#### **Regulations Compliance Report**



Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8 *Printed on 09