 ion L9 of 7.86 uation L 202.5 ion L15	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a)	136.77 Iso see 11.04 3a), also 188.57	136.77 Table 5 14.82 see Tal 195.25 ee Table	136.77 18.82 ble 5 209.48	136.77 21.97 227.44	23.42 244.32		(67) (68)
(67)m = 22.79 Appliances gai $(68)m = 255.6$ Cooking gains $(69)m = 36.68$ Pumps and far $(70)m = 0$	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5	Apr 136.77 opendix 12.46 n Append 237.34 opendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	136.77 21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5	Apr 136.77 opendix 12.46 n Append 237.34 opendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	136.77 21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.41	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat	Apr 136.77 ppendix 12.46 Appendix 237.34 ppendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69) (70)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat	Apr 136.77 ppendix 12.46 Appendix 237.34 ppendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69) (70)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.41 Water heating (72)m= 46.2	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41 gains (Table 44.74	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat -109.41 Table 5) 41.7	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68 5a) 0 tive valu	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0 lle 5) -109.41	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68 0 -109.41	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68 0 -109.41	136.77 18.82 ble 5 209.48 5 36.68 0 -109.41	136.77 21.97 227.44 36.68 0 -109.41 42.58	136.77 23.42 244.32 36.68 0 -109.41		(67) (68) (69) (70) (71)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.41 Water heating	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41 gains (Table 44.74	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat -109.41 Table 5) 41.7	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68 5a) 0 tive valu	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0 lle 5) -109.41	136.77 r L9a), a 8.5 13 or L1 191.22 or L15a) 36.68 0 -109.41	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68 0 -109.41	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68 0 -109.41	136.77 18.82 ble 5 209.48 5 36.68 0 -109.41	136.77 21.97 227.44 36.68 0 -109.41 42.58	136.77 23.42 244.32 36.68 0 -109.41		(67) (68) (69) (70) (71)

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

Orientation: Access Fac Table 6d	ctor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	14.28	x	11.28	x	0.63	X	0.7] =	49.24	(75)
Northeast 0.9x 0.77	х	14.28	x	22.97	X	0.63	X	0.7	=	100.23	(75)
Northeast 0.9x 0.77	x	14.28	x	41.38	x	0.63	X	0.7	=	180.58	(75)
Northeast 0.9x 0.77	х	14.28	x	67.96	X	0.63	X	0.7	=	296.57	(75)
Northeast 0.9x 0.77	x	14.28	x	91.35	X	0.63	X	0.7	=	398.65	(75)
Northeast 0.9x 0.77	x	14.28	x	97.38	x	0.63	X	0.7	=	425	(75)
Northeast 0.9x 0.77	x	14.28	x	91.1	x	0.63	X	0.7	=	397.58	(75)
Northeast _{0.9x} 0.77	X	14.28	x	72.63	x	0.63	X	0.7	=	316.95	(75)
Northeast 0.9x 0.77	x	14.28	x	50.42	x	0.63	X	0.7	=	220.04	(75)
Northeast 0.9x 0.77	x	14.28	x	28.07	x	0.63	X	0.7	=	122.49	(75)
Northeast _{0.9x} 0.77	X	14.28	x	14.2	x	0.63	X	0.7	=	61.96	(75)
Northeast _{0.9x} 0.77	x	14.28	x	9.21	x	0.63	X	0.7	=	40.21	(75)
Southeast 0.9x 0.77	x	2.09	x	36.79	x	0.63	X	0.7	=	23.5	(77)
Southeast 0.9x 0.77	X	2.09	x	62.67	x	0.63	X	0.7	=	40.03	(77)
Southeast 0.9x 0.77	x	2.09	x	85.75	x	0.63	X	0.7	=	54.77	(77)
Southeast 0.9x 0.77	X	2.09	x	106.25	x	0.63	X	0.7	=	67.87	(77)
Southeast 0.9x 0.77	x	2.09	x	119.01	x	0.63	X	0.7	=	76.02	(77)
Southeast 0.9x 0.77	x	2.09	x	118.15	x	0.63	X	0.7	=	75.47	(77)
Southeast 0.9x 0.77	x	2.09	x	113.91	x	0.63	X	0.7	=	72.76	(77)
Southeast 0.9x 0.77	x	2.09	x	104.39	X	0.63	X	0.7	=	66.68	(77)
Southeast 0.9x 0.77	x	2.09	x	92.85	x	0.63	X	0.7	=	59.31	(77)
Southeast 0.9x 0.77	X	2.09	x	69.27	x	0.63	X	0.7	=	44.24	(77)
Southeast 0.9x 0.77	X	2.09	x	44.07	x	0.63	X	0.7	=	28.15	(77)
Southeast 0.9x 0.77	X	2.09	x	31.49	x	0.63	X	0.7	=	20.11	(77)
Southwest _{0.9x} 0.77	X	5.89	x	36.79		0.63	X	0.7	=	66.23	(79)
Southwest _{0.9x} 0.77	x	5.89	x	62.67]	0.63	X	0.7	=	112.82	(79)
Southwest _{0.9x} 0.77	X	5.89	x	85.75]	0.63	X	0.7	=	154.36	(79)
Southwest _{0.9x} 0.77	x	5.89	x	106.25		0.63	X	0.7	=	191.26	(79)
Southwest _{0.9x} 0.77	X	5.89	x	119.01]	0.63	X	0.7	=	214.23	(79)
Southwest _{0.9x} 0.77	X	5.89	x	118.15]	0.63	X	0.7	=	212.68	(79)
Southwest _{0.9x} 0.77	X	5.89	x	113.91		0.63	X	0.7	=	205.04	(79)
Southwest _{0.9x} 0.77	X	5.89	x	104.39]	0.63	X	0.7	=	187.91	(79)
Southwest _{0.9x} 0.77	X	5.89	x	92.85		0.63	X	0.7	=	167.14	(79)
Southwest _{0.9x} 0.77	x	5.89	x	69.27]	0.63	X	0.7	=	124.69	(79)
Southwest _{0.9x} 0.77	x	5.89	x	44.07]	0.63	X	0.7	=	79.33	(79)
Southwest _{0.9x} 0.77	x	5.89	x	31.49]	0.63	X	0.7	=	56.68	(79)
Northwest 0.9x 0.77	x	0.52	x	11.28	x	0.63	X	0.7	=	1.79	(81)
Northwest 0.9x 0.77	x	0.52	x	22.97	x	0.63	X	0.7	=	3.65	(81)
Northwest _{0.9x} 0.77	X	0.52	x	41.38	x	0.63	×	0.7] =	6.58	(81)

Niamilana							. —						— , ,
Northwest _{0.9x}	0.77	X	0.5	52	× 6	57.96	X	0.63	_	0.7	=	10.8	(81)
Northwest 0.9x	0.77	X	0.5	52	x 9	1.35	X	0.63	x	0.7	=	14.52	(81)
Northwest 0.9x	0.77	X	0.5	52	x g	7.38	X	0.63	x	0.7	=	15.48	(81)
Northwest 0.9x	0.77	X	0.5	52	x g	91.1	X	0.63	X	0.7	=	14.48	(81)
Northwest 0.9x	0.77	x	0.5	52	x 7	2.63	х	0.63	x	0.7	=	11.54	(81)
Northwest 0.9x	0.77	X	0.5	52	X 5	0.42	x	0.63	x	0.7	=	8.01	(81)
Northwest 0.9x	0.77	X	0.5	52	x 2	8.07	x	0.63	x	0.7	=	4.46	(81)
Northwest 0.9x	0.77	Х	0.5	52	X	14.2	x	0.63	x	0.7	=	2.26	(81)
Northwest 0.9x	0.77	Х	0.5	52	X g	9.21	x	0.63	x	0.7	=	1.46	(81)
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m = S	um(74)m .	(82)m				
(83)m= 140.77	256.73	396.29	566.49	703.41	728.62	689.86	583.08	454.5	295.88	171.69	118.47		(83)
Total gains –	internal a	nd solar	(84)m =	(73)m -	+ (83)m	, watts		!			!	l	
(84)m= 529.38	643.99	770.05	917.89	1031.01	1034.11	981.5	878.73	762.08	625.96	527.71	494.98		(84)
7. Mean inte	rnal temr	erature	(heating	season)					,			
Temperature					,	from Tak	olo 0. Th	1 (°C)				21	(85)
	Ū	٠.			Ū) , 11	11 (C)				21	(00)
Utilisation fa					r				0.1	T			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(86)m= 1	1	0.99	0.96	0.88	0.71	0.55	0.63	0.88	0.98	1	1		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m= 19.48	19.66	19.96	20.38	20.73	20.93	20.98	20.97	20.8	20.33	19.83	19.45		(87)
Temperature	e during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m= 19.83	19.83	19.83	19.84	19.85	19.85	19.85	19.86	19.85	19.85	19.84	19.84		(88)
L Hiliantian fo				ا بمالانم م	h O ma /a.a	L Table	0-2	·		1	l		
Utilisation fa	ctor for g	0.99	0.95	0.83	n∠,m (se 0.61	0.42	9a) 0.49	0.81	0.97	1	1		(89)
(89)m= 1	'	0.99	0.93	0.83	0.01	0.42	0.49	0.61	0.97	<u> </u>	'		(00)
Mean interna	al temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)	,		ı	
(90)m= 18.45	18.63	18.93	19.34	19.66	19.82	19.85	19.85	19.74	19.31	18.81	18.43		(90)
								f	LA = Livir	ng area ÷ (4	4) =	0.3	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m= 18.75	18.93	19.24	19.65	19.98	20.15	20.19	20.18	20.05	19.61	19.11	18.73		(92)
Apply adjust	ment to t	he mean	internal	temper	ı ature fro	m Table	4e. whe	ere appro	opriate	!	ļ		
(93)m= 18.75	18.93	19.24	19.65	19.98	20.15	20.19	20.18	20.05	19.61	19.11	18.73		(93)
8. Space hea	ating regu	uirement											
Set Ti to the				re obtain	ed at ste	en 11 of	Table 9	b so tha	t Ti m=(76)m an	d re-calc	culate	
the utilisation			•			- F		.,	, (. 0,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	:		•	•		•		•			
(94)m= 1	0.99	0.98	0.94	0.83	0.64	0.46	0.53	0.82	0.97	1	1		(94)
Useful gains	, hmGm ,	W = (94	1)m x (84	4)m				!				l	
(95)m= 528.18	640.31	757.22	865.68	860.34	664.06	450.31	467.58	626.19	608.35	525.18	494.15		(95)
(55)111= 520.10												1	
Monthly ave		rnal tem	perature	from Ta	able 8								
` '		rnal tem 6.5	perature 8.9	from Ta	able 8 14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Monthly ave	rage exte	6.5	8.9	11.7	14.6	<u> </u>	<u> </u>			7.1	4.2		(96)
Monthly aver	rage exte	6.5	8.9 al tempe	11.7	14.6	<u> </u>	<u> </u>			7.1			(96) (97)

Space he	eating	g require	ement fo	r each m	nonth, k\	Nh/mont	h = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m= 101	17.2	803.55	673.78	376.09	153.79	0	0	0	0	411.61	741.07	1037.21		
	-	-	_			-		Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	5214.29	(98)
Space he	eating	g require	ement in	kWh/m²	/year								52.38	(99)
8c. Space	e coc	oling req	luiremen	it										
Calculate	d for	June, J	luly and	August.	See Tal	ole 10b				•	•		•	
Ja	an	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss	rate	Lm (ca	lculated	using 25	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)	•	
(100)m=	0	0	0	0	0	1199.97	944.66	968.47	0	0	0	0		(100)
Utilisation	n fact	or for lo	ss hm											
(101)m=	0	0	0	0	0	0.86	0.92	0.88	0	0	0	0		(101)
Useful los	ss, hi	mLm (W	/atts) = (100)m x	(101)m							•	•	
(102)m=	0	0	0	0	0	1028.1	864.52	851.68	0	0	0	0		(102)
Gains (so	olar g	ains cal	lculated	for appli	cable we	eather re	gion, se	e Table	10)	•	•		•	
(103)m=	0	0	0	0	0	1313.48	1249.72	1131.44	0	0	0	0		(103)
Space co						lwelling,	continu	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
set (104)		i											1	
(104)m=	0	0	0	0	0	205.48	286.58	208.14	0	0	0	0		_
										= Sum(,	=	700.2	(104)
Cooled fra			shla 10h	`					f C =	cooled	area ÷ (4	4) =	1	(105)
Intermitten (106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(11)					-				Tota	l = Sum(104)	=	0	(106)
Space coo	olina	reauiren	nent for	month =	(104)m	× (105)	× (106)r	n	rota	ı = Oam	16 <u>₩</u> 6 Т)	_	0	(100)
· —	0	0	0	0	0	51.37	71.65	52.04	0	0	0	0		
` ′									Total	l = Sum(1 <u>0</u> 7)	=	175.05	(107)
Space coo	oling	requiren	nent in k	:Wh/m²/y	ear/				(107)) ÷ (4) =			1.76	(108)
8f. Fabric I	Ener	gy Effici	ency (ca	alculated	only un	der spec	ial cond	litions, s	ee sectio	on 11)				
Fabric En	nergy	Efficier	псу						(99)	+ (108) =	=		54.14	(109)

Target Fabric Energy Efficiency (TFEE)

(109)

62.26

		User Details:				
Assessor Name:	Harry Hinchcliffe	Stroma Nu	mber:	STRO	034627	
Software Name:	Stroma FSAP 2012	Software V	ersion:	Versio	n: 1.0.5.16	
	F	Property Address: 1559	2 - L1a Assessn	nent		
Address :	New Dwelling @, 34 Summ	ner House Way, Langle	y, WD5 0DY			
1. Overall dwelling dime	nsions:					
Ground floor		Area(m²) 52.34 (1a) x	Av. Height(n	n) (2a) = [Volume(m³)	(3a)
First floor				-		Ⅎ
	-) . (4 -) . (4 -) . (4 -) (4 -)	47.21 (1b) x	2.65	(2b) =	125.11	(3b)
·	a)+(1b)+(1c)+(1d)+(1e)+(1	,		_		_
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+	+(3n) =	250.2	(5)
2. Ventilation rate:	main cocondo	m. othor	total		m3 nor hou	
	main seconda heating heating	ry other	total	_	m³ per hou	_
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)
				A ! I		
1.66	(0-)-(0 -)-(0	7-1.77.1.4		-	anges per ho	_
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced		30 se from (9) to (16)	÷ (5) =	0.12	(8)
Number of storeys in the		ou to (11), outor mod continue	7 110111 (0) 10 (10)	Γ	0	(9)
Additional infiltration	5 \		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 for masonry con	struction		0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value corresponding t	to the greater wall area (after				
	loor, enter 0.2 (unsealed) or (0.1 (sealed), else enter	0	Γ	0	(12)
If no draught lobby, en	,	, ,		<u> </u>	0	(13)
• •	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) =	<u> </u>	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	ne or a degree air permeabil	ity is being used	-		_
Number of sides sheltere	d				1	(19)
Shelter factor		(20) = 1 - [0.075)			0.92	(20)
Infiltration rate incorporat	ing shelter factor	$(21) = (18) \times (20)$	=	[0.34	(21)
Infiltration rate modified f	or monthly wind speed	1 1				
Jan Feb	Mar Apr May Jun	Jul Aug Se	o 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 (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	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.38	0.4		
Calculate effe		•	rate for t	he appli	cable ca	se							(23a)
If exhaust air h			endix N. (2	(23a) = (23a	a) × Fmv (e	eguation (N	N5)) . othe	rwise (23b) = (23a)			0	(23a)
If balanced wit		0		, ,	,	. `	,, .	,	, (,			0	(23c)
a) If balance		-	-	_					2b)m + (23b) × [1 – (23c)		(200)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24t	m = (22)	2b)m + (23b)		•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I				•					-	-		-	
	m < 0.5 ×		· ·	· · · · · ·	·	· · · · · ·	· · · · ·	i	· ·	i	1	1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilation $m = 1$, the			•	•				0.51				
(24d)m = 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	1	(24d)
Effective air	r change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				J	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	1	(25)
	1					l	l		I	1		1	
2 Hoot look	on and he	ot loco r	acromot	or:									
3. Heat losse		·			Net Ar	ea	U-valı	IIE	AXII		k-value	a	ΑΧk
3. Heat losse	es and he Gros area	SS	oarameto Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
	Gros	SS	Openin	gs									
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/				kJ/K
ELEMENT Doors	Gros area e 1	SS	Openin	gs	A ,r	m ² x x 1/2	W/m2 1.6	2K = - 0.04] =	(W/ 3.36				kJ/K (26)
ELEMENT Doors Windows Typ	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.1 7.78	x x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/	W/m2 1.6 /[1/(1.4)+	2K = 0.04] = 0.04] =	3.36 10.31				kJ/K (26) (27)
ELEMENT Doors Windows Typ Windows Typ	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.1 7.78 18.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31 25				kJ/K (26) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.1 7.78 18.86 2.76	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31 25 3.66	K)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3	ss (m²)	Openin	gs ₁ 2	A ,r 2.1 7.78 18.86 2.76 0.69	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 3.36 10.31 25 3.66 0.91	K)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 7.78 18.86 2.76 0.69 52.34	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18	eK = 0.04] = 0	(W/ 3.36 10.31 25 3.66 0.91 9.42120	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls	Gros area e 1 e 2 e 3 e 4	05 7	Openin m	gs ₁ 2	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8	x1/2 x1/2 x1/4 x x1/4 x x1/4 x x x1/4 x x x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24	eK = 0.04] = 0	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25	K)			kJ/K (26) (27) (27) (27) (27) (28)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1	Gros area e 1 e 2 e 3 e 4 154. 4.6	05 7	32.19 0	gs ₁ 2	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	EK = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65	K)			kJ/K (26) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1 Roof Type2 Total area of o	Gros area e 1 e 2 e 3 e 4 154. 4.6 47. elements	05 7 5 5, m ² ows, use e	Openin m 32.19 0 0 effective wi	gs 1 ² 9 Indow U-va	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcula	x1/2 x1/2 x1/4 x x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	EK = 0.04] =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1 Roof Type2 Total area of of the for windows and the include the area.	Gros area e 1 e 2 e 3 e 4 154. 4.6 47. elements d roof winders on both	05 7 5 ows, use e	32.19 0 0 effective winternal wall	gs 1 ² 9 Indow U-va	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcula	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	T	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1 Roof Type2 Total area of of the difference	Gros area e 1 e 2 e 3 e 4 154. 4.6 47. elements d roof winders on both	05 7 5 5, m ² ows, use e sides of in	32.19 0 0 effective winternal wall	gs 1 ² 9 Indow U-va	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcula	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²•	1 3.2 87.8	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1 Roof Type2 Total area of of the area of the	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof winderas on both ss, W/K: Cm = S(oss (m²) 7 5 ows, use e sides of int = S (A x (A x k)	32.19 0 0 effective winternal walk	gs 1 ² 9 Indow U-ve Is and pan	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculatitions	x1/2 x1/2 x1/4 x x1/4 x x x1/4 x x x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	EK = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²•	7 3.2 87.8 13538.	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (33) (53) (34)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1 Roof Type2 Total area of of the for windows and the include the area fabric heat loops	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof winders on both sss, W/K: Cm = S(05 7 5 5 6, m ² ows, use e sides of in = S (A x (A x k) eter (TMF	32.19 0 0 effective winternal walk U) $P = Cm \div$	gs 9 Indow U-va Is and pan	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculatitions	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11 formula 1 (26)(30)	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22 ue)+0.04] a	K)	kJ/m²-	1 3.2 87.8	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Roof Type1 Roof Type2 Total area of of the area of the	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof wind eas on both ss, W/K: Cm = S(s parame essments whe ead of a de	05 7 5 ows, use e sides of int = S (A x k) eter (TMF) ere the de tailed calcular	32.19 32.19 0 0 effective winternal walk U) P = Cm - tails of the pulation.	gs 9 indow U-ve Is and pan TFA) ir	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculations n kJ/m²K ion are not	x1/x1/x1/xx/6 x x x 6 x x x 6 atted using	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11 formula 1 (26)(30)	2K = 0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22 ue)+0.04] a	K)	kJ/m²-	7 3.2 87.8 13538.	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (33) (33)

if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he								(33) +	(36) =			107.07	(37)
Ventilation hea								· ,		25)m x (5)	_		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m= 49.14	48.83	48.54	47.13	46.87	45.64	45.64	45.42	46.12	46.87	47.4	47.96		(38)
Heat transfer of									= (37) + (3			1	
(39)m= 156.21	155.91	155.61	154.21	153.94	152.72	152.72	152.49	153.19	153.94	154.47	155.03		–
Heat loss para	meter (F	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	154.2	(39)
(40)m= 1.57	1.57	1.56	1.55	1.55	1.53	1.53	1.53	1.54	1.55	1.55	1.56		
Number of de	o in mo	oth (Tob	lo 1o)						Average =	Sum(40) ₁	12 /12=	1.55	(40)
Number of day	Feb	· ·		May	lup	Jul	Δυα	Son	Oct	Nov	Dec		
(41)m= 31	28	Mar 31	Apr 30	May 31	Jun 30	31	Aug 31	Sep 30	31	Nov 30	31		(41)
(41)m= 31	20	31	30	31	30	31	31	30	31	30	31		(41)
4 10/2/22/22											1.10/1./		
4. Water hea	ting ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu											.74		(42)
if TFA > 13. if TFA £ 13.		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
Annual average	•	ater usac	ae in litre	s per da	av Vd.av	erage =	(25 x N)	+ 36		QC	0.16		(43)
Reduce the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		7.10		(1.5)
not more that 125	litres per p	person per	day (all w	ater use, l	not 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= 109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08		_
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1189.97	(44)
(45)m= 161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66		
If instantaneous v	votor booti	na ot noint	of upo (no	, bot water	· otorogo)	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	=	1560.23	(45)
If instantaneous v								, ,	ı	ı	I	ı	(40)
(46)m= 0 Water storage	0	0	0	0	0	0	0	0	0	0	0		(46)
Storage volum		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	, ,		•			•					0		(,
Otherwise if no	_			_			, ,	ers) ente	er '0' in (47)			
Water storage	loss:		,					·	·	•			
a) If manufact	turer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)	=			0		(50)
b) If manufact			-									· I	
Hot water stor If community h	_			e∠(KVVI	n/ntre/da	ıy)					0		(51)
Volume factor	_		ن. ۱۱ -۱ .۵								0		(52)
Temperature f			2b							-	0		(52)
Energy lost fro				ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or		_	, y .				. / (= -)	(-) (,		0		(55)
. ,												ı	

Water Storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (an	nual) fro	om Table	3							0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	5 × (41)	m				•	
(modified by	factor fr	om Tabl	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss cal	culated	for each	month (61)m =	(60) ÷ 36	65 × (41)	m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat 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= 137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16		(62)
Solar DHW input of	alculated	using App	endix G or	Appendix	H (negati	ve quantity) (enter '0	if no sola	r contributi	on to wate	er heating)	1	
(add additional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter										•	
(64)m= 137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16		
							Outp	out from wa	ater heate	· (annual)₁	12	1326.2	(64)
Heat gains fror	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	_
(65)m= 34.37	30.06	31.02	27.05	25.95	22.39	20.75	23.81	24.1	28.08	30.66	33.29		(65)
include (57)r	n in calc	culation (of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga				•	•						•		
Metabolic gain	·												
Jan	Feb	Mar											
(66)m= 136.77	136.77	iviai	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting going		136.77		May 136.77	Jun 136.77	Jul 136.77	Aug 136.77	Sep 136.77	Oct	Nov 136.77	Dec 136.77		(66)
Lighting gains		-	Apr 136.77	136.77	136.77	136.77	136.77	136.77					(66)
(67)m= 22.79		136.77	Apr 136.77	136.77	136.77	136.77	136.77	136.77					(66) (67)
(67)m= 22.79	(calculat	136.77 ted in Ap 16.46	Apr 136.77 opendix 12.46	136.77 L, equat	136.77 ion L9 oi 7.86	136.77 r L9a), a 8.5	136.77 Iso see	136.77 Table 5	136.77	136.77	136.77		, ,
, <u>, , , , , , , , , , , , , , , , , , </u>	(calculat	136.77 ted in Ap 16.46	Apr 136.77 opendix 12.46	136.77 L, equat	136.77 ion L9 oi 7.86	136.77 r L9a), a 8.5	136.77 Iso see	136.77 Table 5	136.77	136.77	136.77		, ,
(67)m= 22.79 Appliances gai (68)m= 255.6	(calculat 20.24 ns (calc 258.25	136.77 ted in Ap 16.46 ulated in 251.57	Apr 136.77 ppendix 12.46 Append 237.34	136.77 L, equat 9.31 dix L, eq 219.38	136.77 ion L9 or 7.86 uation L 202.5	136.77 r L9a), a 8.5 13 or L1 191.22	136.77 Iso see 11.04 3a), also	136.77 Table 5 14.82 see Tal 195.25	136.77 18.82 ole 5 209.48	136.77 21.97	136.77 23.42		(67)
(67)m= 22.79 Appliances gai	(calculat 20.24 ns (calc 258.25	136.77 ted in Ap 16.46 ulated in 251.57	Apr 136.77 ppendix 12.46 Append 237.34	136.77 L, equat 9.31 dix L, eq 219.38	136.77 ion L9 or 7.86 uation L 202.5	136.77 r L9a), a 8.5 13 or L1 191.22	136.77 Iso see 11.04 3a), also	136.77 Table 5 14.82 see Tal 195.25	136.77 18.82 ole 5 209.48	136.77 21.97	136.77 23.42		(67)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68	(calculate 20.24 ns (calculate 258.25 (calculate 36.68	136.77 ted in Ap 16.46 ulated in 251.57 tted in Ap 36.68	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68	136.77 L, equat 9.31 dix L, eq 219.38 L, equat	136.77 ion L9 of 7.86 uation L 202.5 ion L15	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a)	136.77 Iso see 11.04 3a), also 188.57	136.77 Table 5 14.82 see Tal 195.25 ee Table	136.77 18.82 ble 5 209.48	136.77 21.97 227.44	23.42 244.32		(67) (68)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains	(calculate 20.24 ns (calculate 258.25 (calculate 36.68	136.77 ted in Ap 16.46 ulated in 251.57 tted in Ap 36.68	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68	136.77 L, equat 9.31 dix L, eq 219.38 L, equat	136.77 ion L9 of 7.86 uation L 202.5 ion L15	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a)	136.77 Iso see 11.04 3a), also 188.57	136.77 Table 5 14.82 see Tal 195.25 ee Table	136.77 18.82 ble 5 209.48	136.77 21.97 227.44	23.42 244.32		(67) (68)
(67)m = 22.79 Appliances gai $(68)m = 255.6$ Cooking gains $(69)m = 36.68$ Pumps and far $(70)m = 0$	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5	Apr 136.77 opendix 12.46 n Append 237.34 opendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	136.77 21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5	Apr 136.77 opendix 12.46 n Append 237.34 opendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	136.77 21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.41	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat	Apr 136.77 ppendix 12.46 Appendix 237.34 ppendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69) (70)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat	Apr 136.77 ppendix 12.46 Appendix 237.34 ppendix 36.68 5a) 0	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68	136.77 18.82 ble 5 209.48 5 36.68	21.97 227.44 36.68	23.42 244.32 36.68		(67) (68) (69) (70)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.41 Water heating (72)m= 46.2	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41 gains (Table 44.74	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat -109.41 Table 5) 41.7	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68 5a) 0 tive valu	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0 lle 5) -109.41	136.77 r L9a), a 8.5 13 or L1: 191.22 or L15a) 36.68	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68 0 -109.41	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68 0 -109.41	136.77 18.82 ble 5 209.48 5 36.68 0 -109.41	136.77 21.97 227.44 36.68 0 -109.41 42.58	136.77 23.42 244.32 36.68 0 -109.41		(67) (68) (69) (70) (71)
(67)m= 22.79 Appliances gai (68)m= 255.6 Cooking gains (69)m= 36.68 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.41 Water heating	(calculate 20.24 ns (calculate 258.25 (calculate 36.68 ns gains 0 aporatio -109.41 gains (Table 44.74	136.77 ted in Ap 16.46 ulated in 251.57 ted in Ap 36.68 (Table 5 0 on (negat -109.41 Table 5) 41.7	Apr 136.77 ppendix 12.46 Append 237.34 ppendix 36.68 5a) 0 tive valu	136.77 L, equat 9.31 dix L, eq 219.38 L, equat 36.68 0 es) (Tab	136.77 ion L9 or 7.86 uation L 202.5 ion L15 36.68 0 lle 5) -109.41	136.77 r L9a), a 8.5 13 or L1 191.22 or L15a) 36.68 0 -109.41	136.77 Iso see 11.04 3a), also 188.57 , also se 36.68 0 -109.41	136.77 Table 5 14.82 see Tal 195.25 ee Table 36.68 0 -109.41	136.77 18.82 ble 5 209.48 5 36.68 0 -109.41	136.77 21.97 227.44 36.68 0 -109.41 42.58	136.77 23.42 244.32 36.68 0 -109.41		(67) (68) (69) (70) (71)

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

Orientation: Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	18.86	x	11.28	x	0.63	x	0.7	=	65.03	(75)
Northeast _{0.9x} 0.77	x	18.86	x	22.97	x	0.63	x	0.7	=	132.38	(75)
Northeast 0.9x 0.77	x	18.86	x	41.38	x	0.63	x	0.7	=	238.5	(75)
Northeast _{0.9x} 0.77	x	18.86	x	67.96	x	0.63	x	0.7	=	391.69	(75)
Northeast _{0.9x} 0.77	X	18.86	x	91.35	X	0.63	x	0.7	=	526.51	(75)
Northeast 0.9x 0.77	x	18.86	x	97.38	x	0.63	x	0.7	=	561.31	(75)
Northeast _{0.9x} 0.77	x	18.86	x	91.1	x	0.63	x	0.7	=	525.09	(75)
Northeast _{0.9x} 0.77	x	18.86	x	72.63	x	0.63	x	0.7	=	418.61	(75)
Northeast _{0.9x} 0.77	x	18.86	x	50.42	x	0.63	x	0.7	=	290.62	(75)
Northeast _{0.9x} 0.77	x	18.86	x	28.07	x	0.63	x	0.7	=	161.78	(75)
Northeast _{0.9x} 0.77	x	18.86	x	14.2	x	0.63	x	0.7	=	81.83	(75)
Northeast _{0.9x} 0.77	x	18.86	x	9.21	x	0.63	x	0.7	=	53.11	(75)
Southeast 0.9x 0.77	x	2.76	x	36.79	x	0.63	x	0.7	=	31.04	(77)
Southeast 0.9x 0.77	x	2.76	x	62.67	x	0.63	x	0.7	=	52.86	(77)
Southeast 0.9x 0.77	x	2.76	x	85.75	x	0.63	x	0.7	=	72.33	(77)
Southeast 0.9x 0.77	x	2.76	x	106.25	x	0.63	x	0.7	=	89.62	(77)
Southeast 0.9x 0.77	x	2.76	x	119.01	x	0.63	x	0.7	=	100.38	(77)
Southeast 0.9x 0.77	x	2.76	x	118.15	x	0.63	x	0.7	=	99.66	(77)
Southeast 0.9x 0.77	x	2.76	x	113.91	x	0.63	x	0.7	=	96.08	(77)
Southeast 0.9x 0.77	x	2.76	x	104.39	x	0.63	x	0.7	=	88.05	(77)
Southeast 0.9x 0.77	X	2.76	x	92.85	x	0.63	x	0.7	=	78.32	(77)
Southeast 0.9x 0.77	x	2.76	x	69.27	x	0.63	x	0.7	=	58.43	(77)
Southeast 0.9x 0.77	x	2.76	x	44.07	x	0.63	x	0.7	=	37.17	(77)
Southeast 0.9x 0.77	x	2.76	x	31.49	x	0.63	x	0.7	=	26.56	(77)
Southwest _{0.9x} 0.77	x	7.78	x	36.79		0.63	X	0.7	=	87.48	(79)
Southwest _{0.9x} 0.77	x	7.78	x	62.67]	0.63	x	0.7	=	149.02	(79)
Southwest _{0.9x} 0.77	x	7.78	x	85.75		0.63	X	0.7	=	203.89	(79)
Southwest _{0.9x} 0.77	X	7.78	X	106.25		0.63	X	0.7	=	252.63	(79)
Southwest _{0.9x} 0.77	X	7.78	x	119.01]	0.63	X	0.7	=	282.97	(79)
Southwest _{0.9x} 0.77	X	7.78	X	118.15		0.63	X	0.7	=	280.92	(79)
Southwest _{0.9x} 0.77	X	7.78	X	113.91		0.63	X	0.7	=	270.84	(79)
Southwest _{0.9x} 0.77	x	7.78	x	104.39		0.63	X	0.7	=	248.21	(79)
Southwest _{0.9x} 0.77	x	7.78	x	92.85		0.63	X	0.7	=	220.77	(79)
Southwest _{0.9x} 0.77	x	7.78	x	69.27		0.63	X	0.7	=	164.7	(79)
Southwest _{0.9x} 0.77	x	7.78	x	44.07]	0.63	x	0.7	=	104.79	(79)
Southwest _{0.9x} 0.77	x	7.78	x	31.49]	0.63	x	0.7	=	74.87	(79)
Northwest 0.9x 0.77	x	0.69	x	11.28	x	0.63	x	0.7	=	2.38	(81)
Northwest 0.9x 0.77	x	0.69	x	22.97	x	0.63	x	0.7] =	4.84	(81)
Northwest 0.9x 0.77	x	0.69	x	41.38	x	0.63	X	0.7	=	8.73	(81)

_					_											_
Northwest 0.9x	0.77	Х	0.6	9	x	6	7.96	X		0.63	X	0.7		=	14.33	(81)
Northwest 0.9x	0.77	X	0.6	69	x	9	1.35	X		0.63	X	0.7		= [19.26	(81)
Northwest 0.9x	0.77	X	0.6	69	x	9	7.38	X		0.63	x	0.7		= [20.54	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x	g	1.1	X		0.63	x	0.7		= [19.21	(81)
Northwest 0.9x	0.77	X	0.6	69	x	7	2.63	X		0.63	x [0.7		= [15.32	(81)
Northwest 0.9x	0.77	X	0.6	69	x	5	0.42	X		0.63	x	0.7		= [10.63	(81)
Northwest 0.9x	0.77	X	0.6	69	x	2	8.07	x		0.63	x	0.7		= [5.92	(81)
Northwest 0.9x	0.77	X	0.6	69	x	1	4.2	x		0.63	x [0.7		= [2.99	(81)
Northwest 0.9x	0.77	X	0.6	69	x	9).21	x		0.63	x [0.7		=	1.94	(81)
Solar gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Su	ım(74)m .	(82)m					
(83)m= 185.93	339.1	523.45	748.27	929.12	96	32.43	911.23	770	.18	600.34	390.82	226.78	156.4	18		(83)
Total gains – ir	nternal a	nd solar	(84)m =	= (73)m ·	+ (8	33)m ,	watts					_				
(84)m= 574.55	726.36	897.2	1099.67	1256.72	126	67.92	1202.86	1065	5.83	907.91	720.89	582.8	532.9	9		(84)
7. Mean inter	nal temp	erature	(heating	season)											
Temperature	during h	eating p	eriods ir	n the livii	ng a	area f	rom Tab	ole 9,	, Th1	1 (°C)					21	(85)
Utilisation fac	tor for g	ains for I	living are	ea, h1,m	(se	ee Ta	ble 9a)							١		
Jan	Feb	Mar	Apr	May	Ť,	Jun	Jul	Αι	ug	Sep	Oct	Nov	De	С		
(86)m= 0.97	0.95	0.92	0.84	0.73	(0.6	0.48	0.5	54	0.74	0.9	0.96	0.98	3		(86)
Mean interna	l temper	ature in	living an	ea T1 (fo	ירווטי	w ster	ns 3 to 7	in T	able	, 9c)		•	•			
(87)m= 17.79	18.15	18.75	19.52	20.19	_	0.65	20.85	20.	$\overline{}$	20.39	19.49	18.5	17.7	2		(87)
` '				l	<u> </u>					.0 (00)		1	<u> </u>			
Temperature (88)m= 19.64	19.64	19.64	19.65	19.65	_	9.66	19.66	19.0		19.66	19.65	19.65	19.6	<u>л</u>		(88)
` '					<u> </u>				00	10.00	10.00	10.00	10.0			(00)
Utilisation fac					·	`		<u> </u>				T		_		(00)
(89)m= 0.97	0.94	0.9	0.81	0.68	0).51	0.36	0.4	12	0.67	0.87	0.95	0.97			(89)
Mean interna	temper	ature in	the rest	of dwelli	ng	T2 (fc	ollow ste	ps 3	to 7	in Tabl	e 9c)	•				
(90)m= 16.75	17.11	17.7	18.45	19.07	19	9.46	19.6	19.	58	19.27	18.44	17.47	16.6	9		(90)
										f	LA = Livi	ng area ÷ (4	4) =		0.3	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling	g) = fL	_A × T1	+ (1	– fL	A) × T2						
(92)m= 17.06	17.42	18.01	18.76	19.4	19	9.81	19.97	19.9	94	19.6	18.75	17.77	17			(92)
Apply adjustn	nent to tl	ne mean	interna	temper	atuı	re fro	m Table	4e, '	whe	re appro	priate					
(93)m= 17.06	17.42	18.01	18.76	19.4	19	9.81	19.97	19.9	94	19.6	18.75	17.77	17			(93)
8. Space hea	ting requ	uirement														
Set Ti to the r					ed	at ste	p 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-c	alc	ulate	
the utilisation				I		1	11	Λ.		Can	0-4	Nov				
Jan Utilisation fac	Feb tor for a	Mar	Apr	May	<u> </u>	Jun	Jul	A	ug	Sep	Oct	Nov	De	C		
(94)m= 0.95	0.92	0.88	0.79	0.67	0).52	0.39	0.4	14	0.66	0.85	0.93	0.96	;		(94)
Useful gains,				l			0.00	<u> </u>		0.00	0.00	1 0.00				(- /
(95)m= 546.85	671.23	785.98	868.07	838.07	65	9.15	466.33	472	.81	600.77	611.64	542.84	510.7	72		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	<u> </u>							1				
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.	.4	14.1	10.6	7.1	4.2			(96)
Heat loss rate	for mea	an intern	al tempe	erature,	Lm	, W =	:[(39)m	x [(93	3)m-	- (96)m]	1				
(97)m= 1992.87			1520.98	r		5.86	514.74	539		842.37	1255.36	1648.37	1983	.9		(97)
														_		

Space he	eating	require	ement fo	r each n	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95	5)m] x (4	1)m			
(98)m= 107	75.84 8	860.21	747.56	470.1	258.19	0	0	0	0	478.92	795.98	1096.05		
		•						Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	5782.85	(98)
Space he	eating	require	ement in	kWh/m²	/year								58.09	(99)
8c. Spac	ce cooli	ing req	uiremen	it										
Calculate	ed for J	June, J	uly and	August.	See Tal	ole 10b				-				
J	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss	s rate L	_m (cal	lculated	using 2	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	1435.56	1130.12	1158.95	0	0	0	0		(100)
Utilisatio	n facto	r for lo	ss hm											
(101)m=	0	0	0	0	0	0.72	0.78	0.74	0	0	0	0		(101)
Useful lo	ss, hm	nLm (W	/atts) = (100)m x	(101)m					•				
(102)m=	0	0	0	0	0	1036.33	881.97	856.57	0	0	0	0		(102)
Gains (se	olar ga	ins cal	culated	for appli	cable we	eather re	gion, se	e Table	10)					
(103)m=	0	0	0	0	0	1586.76	1508.46	1350.13	0	0	0	0		(103)
Space co						lwelling,	continuo	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m] >	c (41)m	
(104)m=	0	0	0	0	0	396.31	466.1	367.21	0	0	0	0		
	<u> </u>	·							Total	l = Sum(104)	=	1229.63	(104)
Cooled fra	action								f C =	cooled	area ÷ (4	1) =	1	(105)
Intermitte	ncy fac	tor (Ta	ble 10b)										_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Tota	I = Sum(104)	= [0	(106)
Space coo	oling re	equiren	nent for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	99.08	116.53	91.8	0	0	0	0		
									Total	I = Sum(107)	= [307.41	(107)
Space cod	oling re	equiren	nent in k	:Wh/m²/y	/ear				(107)) ÷ (4) =		Ī	3.09	(108)
8f. Fabric	Energy	y Effici	ency (ca	alculated	only un	der spec	cial cond	itions, se	ee sectio	on 11)				-

(99) + (108) =

Fabric Energy Efficiency

(109)

61.18

		User Details:				
Assessor Name:	Harry Hinchcliffe	Stroma Nu	mher·	STRO	034627	
Software Name:	Stroma FSAP 2012	Software V			n: 1.0.5.16	
	Pi	roperty Address: 1559	2 - L1a Assessm	ent		
Address :	New Dwelling @, 34 Summe	er House Way, Langle	y, WD5 0DY			
1. Overall dwelling dime	ensions:					
		Area(m²)	Av. Height(m)	Volume(m³)
Ground floor		52.34 (1a) x	2.39	(2a) =	125.09	(3a)
First floor		47.21 (1b) x	2.65	(2b) =	125.11	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n	99.55 (4)				
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.	(3n) =	250.2	(5)
2. Ventilation rate:				-		
	main secondary heating	y 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	-	0	x 10 =	0	(7a)
Number of passive vents	;		0	x 10 =	0	(7b)
Number of flueless gas fi	res		0 ,	x 40 =	0	(7c)
				Air ch	anges per ho	
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a	(a)+(7h)+(7c) -		-		_
	peen carried out or is intended, proceed		0 e from (9) to (16)	÷ (5) =	0	(8)
Number of storeys in the	he dwelling (ns)		,,,,,	ſ	0	(9)
Additional infiltration			[(9	9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame or	0.35 for masonry cons	struction		0	(11)
if both types of wall are p deducting areas of openii	resent, use the value corresponding to	the 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			Ī	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 metre	s per hour per square	metre of envelop	e area	5	(17)
·	lity value, then $(18) = [(17) \div 20] + (8)$				0.25	(18)
	es if a pressurisation test has been don	e or a degree air permeabil	ity is being used			_
Number of sides sheltere Shelter factor	ed	(20) = 1 - [0.075 ×	v (10)] —	-	1	(19)
	ting chalter factor	$(20) = 1 - [0.073 \times 20]$ $(21) = (18) \times (20)$		l r	0.92	(20)
Infiltration rate incorporat	_	(21) - (10) x (20)	_	L	0.23	(21)
Infiltration rate modified f		Jul Aug Sei	o Oct Nov	Dec		
		Jui Aug Sel	o Oct NOV	Dec		
Monthly average wind sp	peed from Table /		· · · · ·			

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

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	ration rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m	•		-	•	
0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27	1	
Calculate effe		_	rate for t	he appli	cable ca	se	!	ļ.	ļ.	!			
If mechanic			l' N. (0	al.) (aa	\ - /		\\	. (22)) (00)			0	(23a)
If exhaust air h		•		, ,	,			,	o) = (23a)			0	(23b)
If balanced with			•	_		,		•				0	(23c)
a) If balance	1	1	·			, 	- 	í `	, 	<u> </u>	· · · ·) ÷ 100] 1	(0.4-)
(24a)m= 0	0	0	0	0	. 0	0	0	0	0	0	0]	(24a)
b) If balance	_					, 		í `	r ´ `	` 	i	1	(0.41.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h if (22b)r	nouse ex m < 0.5 >				•				.5 × (23k	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from	loft		L	Į.	1	
,	m = 1, the				•				0.5]				
(24d)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54]	(24d)
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)	-	-	-	_	
(25)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54]	(25)
2 Hoot losse												='	
	es and ne	at loss r	paramete	∍r·									
	es and ne Gros	·	oaramete Openin		Net Ar	ea	U-val	ue	A X U		k-value	e	ΑΧk
ELEMENT		SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
	Gros	SS	Openin	gs									
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/				kJ/K
ELEMENT Doors	Gros area e 1	SS	Openin	gs	A ,r	m² x x1	W/m2	2K = -0.04] =	(W/ 3.36				kJ/K (26)
ELEMENT Doors Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.1 7.78	m ² x x ¹ s x ¹	W/m2 1.6 /[1/(1.4)+	2K = - 0.04] = - 0.04] =	(W/ 3.36 10.31				kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.1 7.78	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+	2K = 0.04] = -0.04] = -0.04] =	(W/ 3.36 10.31 25				kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.1 7.78 18.86 2.76	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.0	(W/ 3.36 10.31 25 3.66	K)			kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.0	(W/ 3.36 10.31 25 3.66 0.91 9.42120	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18	2K = 0.04] = 0	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25	K)			kJ/K (26) (27) (27) (27) (27) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1	Gros area e 1 e 2 e 3 e 4 154.	05 7	32.19 0	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	2K = -0.04]	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65	K)			kJ/K (26) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 e 4 154. 4.6	05 7	Openin m	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18	2K = 0.04] = 0	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25	K)			kJ/K (26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2 Total area of e	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.	05 7 5 , m ²	32.19 0	gs ₂	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	2K = -0.04]	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.	05 7 5 5, m ² ows, use e	Openin m 32.19 0 0 effective wi	gs p	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	2K = -0.04]	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof winder	05 7 5 ows, use e	32.19 0 0 offective winternal wall	gs p	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14	2K = -0.04 = -0.04 = -0.04 = -0.04 = = = = = = = = = =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area	Gros area e 1 e 2 e 3 e 4 154. 4.6 47. elements d roof windas on both ss, W/K :	05 7 5 5, m ² ows, use e sides of in	32.19 0 0 offective winternal wall	gs p	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calcul	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	2K = -0.04 = -0.04 = -0.04 = -0.04 = = -0.04 = = = = = = = = = =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	h 3.2	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area Fabric heat los	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof winde as on both ss, W/K: Cm = S(oss (m²) 7 5 ows, use e sides of int = S (A x (A x k)	32.19 0 0 oriffective winternal walk	gs 2 9 Indow U-ve	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculatitions	x1 x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11	2K = -0.04 = -0.0	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22	K)	kJ/m²-	n 3.2	kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof wind as on both ss, W/K: Cm = S(05 7 5 5, m ² ows, use e sides of in = S (A x (A x k) eter (TMF)	32.19 32.19 0 offective with atternal walk U) P = Cm : tails of the	gs p ndow U-va ls and pan	A ,r 2.1 7.78 18.86 2.76 0.69 52.34 121.8 4.67 47.5 258.5 alue calculatitions	m ²	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11 g formula 1 (26)(30	2K = -0.04 = -0.04 = -0.04 = -0.04 = -0.04 = = -0.04 = = -0.04 = = -0.04 = = -0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22 ue)+0.04] & ative Value	K)	kJ/m²-	h 3.2 87.8 13538.	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (33) (53) (34)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the are. Fabric heat los Heat capacity Thermal mass	Gros area e 1 e 2 e 3 e 4 154. 4.6 47.: elements d roof wind as on both ss, W/K: Cm = S(s parame sments whe ead of a de	05 7 5 ows, use e sides of int = S (A x k) eter (TMF) ere the de tailed calculations	32.19 32.19 0 0 offective winternal walk U) P = Cm - tails of the culation.	gs 2 Indow U-valls and part - TFA) ir constructi	A ,r 2.1 7.78 18.86 2.76 0.69 52.32 121.8 4.67 47.5 258.5 alue calculations n kJ/m²K	x1 xx xx xx x	W/m2 1.6 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.24 0.14 0.11 g formula 1 (26)(30	2K = -0.04 = -0.04 = -0.04 = -0.04 = -0.04 = = -0.04 = = -0.04 = = -0.04 = = -0.04 =	(W/ 3.36 10.31 25 3.66 0.91 9.42120 29.25 0.65 5.22 ue)+0.04] & ative Value	K)	kJ/m²-	h 3.2 87.8 13538.	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (33) (53) (34)

		0 0	are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he								. ,	(36) =			107.07	(37)
Ventila	ation hea			i		_			` ,	`	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	44.87	44.73	44.6	43.95	43.83	43.28	43.28	43.17	43.49	43.83	44.08	44.33		(38)
Heat t	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	151.95	151.81	151.67	151.03	150.91	150.35	150.35	150.25	150.57	150.91	151.15	151.41		_
Heat le	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	151.03	(39)
(40)m=	1.53	1.52	1.52	1.52	1.52	1.51	1.51	1.51	1.51	1.52	1.52	1.52		
									,	Average =	Sum(40) ₁ .	12 /12=	1.52	(40)
Numb	er of day	s in mor	nth (Tab	le 1a)							Ι			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	gy requi	irement:								kWh/ye	ear:	
	ned occu FA > 13.9			[1 - AVD	(<u>-</u> 0 0003	40 v (TE	-13 Q)2)] + 0 (1013 v /	Γ Γ Δ -13		74		(42)
	FA £ 13.9		+ 1.70 X	[ı - exp	(-0.0003	49 X (11	A - 13.9)2)] + 0.C) X C 1 O	IFA - 13.	9)			
	al averag	•	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		99	.16		(43)
	the annua	_				_	_	to achieve	a water us	se target o				, ,
not mor	e that 125	litres per p	person per	day (all w	ater use, h	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08		
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,n	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1189.97	(44)
(45)m=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66		
				<u>. </u>							<u> </u>			_
If instan	taneous w								-	Fotal = Su	m(45) ₁₁₂ =		1560.23	(45)
	nanoodo w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,		Γotal = Su	m(45) ₁₁₂ =		1560.23	(45)
	24.26	21.22	ng at point 21.9	of use (no	hot water 18.32	storage),	enter 0 in 14.65	boxes (46,		Total = Su 19.82	m(45) ₁₁₂ =	23.5	1560.23	(45) (46)
Water	24.26 storage	21.22 loss:	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	· ·		1560.23	
Water	24.26	21.22 loss:	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64		1560.23	
Water Storag	24.26 storage ge volum munity h	21.22 loss: e (litres) eating a	21.9 includin	19.09 ng any so	18.32 Dlar or W	15.81 /WHRS :	14.65 storage	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46)
Storag If com Other	24.26 storage ge volum munity h	21.22 loss: e (litres) eating a	21.9 includin	19.09 ng any so	18.32 Dlar or W	15.81 /WHRS :	14.65 storage	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46)
Water Storag If com Other Water	24.26 storage ge volum munity h wise if no storage	21.22 loss: e (litres) eating a o stored loss:	21.9 including and no tath	19.09 ng any so ank in dwer (this in	18.32 blar or W relling, e	15.81 /WHRS : nter 110	storage litres in neous co	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46) (47)
Water Storag If com Other Water a) If n	24.26 storage ge volum munity h wise if no storage nanufact	21.22 loss: e (litres) eating a o stored loss: urer's de	21.9 including nd no tale hot water	19.09 Ing any so ank in dwer (this in oss factor)	18.32 Dlar or W relling, e	15.81 /WHRS : nter 110	storage litres in neous co	16.81 within sa (47)	17.01 ame ves	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48)
Water Storag If com Other Water a) If n	24.26 storage ge volum munity h wise if no storage nanufact erature fa	21.22 loss: e (litres) eating a stored loss: urer's de	21.9 including nd no tale hot water eclared lome.	19.09 Ing any so ank in dwer (this in oss factor 2b	18.32 plar or W relling, e includes in	15.81 /WHRS : nter 110	storage litres in neous co n/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47)
Water Storag If com Other Water a) If n Tempo Energ	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro	21.22 loss: e (litres) eating a o stored loss: urer's de actor from	21.9 including no tale hot water eclared lem Table storage	19.09 Ing any so ank in dwer (this in oss factor 2b	18.32 plar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan	storage litres in neous co n/day):	16.81 within sa (47)	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48)
Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa	24.26 storage ge volum munity havise if no storage manufact erature fay lost fromanufact ater storage that is to a storage manufact ater storage that is to a storage that is to a storage at the storage	21.22 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de	21.9 including not a hot water eclared least storage eclared of factor fr	19.09 Ing any so ank in dwer (this in oss factor 2b explinder left)	18.32 Dlar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous con/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48) (49)
Water Storag If com Other Water a) If n Tempo Energ b) If n Hot wa If com	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h	21.22 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de age loss eating s	21.9 including not not a hot water eclared leastorage eclared of factor free sections.	19.09 Ing any so ank in dwer (this in oss factor 2b explinder left)	18.32 Dlar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous con/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	21.64	23.5	1560.23	(46) (47) (48) (49) (50) (51)
Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa If com Volum	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor	21.22 loss: e (litres) eating a o stored loss: urer's de actor from water urer's de age loss eating s from Tal	including and no tale hot water leclared least storage eclared of factor free sections and the sections are sections.	19.09 Ing any so ank in dwer (this in oss factors, kWh/ye cylinder I from Tablon 4.3	18.32 Dlar or Warelling, eacludes in the control of the control o	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous con/day):	16.81 within sa (47) ombi boild	17.01 17.01 nme vessers) ente	19.82 Sel	47)	23.5	1560.23	(46) (47) (48) (49) (50) (51)
Water Storag If com Other Water a) If n Tempe Energ b) If n Hot wa If com Volum Tempe	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor erature fa	21.22 loss: e (litres) eating a o stored loss: urer's de actor from urer's de age loss eating s from Tal actor from	including and no tale hot water eclared leastorage eclared of factor free sections ble 2a m Table	19.09 Ing any so ank in dwer (this in oss factors, kWh/ye cylinder I from Tabloon 4.3	olar or Welling, encludes in the property of t	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous co n/day): known:	16.81 within sa (47) ombi boild (48) x (49)	17.01 17.01 ame vessers) ente	19.82 sel er 'O' in (47)	23.5	1560.23	(46) (47) (48) (49) (50) (51)
Water Storag If com Other Water a) If n Tempe b) If n Hot wa If com Volum Tempe Energ	24.26 storage ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora munity h ne factor	21.22 loss: e (litres) eating a o stored loss: urer's de actor froi urer's de age loss eating s from Tal actor froi m water	including and no tale hot water leclared least orage eclared of factor free sections le 2a m Table storage	19.09 Ing any so ank in dwer (this in oss factors, kWh/ye cylinder I from Tabloon 4.3	olar or Welling, encludes in the property of t	15.81 /WHRS : nter 110 nstantan wn (kWh	storage litres in neous co n/day): known:	16.81 within sa (47) ombi boild	17.01 17.01 ame vessers) ente	19.82 sel er 'O' in (21.64	23.5	1560.23	(46) (47) (48) (49) (50) (51)

Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	m Table	3							0		(58)
	•	•	•			59)m = ((58) ÷ 36	65 × (41)	m				•	
(mod	dified by	factor fr	om Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month ((61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	14.14	12.76	14.11	13.61	14.03	13.54	13.97	14.01	13.58	14.07	13.66	14.13		(61)
Total h	neat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	ι κ Η (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	l	
(add a	dditiona	l lines if	FGHRS	and/or \	vwhrs	applies	, see Ap	pendix (€)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter	•		•	•	•		•	•	•	•	
(64)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
								Outp	out from w	ater heate	r (annual)₁	12	1725.84	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	-
(65)m=	57.32	50.23	52.07	45.72	44.12	38.43	35.96	40.76	41.1	47.46	51.38	55.62	1	(65)
inclu	ude (57)	m in calc	culation o	of (65)m	only if c	vlinder i	s in the ເ	dwellina	or hot w	ater is fr	om com	munity h	ı ıeating	
	. ,	ains (see			•	,		- 3				• •	3	
	Ĭ	·			,·									
wetab	Jan	s (Table Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77		(66)
` ,				<u> </u>		ion L9 o		<u> </u>		100	100	100	l	,
ւյցուու (67)m=	22.79	20.24	16.46	12.46	9.31	7.86	8.5	11.04	14.82	18.82	21.97	23.42	1	(67)
						L		l			21.07	20.42		(0.)
Appiiai (68)m=	255.6	258.25	251.57	237.34	219.38	uation L 202.5	191.22	3a), aisc 188.57	195.25	209.48	227.44	244.32	I	(68)
				!		<u> </u>	<u> </u>	!		<u> </u>	221.44	244.32		(00)
						tion L15		ı —			20.00	1 20 00	1	(69)
(69)m=	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68		(69)
•		ns gains	<u> </u>							Γ.		Γ.	Ī	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
		aporatio				- 		i				1	1	
` '	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41		(71)
Water		gains (T	able 5)	T		1	1	T		1		1	1	
(72)m=	77.05	74.75	69.99	63.5	59.29	53.37	48.34	54.79	57.08	63.79	71.36	74.76		(72)
Total i	internal	gains =				(66))m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72))m	•	
	1				055.00	220.70	245.00	204.42	00440			1	l	(\)
(73)m=	422.46	420.27	405.04	380.33	355.02	330.76	315.08	321.43	334.19	359.12	387.8	409.53		(73)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	18.86	x	11.28	x	0.63	x	0.7	=	65.03	(75)
Northeast 0.9x	0.77	x	18.86	x	22.97	x	0.63	x	0.7	=	132.38	(75)
Northeast 0.9x	0.77	x	18.86	x	41.38	x	0.63	x	0.7	=	238.5	(75)
Northeast 0.9x	0.77	x	18.86	x	67.96	x	0.63	x	0.7	=	391.69	(75)
Northeast 0.9x	0.77	x	18.86	x	91.35	x	0.63	x	0.7	=	526.51	(75)
Northeast 0.9x	0.77	x	18.86	x	97.38	x	0.63	x	0.7	=	561.31	(75)
Northeast 0.9x	0.77	x	18.86	x	91.1	x	0.63	x	0.7	=	525.09	(75)
Northeast 0.9x	0.77	x	18.86	x	72.63	x	0.63	x	0.7	=	418.61	(75)
Northeast 0.9x	0.77	x	18.86	x	50.42	x	0.63	x	0.7	=	290.62	(75)
Northeast 0.9x	0.77	x	18.86	x	28.07	x	0.63	x	0.7	=	161.78	(75)
Northeast 0.9x	0.77	x	18.86	x	14.2	x	0.63	x	0.7	=	81.83	(75)
Northeast 0.9x	0.77	x	18.86	x	9.21	x	0.63	x	0.7	=	53.11	(75)
Southeast 0.9x	0.77	x	2.76	x	36.79	x	0.63	x	0.7	=	31.04	(77)
Southeast 0.9x	0.77	x	2.76	x	62.67	x	0.63	x	0.7	=	52.86	(77)
Southeast 0.9x	0.77	x	2.76	x	85.75	x	0.63	x	0.7	=	72.33	(77)
Southeast 0.9x	0.77	x	2.76	x	106.25	х	0.63	x	0.7	=	89.62	(77)
Southeast 0.9x	0.77	x	2.76	x	119.01	x	0.63	x	0.7	=	100.38	(77)
Southeast 0.9x	0.77	x	2.76	x	118.15	x	0.63	x	0.7	=	99.66	(77)
Southeast 0.9x	0.77	x	2.76	x	113.91	X	0.63	x	0.7	=	96.08	(77)
Southeast 0.9x	0.77	x	2.76	x	104.39	x	0.63	x	0.7	=	88.05	(77)
Southeast 0.9x	0.77	x	2.76	x	92.85	x	0.63	x	0.7	=	78.32	(77)
Southeast 0.9x	0.77	x	2.76	x	69.27	х	0.63	x	0.7	=	58.43	(77)
Southeast 0.9x	0.77	x	2.76	x	44.07	x	0.63	x	0.7	=	37.17	(77)
Southeast 0.9x	0.77	x	2.76	x	31.49	x	0.63	x	0.7	=	26.56	(77)
Southwest _{0.9x}	0.77	x	7.78	x	36.79]	0.63	x	0.7	=	87.48	(79)
Southwest _{0.9x}	0.77	x	7.78	x	62.67		0.63	x	0.7	=	149.02	(79)
Southwest _{0.9x}	0.77	x	7.78	x	85.75]	0.63	x	0.7	=	203.89	(79)
Southwest _{0.9x}	0.77	x	7.78	x	106.25		0.63	x	0.7	=	252.63	(79)
Southwest _{0.9x}	0.77	x	7.78	x	119.01]	0.63	x	0.7	=	282.97	(79)
Southwest _{0.9x}	0.77	x	7.78	x	118.15]	0.63	x	0.7	=	280.92	(79)
Southwest _{0.9x}	0.77	x	7.78	x	113.91]	0.63	x	0.7	=	270.84	(79)
Southwest _{0.9x}	0.77	x	7.78	x	104.39]	0.63	x	0.7	=	248.21	(79)
Southwest _{0.9x}	0.77	x	7.78	x	92.85		0.63	x	0.7	=	220.77	(79)
Southwest _{0.9x}	0.77	x	7.78	x	69.27		0.63	x	0.7	=	164.7	(79)
Southwest _{0.9x}	0.77	x	7.78	x	44.07]	0.63	x	0.7	=	104.79	(79)
Southwest _{0.9x}	0.77	X	7.78	x	31.49]	0.63	x	0.7	=	74.87	(79)
Northwest 0.9x	0.77	X	0.69	x	11.28	x	0.63	x	0.7] =	2.38	(81)
Northwest 0.9x	0.77	X	0.69	x	22.97	x	0.63	х	0.7] =	4.84	(81)
Northwest 0.9x	0.77	X	0.69	x	41.38	x	0.63	х	0.7] =	8.73	(81)
				-		-		•		-		_

Northwest 0.9x	0.77	×	0.6	69	x	67.96	X		0.63	x	0.7	=	14.33	(81)
Northwest _{0.9x}	0.77	x	0.6	69	x	91.35	X		0.63	x	0.7	=	19.26	(81)
Northwest _{0.9x}	0.77	x	0.6	69	x	97.38	X		0.63	x	0.7	=	20.54	(81)
Northwest _{0.9x}	0.77	x	0.6	69	x	91.1	X		0.63	x	0.7	=	19.21	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x	72.63	X		0.63	x	0.7	=	15.32	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x	50.42	X		0.63	x	0.7	=	10.63	(81)
Northwest 0.9x	0.77	X	0.6	69	x	28.07	X		0.63	x	0.7		5.92	(81)
Northwest _{0.9x}	0.77	x	0.6	69	x	14.2	x		0.63	x	0.7	=	2.99	(81)
Northwest _{0.9x}	0.77	X	0.6	69	x	9.21	X		0.63	x	0.7	=	1.94	(81)
_							_							
Solar gains in	watts, c	alculated	I for eac	h month			(83)m	n = Su	ım(74)m .	(82)m				
(83)m= 185.93	339.1	523.45	748.27	929.12	962.4	3 911.23	770).18	600.34	390.82	226.78	156.48		(83)
Total gains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (83)	m , watts						ļ.	ı	
(84)m= 608.39	759.37	928.49	1128.6	1284.14	1293.	19 1226.31	109	1.61	934.53	749.94	614.58	566.01		(84)
7. Mean inter	nal tami	ocratura	(hooting	coscon	١									
			`		<i>'</i>	o from To	bla O	Th/	L (0C)				0.4	(85)
Temperature	•	٠.			_		DIE 9	, 1111	i (C)				21	(65)
Utilisation fac		1		1	<u> </u>	<u> </u>	Τ,			0 /	T		1	
Jan	Feb	Mar	Apr	May	Ju	+	+	ug	Sep	Oct	Nov	Dec		(00)
(86)m= 0.97	0.95	0.91	0.83	0.72	0.58	0.47	0.5	52	0.73	0.89	0.95	0.97		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	llow	steps 3 to	7 in T	Table	9c)				,	
(87)m= 17.91	18.26	18.85	19.59	20.24	20.6	7 20.86	20.	.81	20.42	19.56	18.59	17.83		(87)
Temperature	during h	neating p	eriods ii	n rest of	dwell	ng from Ta	able 9	9, Th	12 (°C)					
(88)m= 19.67	19.67	19.67	19.67	19.68	19.6	8 19.68	19.	.68	19.68	19.68	19.67	19.67		(88)
Utilisation fac	tor for a	ains for	rest of d	welling	h2 m	(see Table	02)				•		•	
(89)m= 0.96	0.94	0.89	0.8	0.67	0.5	0.35	0.4	41	0.65	0.86	0.94	0.97]	(89)
, ,				l i	l						1 3.3			` ,
Mean interna		1		1	-	`	i 				1		1	(00)
(90)m= 15.6	16.12	16.95	18	18.87	19.4	19.6	19.	.56	19.14	17.99	16.6	15.5		(90)
									ı	LA = LIVII	ng area ÷ (4) =	0.3	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling) :	= fLA × T1	+ (1	– fL	A) × T2					
(92)m= 16.28	16.75	17.51	18.47	19.27	19.7	8 19.97	19.	.93	19.52	18.45	17.19	16.19		(92)
Apply adjustn	nent to t	he mean	interna	l temper	ature	from Table	e 4e,	whe	re appro	priate			•	
(93)m= 16.13	16.6	17.36	18.32	19.12	19.6	3 19.82	19.	.78	19.37	18.3	17.04	16.04		(93)
8. Space hea	ting req	uirement												
Set Ti to the i	mean in	ternal ter	mperatu	re obtair	ed at	step 11 of	Tab	le 9b	, so tha	t Ti,m=((76)m an	d re-cal	culate	
the utilisation	factor fo	or gains	using Ta	able 9a									1	
Jan	Feb	Mar	Apr	May	Ju	า Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisation fac		ains, hm	:				_						1	
(94)m= 0.94	0.91	0.85	0.76	0.64	0.5	0.36	0.4	42	0.63	0.82	0.91	0.95		(94)
Useful gains,		- `	<u> </u>	·	· · ·			-	1		1	1	1	
(95)m= 570.66	688.52	793.39	863.12	823.52	640.4		454	.14	590.5	617.08	561.64	535.19		(95)
Monthly avera		1	i –	I	ı			-	1		1	ı	1	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6		16		14.1	10.6	7.1	4.2		(96)
Heat loss rate	r	r			r —		T	- -	· <i>′</i>		1		1	
(97)m= 1798.25	1776.02	1647.67	1422.3	1120.01	755.8	484.32	508	3.22	793.55	1162.65	1501.98	1792.04		(97)

Total per year (kWh/year) = Sum(8b), so. II = 492.094 (98)	Space heating	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
Space heating requirement in kWh/m²/year Space heating requirements – Individual heating systems including micro-CHP)	(98)m= 913.32	730.8	635.58	402.61	220.59	0	0	0	0	405.9	677.04	935.1		_
Space heating:								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	4920.94	(98)
Space Note	Space heating	g require	ement in	kWh/m²	² /year								49.43	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system (s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, 9 Efficiency of secondary/supplementary heating system, 9 Ban Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) [131,32] 730,8 [335,58] 402,61 [220,58] 0 0 0 0 0 405,9 [677,04] 335,1 211)m = ([(88)m x (204)]) x 100 ÷ (206) [375,81] 781,6 [679,77] 430,6 [235,33] 0 0 0 0 0 405,9 [677,04] 335,1 2121)m = ([(88)m x (204)]) x 100 ÷ (206) [375,81] 781,6 [679,77] 430,6 [235,33] 0 0 0 0 0 405,9 [677,04] 335,1 Space heating fuel (secondary), kWh/month [((198)m x (201)]) x 100 ÷ (208) 215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9a. Energy rec	quiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					
Fraction of space heat from main system (s) Fraction of space heating from main system 1 Efficiency of main space heating system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Space heating requirement (calculated above) 913.32 730.8 Space heating requirement (calculated above) 913.32 730.8 Space heating from main system 1 Efficiency of water heating (secondary), kWh/hmonth = {{([98]m x (204)] } x 100 ÷ (206) Space heating fuel (secondary), kWh/month = {{([98]m x (201)] } x 100 ÷ (208) 215]me 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-	_			, .							ſ		7 ,
Fraction of total heating from main system 1 (204] = (202) × [1 - (203)] =	·					mentary	•		(004)					╡` ′
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 913.32 730.8 635.8 02.61 220.59 0 0 0 0 0 405.9 677.04 935.1 211)m = [[(98)m x (204)]] \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	·			-	, ,			` ,	,	(000)1		ļ		վ՝ ՝
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 913.32 730.8 635.8 402.61 220.59 0 0 0 0 0 405.9 677.04 936.1 211)m = {([(98)m x (204)] } x 100 + (206) Space heating fuel (secondary), kWh/month = {(((98)m x (201)] } x 100 + (208) 215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(211), _a, _a, _e 0 215 Nater heating Dutput from water heater (calculated above) 175.91 154.24 160.1 140.89 136.16 118.93 111.62 126.07 126.98 146.23 157.92 170.79 Efficiency of water heater heating, kWh/month 219)m = (84)m x 100 + (217)m 219)m = (84)m x 10			•	-				(204) = (2	02) x [1 –	(203)] =		ļ		╡
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	•	•		• .			0.4							╡゛゙
Space heating requirement (calculated above) 913.32 730.8 635.68 402.61 220.59 0 0 0 0 406.9 677.04 935.1 (211) 976.81 781.6 673.77 430.6 235.93 0 0 0 434.12 724.11 1000.1 (211) (198)m x (204)] } 1 100 + (206) (211) (198)m x (201)] } 1 100 + (208) (211) (198)m x (201)] } 1 100 + (208) (211) (198)m x (201)] } 1 100 + (208) (215)m 0 0 0 0 0 0 0 0 0	Efficiency of s					g systen	า, % เ							(208)
913.32 730.8 635.58 402.61 220.59 0 0 0 0 405.9 677.04 935.1 211 m = {[(98)m × (204)] } × 100 + (206)				<u> </u>			Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
211)m = {[[98]m x (204]] } x 100 ÷ (206)		·		i	·	1	n	0	0	405.9	677.04	935.1		
976.81 781.6 679.77 430.6 235.93 0 0 0 0 434.12 724.11 1000.1 Total (kWhtyear) = Sum(211)_{1, \pm 10				<u> </u>				Ŭ		400.0	077.04	000.1		(211)
Space heating fuel (secondary), kWh/month = {						0	0	0	0	434.12	724.11	1000.1		(211)
## Company of the proof of all uses (211)(221) + (231) + (232)(237b) = \$ (230)								Tota	l (kWh/yea	ar) =Sum(2	L 211) _{15,1012}	<u> </u>	5263.04	(211)
Companies Comp	Space heating	g fuel (s	econdar	y), kWh/	month							L		_
Total (kWh/year) = Sum(215) _{1.5,19.3} 0 (215) Mater heating	= {[(98)m x (20)1)]} x 1	00 ÷ (20	8)						_	,			
Nater heating Dutput from water heater (calculated above)	(215)m= 0	0	0	0	0	0	0	_						٦
Cutput from water heater (calculated above) 175.91 154.24 160.1 140.89 136.16 118.93 111.62 126.07 126.98 146.23 157.92 170.79 217 217 217 217 217 219 219 217 219 219 217 219								lota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215)
175.91 154.24 160.1 140.89 136.16 118.93 111.62 126.07 126.98 146.23 157.92 170.79	_		ter (calc	ulated a	hove)									
217)m= 89.97 89.93 89.84 89.65 89.25 87.3 87.3 87.3 87.3 89.63 89.88 89.99 (217)m= (64)m x 100 ÷ (217)m= (195.52 171.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 171.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 (219)m= 195.52 178.21 189.75 (219)m= 195.52 178.21 189.21 189.21 (219)m= 195.52 178.21 189.21 (219)m= 195.52 178.21 189.21 (219)m= 195.52 178.21 189.21 (219)m= 195.52 178.21 189.21						118.93	111.62	126.07	126.98	146.23	157.92	170.79		
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 219)m = 195.52 171.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 Total = Sum(219a) ₁₋₁₂ = 1937.57 (219) Annual totals Space heating fuel used, main system 1 Water heating fuel used Fuel ctricity for pumps, fans and electric keep-hot central heating pump: billectricity for the above, kWh/year Sum of (230a)(230g) = 75 (231) Fuel ctricity for lighting Fuel delivered energy for all uses (211)(221) + (231) + (232)(237b) = 7678.03 (338)	Efficiency of w	ater hea	iter										87.3	(216)
219)m = (64)m x 100 ÷ (217)m 219)m = 195.52 171.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 Total = Sum(219a) ₁₂ = 1937.57 (219) Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: 5263.04 Cotal electricity for the above, kWh/year Sum of (230a)(230g) = 75 (231g) Fotal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 7678.03 (338)	(217)m= 89.97	89.93	89.84	89.65	89.25	87.3	87.3	87.3	87.3	89.63	89.88	89.99		(217)
195.52 171.52 178.21 157.16 152.56 136.23 127.86 144.41 145.45 163.15 175.71 189.79 1937.57 (219)		0,												
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Fotal delivered energy for all uses (211)(221) + (231) + (232)(237b) = kWh/year 5263.04 1937.57 230 (230)	` ' —				152.56	136.23	127.86	144.41	145.45	163.15	175.71	189.79		
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 5263.04 1937.57 30 (230 45 (231) 45 (231) 402.42 (232) (338)			!				ļ	Tota	I = Sum(2	19a) ₁₁₂ =	ļ.		1937.57	(219)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Fotal electricity for the above, kWh/year Electricity for lighting Fotal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 1937.57 30 (230) 45 (230) 45 (231) (232) (232) (232) (338)	Annual totals									k'	Wh/year		kWh/year	_
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = (230) (230) (230) (230) (230) (231) (231) (232) (232) (232) (233) (234)	Space heating	fuel use	ed, main	system	1								5263.04	
central heating pump: 30 (230) boiler with a fan-assisted flue 45 (230) Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting 402.42 (232) Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 7678.03 (338)	Water heating	fuel use	ed										1937.57	
boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = (230) (231) (231) (232) (232) (233) (233) (233)	Electricity for p	umps, f	ans and	electric	keep-ho	t								
Fotal electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting Fotal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 7678.03 (338)	central heatin	g pump	:									30		(2300
Electricity for lighting 402.42 (232) (231) + (231) + (232)(237b) = 7678.03 (338)	boiler with a f	an-assis	sted flue									45		(230
Electricity for lighting Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 7678.03 (338)	Total electricity	for the	above, k	kWh/yea	r			sum	of (230a).	(230g) =		 	75	(231)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 7678.03 (338)	•		,	,								ا [(232)
	•		for all us	ses (211)(221)	+ (231)	+ (232).	(237b)	=			[[] (338)
				`	, , ,	` '	` ′	` ′						`

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	1136.82 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	418.52 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1555.33 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	208.86 (268)
Total CO2, kg/year	sum	of (265)(271) =	1803.11 (272)
Dwelling CO2 Emission Rate	(272	(a) ÷ (4) =	18.11 (273)
El rating (section 14)			83 (274)

		User Details:				
Assessor Name:	Harry Hinchcliffe	Stroma Nu	mber:	STRO	034627	
Software Name:	Stroma FSAP 2012	Software V	ersion:	Versio	n: 1.0.5.16	
	P	roperty Address: 1559	2 - L1a Assessm	nent		
Address:	New Dwelling @, 34 Summ	er House Way, Langle	y, WD5 0DY			
1. Overall dwelling dime	nsions:					
		Area(m²)	Av. Height(m	1)	Volume(m³))
Ground floor		52.34 (1a) x	2.39	(2a) =	125.09	(3a)
First floor		47.21 (1b) x	2.65	(2b) =	125.11	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	99.55 (4)				_
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+	(3n) =	250.2	(5)
2. Ventilation rate:						
	main secondal heating heating	ry 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)
				Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(7a)$	7a)+(7b)+(7c) =	30	÷ (5) =	0.12	(8)
•	een carried out or is intended, procee			. (6)	0.12	
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration			[0	(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame or	0.35 for masonry cons	struction	Ī	0	(11)
if both types of wall are po deducting areas of openio	resent, use the value corresponding to	o the greater wall area (after		•		_
	loor, enter 0.2 (unsealed) or 0	.1 (sealed), else enter	0	[0	(12)
If no draught lobby, en	ter 0.05, else enter 0			İ	0	(13)
Percentage of windows	s and doors draught stripped			İ	0	(14)
Window infiltration		0.25 - [0.2 x (14)	÷ 100] =	İ	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	İ	0	(16)
Air permeability value,	q50, expressed in cubic metre	es per hour per square	metre of envelop	oe area	5	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + ($	8), otherwise (18) = (16)		Ì	0.37	(18)
Air permeability value applie	s if a pressurisation test has been do	ne or a degree air permeabil	ity is being used	ı		_
Number of sides sheltere	d				1	(19)
Shelter factor		(20) = 1 - [0.075)	(19)] =		0.92	(20)
Infiltration rate incorporat	ing shelter factor	$(21) = (18) \times (20)$	=		0.34	(21)
Infiltration rate modified f	or monthly wind speed					
Jan Feb	Mar Apr May Jun	Jul Aug Se _l	Oct No	v Dec		

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
A .P		- /-!!- '	(-11	1 '- 1 -		(04 -)	(00-)	!	!		•	
Adjusted infiltra	ation rate	e (allowi	ng for sr 0.38	o.37	a wina s	0.33 =	(21a) X 0.32	(22a)m 0.34	0.37	0.38	0.4	1	
Calculate effect						l	0.52	0.54	0.57	0.30	0.4	J	
If mechanica	al ventila	tion:										0	(23a
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b
If balanced with	heat reco	very: effici	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(230
a) If balance						- ` ` 	HR) (24a	i `	2b)m + (23b) × [1 – (23c)) ÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a
b) If balance							<u> </u>	ŕ	r Ó - Ò	<u> </u>	1	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h if (22b)n				•					5 v (22h	,)			
(24c)m = 0	0.5 x	0	nen (240	(230) = (230)	o), other	0 0 NISE	0 = (221)	0	5 × (23L	0	0	1	(240
d) If natural											<u> </u>	J	· ·
if (22b)n				•	•				0.5]				
(24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. Heat losse	s and he	eat loss r	paramet	er:									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e	ΑΧk
_	area	(m²)	m	l ²	A ,r	m²	W/m2	K ,	(W/I	K)	kJ/m²•	K	kJ/K
Doors					2.1	X	1	= [2.1	_			(26)
Windows Type					5.89	x1,	/[1/(1.4)+	0.04] =	7.81				(27)
Windows Type					14.28	x1,	/[1/(1.4)+	0.04] =	18.93				(27)
Windows Type	3				2.09	х1,	/[1/(1.4)+	0.04] =	2.77				(27)
	4				0.52	_X 1,	[1/(1.4)+	0.04] =	0.69				(27)
Windows Type							,						
Windows Type Floor					52.34	×	0.13	=	6.8042				(28)
• •	154.0)5	24.88	8				— ;					(28)
Floor	154.0		24.8	В	52.34		0.13	= [6.8042				
Floor Walls		7		8	52.34 129.1	7 ×	0.13	= [6.8042				(29)
Floor Walls Roof Type1	4.67	7	0	8	52.34 129.1 4.67	7 x x x x	0.13 0.18 0.13	= [= [= [6.8042 23.25 0.61				(29)
Floor Walls Roof Type1 Roof Type2	4.67 47.5 lements	7 5 , m ² ows, use e	0 0	ndow U-va	52.34 129.1 4.67 47.5 258.5	7 x x x x x 6	0.13 0.18 0.13 0.13	= [= [= [= [6.8042 23.25 0.61 6.17		n paragrapi	h 3.2	(29)
Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and	4.67 47.5 lements roof windo	7 5 , m² ows, use e sides of in	0 0 effective winternal wall	ndow U-va	52.34 129.1 4.67 47.5 258.5	7 x x x 6	0.13 0.18 0.13 0.13	= [= [= [/[(1/U-value	6.8042 23.25 0.61 6.17		n paragrapl	h 3.2	(29) (30) (30) (31)
Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area Fabric heat los	4.67.5 llements roof winders on both	7 5 , m ² ows, use e sides of in = S (A x	0 0 effective winternal wall	ndow U-va	52.34 129.1 4.67 47.5 258.5	7 x x x 6	0.13 0.18 0.13 0.13 formula 1	= [= [= [- [(1/U-value) + (32) =	6.8042 23.25 0.61 6.17	as given ir			(29) (30) (30) (31) 4 (33)
Floor Walls Roof Type1 Roof Type2 Total area of e * for windows and ** include the area	4.67 47.8 elements roof winders on both as on both as, W/K =	, m ² ows, use e sides of in = S (A x K)	0 0 effective winternal walk	ndow U-va	52.34 129.1 4.67 47.5 258.5 alue calculatitions	7 x x x 6 ated using	0.13 0.18 0.13 0.13 formula 1	= [= [= [6.8042 23.25 0.61 6.17	as given ir 2) + (32a)		69.1	(29) (30) (30) (31) 4 (33) .13 (34)

if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he								(33) +	(36) =			82.01	(37)
Ventilation hea	at loss ca	alculated	l monthl	У	1			(38)m	= 0.33 × (25)m x (5)	•	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 49.14	48.83	48.54	47.13	46.87	45.64	45.64	45.42	46.12	46.87	47.4	47.96		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 131.15	130.85	130.55	129.14	128.88	127.66	127.66	127.43	128.13	128.88	129.41	129.97		
									Average =		12 /12=	129.14	(39)
Heat loss para		- 						· · ·	= (39)m ÷	`		Ī	
(40)m= 1.32	1.31	1.31	1.3	1.29	1.28	1.28	1.28	1.29	1.29	1.3	1.31		7(40)
Number of day	s in moi	nth (Tab	le 1a)						Average =	Sum(40) _{1.}	12 /12=	1.3	(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	ting ener	rgy requi	irement:								kWh/ye	ear:	
Assumed assu	inanay l	NI									7.4	1	(40)
Assumed occu if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (ΓFA -13.		74		(42)
if TFA £ 13.9				(- (, ,,			-,			
Annual averag).16		(43)
Reduce the annua not more that 125	_				_	-	o acnieve	a water us	se target o	Ī			
		·	· ·		i .	•	Λ	Can	0-4	Nav	Daa		
Jan Hot water usage is	Feb n litres per	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08		
(44)111= 109.08	103.11	101.13	97.10	93.21	09.23	09.23	93.21	l	Total = Su			1189.97	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x C	OTm / 3600			. ,		1103.31	(\.,
(45)m= 161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66		
					, ,	. 0:			Total = Su	m(45) ₁₁₂ =	=	1560.23	(45)
If instantaneous w			,		r storage),	enter 0 in	boxes (46)) to (61)				Ī	
(46)m= 24.26	21.22	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64	23.5		(46)
Water storage Storage volum		includir	na anv sa	olar or M	/WHRS	etorana	within sa	ame ves	امء		0		(47)
If community h	, ,		•			•		arric ves	301		U		(47)
Otherwise if no	_			_			, ,	ers) ente	er 'O' in <i>(</i>	47)			
Water storage		not wate	, (uo	.0.4400 .	- rotal ital	10000		010, 0111	». • (•••			
a) If manufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufact			-									•	
Hot water stor	-			le 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	•		on 4.3								0	l	(50)
Temperature f			2h								0		(52) (53)
·				aar			(A7) v (E4)	\ v (E2\ v /	53) –			<u> </u>	
Energy lost fro Enter (50) or (_	, NVII/Y	-ai			(47) x (51)	, A (OZ) X (00 <i>j</i> =	-	0		(54) (55)
	(/ (· - /											(30)

Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	ry circuit	loss (an	nual) fro	m Table	3							0		(58)
	•	,	,			59)m = ((58) ÷ 36	55 × (41)	m				•	
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m		-			•	
(61)m=	50.96	46.03	50.96	47.92	47.5	44.01	45.48	47.5	47.92	50.96	49.32	50.96		(61)
Total h	neat requ	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	212.72	187.51	196.95	175.21	169.63	149.4	143.14	159.56	161.33	183.12	193.58	207.62		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	r heating)	ı	
(add a	dditiona	l lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter			!				!	!	!		
(64)m=	212.72	187.51	196.95	175.21	169.63	149.4	143.14	159.56	161.33	183.12	193.58	207.62		
			<u> </u>	<u> </u>		<u> </u>	<u> </u>	Outp	out from w	ater heate	ı r (annual)₁	12	2139.75	(64)
Heat o	ains fro	m water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	-
(65)m=	66.53	58.55	61.28	54.3	52.48	46.04	43.84	49.14	49.69	56.68	60.3	64.83	ĺ	(65)
inclu	ıde (57)	m in cald	culation o	of (65)m	only if c	vlinder i	s in the $lpha$	lwellina Jwellina	or hot w	ıater is fr	om com	munity h	ı Jeating	
	ternal ga				•	,							g	
	Ĭ	·) •									
ivietab	olic gain Jan	s (Table Feb	Mar	ts Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77		(66)
` '			<u> </u>	ļ		<u> </u>	ļ		ļ	100.77	100.77	100.77		()
(67)m=	22.79	20.24	16.46	12.46	equat 9.31	ion L9 o	8.5	11.04	14.82	18.82	21.97	23.42	l	(67)
						<u> </u>			l		21.97	25.42		(01)
		· ` ·	251.57			uation L	13 OF L1			1	227.44	244 22	1	(68)
(68)m=	255.6	258.25	l .	237.34	219.38	<u> </u>	!	188.57	195.25	209.48	227.44	244.32		(00)
		·	·			tion L15			ı —	1	1 20 00	1 20 00	1	(60)
(69)m=	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68		(69)
-	s and fai		<u> </u>								Γ.	Γ.	I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
	s e.g. ev		<u> </u>				-		·	1	1	1	•	
` '	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41		(71)
Water	heating	· `	able 5)	r		ı	ı		ı	•	,	,	•	
(72)m=	89.42	87.13	82.37	75.42	70.54	63.95	58.93	66.04	69.01	76.19	83.74	87.14		(72)
(12)111-			-											
` '	internal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m +	(70)m + (7	1)m + (72))m		
` '		gains = 432.65	417.43	392.25	366.26	(66) 341.34	m + (67)m 325.67	332.68	346.11	(70)m + (7 371.52	1)m + (72) 400.18	m 421.91		(73)

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

Orientation: Access Fac Table 6d	ctor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	14.28	x	11.28	x	0.63	X	0.7] =	49.24	(75)
Northeast 0.9x 0.77	х	14.28	x	22.97	X	0.63	X	0.7	=	100.23	(75)
Northeast 0.9x 0.77	x	14.28	x	41.38	x	0.63	X	0.7	=	180.58	(75)
Northeast 0.9x 0.77	х	14.28	x	67.96	X	0.63	X	0.7	=	296.57	(75)
Northeast 0.9x 0.77	х	14.28	x	91.35	X	0.63	X	0.7	=	398.65	(75)
Northeast 0.9x 0.77	x	14.28	x	97.38	x	0.63	X	0.7	=	425	(75)
Northeast 0.9x 0.77	x	14.28	x	91.1	x	0.63	X	0.7	=	397.58	(75)
Northeast _{0.9x} 0.77	X	14.28	x	72.63	x	0.63	X	0.7	=	316.95	(75)
Northeast 0.9x 0.77	x	14.28	x	50.42	x	0.63	X	0.7	=	220.04	(75)
Northeast 0.9x 0.77	x	14.28	x	28.07	x	0.63	X	0.7	=	122.49	(75)
Northeast _{0.9x} 0.77	X	14.28	x	14.2	x	0.63	X	0.7	=	61.96	(75)
Northeast _{0.9x} 0.77	x	14.28	x	9.21	x	0.63	X	0.7	=	40.21	(75)
Southeast 0.9x 0.77	X	2.09	x	36.79	x	0.63	X	0.7	=	23.5	(77)
Southeast 0.9x 0.77	X	2.09	x	62.67	x	0.63	X	0.7	=	40.03	(77)
Southeast 0.9x 0.77	x	2.09	x	85.75	x	0.63	X	0.7	=	54.77	(77)
Southeast 0.9x 0.77	X	2.09	x	106.25	x	0.63	X	0.7	=	67.87	(77)
Southeast 0.9x 0.77	x	2.09	x	119.01	x	0.63	X	0.7	=	76.02	(77)
Southeast 0.9x 0.77	x	2.09	x	118.15	x	0.63	X	0.7	=	75.47	(77)
Southeast 0.9x 0.77	x	2.09	x	113.91	x	0.63	X	0.7	=	72.76	(77)
Southeast 0.9x 0.77	x	2.09	x	104.39	X	0.63	X	0.7	=	66.68	(77)
Southeast 0.9x 0.77	x	2.09	x	92.85	x	0.63	X	0.7	=	59.31	(77)
Southeast 0.9x 0.77	X	2.09	x	69.27	x	0.63	X	0.7	=	44.24	(77)
Southeast 0.9x 0.77	X	2.09	x	44.07	x	0.63	X	0.7	=	28.15	(77)
Southeast 0.9x 0.77	X	2.09	x	31.49	x	0.63	X	0.7	=	20.11	(77)
Southwest _{0.9x} 0.77	X	5.89	x	36.79		0.63	X	0.7	=	66.23	(79)
Southwest _{0.9x} 0.77	x	5.89	x	62.67]	0.63	X	0.7	=	112.82	(79)
Southwest _{0.9x} 0.77	X	5.89	x	85.75]	0.63	X	0.7	=	154.36	(79)
Southwest _{0.9x} 0.77	x	5.89	x	106.25		0.63	X	0.7	=	191.26	(79)
Southwest _{0.9x} 0.77	X	5.89	x	119.01]	0.63	X	0.7	=	214.23	(79)
Southwest _{0.9x} 0.77	X	5.89	x	118.15]	0.63	X	0.7	=	212.68	(79)
Southwest _{0.9x} 0.77	X	5.89	x	113.91		0.63	X	0.7	=	205.04	(79)
Southwest _{0.9x} 0.77	X	5.89	x	104.39]	0.63	X	0.7	=	187.91	(79)
Southwest _{0.9x} 0.77	X	5.89	x	92.85		0.63	X	0.7	=	167.14	(79)
Southwest _{0.9x} 0.77	x	5.89	x	69.27]	0.63	X	0.7	=	124.69	(79)
Southwest _{0.9x} 0.77	x	5.89	x	44.07]	0.63	X	0.7	=	79.33	(79)
Southwest _{0.9x} 0.77	x	5.89	x	31.49]	0.63	X	0.7	=	56.68	(79)
Northwest 0.9x 0.77	x	0.52	x	11.28	x	0.63	X	0.7	=	1.79	(81)
Northwest 0.9x 0.77	x	0.52	x	22.97	x	0.63	X	0.7	=	3.65	(81)
Northwest _{0.9x} 0.77	X	0.52	x	41.38	x	0.63	×	0.7] =	6.58	(81)

Northwest 0.9x	0.77	X	0.5	52	x	67	7.96	X		0.63	x	0.7	=	10.8	(81)
Northwest _{0.9x}	0.77	X	9.0	52	x	91	1.35	x		0.63	x	0.7	=	14.52	(81)
Northwest 0.9x	0.77	X	0.5	52	x	97	7.38	x		0.63	x	0.7	=	15.48	(81)
Northwest _{0.9x}	0.77	X	0.5	52	x	9	1.1	x		0.63	x	0.7	=	14.48	(81)
Northwest _{0.9x}	0.77	X	0.5	52	x	72	2.63	X		0.63	x [0.7	=	11.54	(81)
Northwest _{0.9x}	0.77	X	0.5	52	x	50	0.42	X		0.63	x	0.7	=	8.01	(81)
Northwest 0.9x	0.77	x	0.5	52	x	28	3.07	x		0.63	x	0.7	=	4.46	(81)
Northwest _{0.9x}	0.77	x	0.5	52	x \lceil	1	4.2	x		0.63	_ x _	0.7	=	2.26	(81)
Northwest _{0.9x}	0.77	x	0.5	52	x \lceil	9	.21	x		0.63	_ x [0.7	=	1.46	(81)
_					_										_
Solar gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_	
(83)m= 140.77	256.73	396.29	566.49	703.41	728	3.62	689.86	583	.08	454.5	295.88	171.69	118.47		(83)
Total gains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (83	3)m ,	watts	_						_	
(84)m= 575.6	689.37	813.72	958.74	1069.67	106	9.96	1015.53	915	.77	800.62	667.4	571.87	540.37		(84)
7. Mean inter	nal temp	perature	(heating	season)										
Temperature	during h	neating p	eriods i	n the livii	ng a	rea fi	rom Tab	ole 9,	, Th	1 (°C)				21	(85)
Utilisation fac	tor for g	ains for	living are	ea, h1,m	(se	e Tal	ole 9a)								
Jan	Feb	Mar	Apr	May	J	un	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.96	0.86	0.	.7	0.54	0.6	§1	0.86	0.98	1	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollow	, ster	os 3 to 7	in T	able	e 9c)		•	•	_	
(87)m= 19.52	19.7	20	20.41	20.75	_	.93	20.98	20.	_	20.82	20.37	19.87	19.49		(87)
Temperature	during k	L	oriodo i	root of	طس	اممنال	from To	hla (2 (°C)		1	l		
(88)m= 19.83	19.83	19.83	19.84	19.85		.85	19.85	19.	$\overline{}$	19.85	19.85	19.84	19.84	1	(88)
` ′			<u> </u>	<u> </u>	l	I		L			.0.00	1	1	<u> </u>	(==)
Utilisation fac								r –	[0.70	0.07	T 0 00		7	(00)
(89)m= 1	0.99	0.98	0.94	0.81	0.	٥.	0.41	0.4	+/	0.79	0.97	0.99	1		(89)
Mean interna		†	1	1	<u> </u>	`		i 	$\overline{}$,		7	
(90)m= 17.87	18.13	18.57	19.15	19.6	19	.81	19.85	19.	85	19.71	19.11	18.39	17.83		(90)
										f	LA = Livir	ng area ÷ (4	4) =	0.3	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling)) = fL	A × T1	+ (1	– fL	A) × T2				_	
(92)m= 18.36	18.59	18.99	19.52	19.94	20	.14	20.18	20.	18	20.03	19.48	18.83	18.32		(92)
Apply adjustn	nent to t	he mear	interna	l temper	ature	e fror	m Table	4e,	whe	re appro	priate			-	
(93)m= 18.36	18.59	18.99	19.52	19.94	20	.14	20.18	20.	18	20.03	19.48	18.83	18.32		(93)
8. Space hea															
Set Ti to the i			•		ed a	at ste	p 11 of	Tabl	e 9b	, so tha	t Ti,m=(76)m an	d re-cal	culate	
the utilisation Jan	Feb	Mar	Apr	May	Ι,	un	Jul	Ι	ug	Sep	Oct	Nov	Dec	1	
Utilisation fac			<u> </u>	Iviay		uii	Jui		ug į	Sep	OCI	1407	Dec		
(94)m= 1	0.99	0.98	0.93	0.82	0.0	62	0.44	0.5	51	0.8	0.96	0.99	1		(94)
Useful gains,	hmGm			L 4)m	<u> </u>			<u> </u>				<u> </u>	<u> </u>		
(95)m= 573.53	683.7	795.86	893.72	874.71	66	8.2	451.18	469	.49	640.14	642.61	567.7	538.9		(95)
Monthly avera	age exte	ernal tem	perature	from Ta	able	8					I	1	1	_	
(96)m= 4.3	4.9	6.5	8.9	11.7		1.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al temp	erature,	Lm ,	W =	[(39)m	x [(9	3)m-	- (96)m]			_	
(97)m= 1843.42	1791.63	1630.87	1371.83	1062.1	707	7.73	457.63	481	.56	760.43	1144.76	1517.58	1835.37		(97)
														_	

Space heating	ng require	ement fo	r each m	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m= 944.8	744.53	621.25	344.23	139.42	0	0	0	0	373.6	683.91	964.57		_
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	4816.31	(98)
Space heating	ng require	ement in	kWh/m²	/year								48.38	(99)
9a. Energy re	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heati	_			/I-							Г		7(004)
Fraction of s			-		mentary	-	(202) = 1 -	(201) -			Ĺ	0	(201)
Fraction of s			•	• ,			(202) = 1 - (204) =	,	(202)] _		L	1	(202)
Fraction of to		_	•				(204) = (20	02) * [1 -	(203)] =		Ļ	1	(204)
Efficiency of	•					. 0/					Ļ	93.4	(206)
Efficiency of	_				· ·						<u> </u>	0	(208)
Jan Space heatir	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
944.8	744.53	621.25	344.23	139.42	0	0	0	0	373.6	683.91	964.57		
(211)m = {[(98	I 3)m x (20	4)1 } x 1	00 ÷ (20)6)	<u> </u>				<u> </u>				(211)
1011.56	i 	665.15	368.56	149.27	0	0	0	0	400	732.24	1032.73		(= : :)
							Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	₂ =	5156.65	(211)
Space heatir	ng fuel (s	econdar	y), kWh/	month							_		
$= \{[(98)m \times (2)]\}$	1	1		-	1				1	1			
(215)m= 0	0	0	0	0	0	0	0 Tota	0 L (k\\/b/voc	0 ar) =Sum(2	0	0		7(245)
Water heating	~						Tota	i (KVVII/yea	ar) =50111(2	213) _{15,1012}		0	(215)
Output from w	_	ter (calc	ulated al	oove)									
212.72	187.51	196.95	175.21	169.63	149.4	143.14	159.56	161.33	183.12	193.58	207.62		
Efficiency of w	vater hea	ter										80.3	(216)
(217)m= 88.36	88.17	87.74	86.72	84.56	80.3	80.3	80.3	80.3	86.81	87.96	88.43		(217)
Fuel for water $(219)m = (64)$	•												
(219)m = 240.75		224.46	202.03	200.6	186.05	178.25	198.71	200.9	210.94	220.08	234.78		
							Tota	I = Sum(2	19a) ₁₁₂ =			2510.23	(219)
Annual totals									k'	Wh/year	· -	kWh/yea	
Space heating	g fuel use	ed, main	system	1							Ĺ	5156.65	╛
Water heating	fuel use	d										2510.23	
Electricity for	pumps, f	ans and	electric	keep-ho	t								
central heati	ng pump	:									30		(2300
boiler with a	fan-assis	sted flue									45		(230
Total electricit	y for the	above, k	«Wh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for	•	•	-								L [402.42	(232)
,	5												` ′
Total delivere	d energy	for all u	ses (211) (221)	+ (231)	+ (232)	(237h)	_			Ī	8144.3	(338)

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	1113.84 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	542.21 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1656.05 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	208.86 (268)
Total CO2, kg/year	sum	of (265)(271) =	1903.83 (272)
TER =			19.12 (273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 14 February 2023

Property Details: 15592 - L1a Assessment

Dwelling type: Located in:Detached House
England

Region: Thames valley

Cross ventilation possible:YesNumber of storeys:2Front of dwelling faces:North

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient: 330.26 (P1)

Transmission heat loss coefficient: 107.1

Summer heat loss coefficient: 437.34 (P2)

Overhangs:

South West (Front Windows) 1
North East (Rear Windows) 1
South East (SE Windows) 1
North West (NW Windows) 1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (Front Win	dows)	0.9	1	0.9	(P8)
North East (Rear Windo	ows)	0.9	1	0.9	(P8)
South East (SE Windov	vs)1	0.9	1	0.9	(P8)
North West (NW Windo	ow)	0.9	1	0.9	(P8)

Solar gains

Orientation	Area	Flux	g_{-}	FF	Shading	Gains
South West (Front Windows)x	7.78	119.92	0.63	0.7	0.9	333.28
North East (Rear Windows)9 x	18.86	98.85	0.63	0.7	0.9	665.92
South East (SE Windows)0.9 x	2.76	119.92	0.63	0.7	0.9	118.23
North West (NW Window)).9 x	0.69	98.85	0.63	0.7	0.9	24.36
					Total	1141.79 (P3/P4)

Internal gains:

	June	July	August
Internal gains	484.11	463.83	472.7
Total summer gains	1703.28	1605.62	1458.63 (P5)
Summer gain/loss ratio	3.89	3.67	3.34 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	21.19	22.87	22.44 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature:	Medium
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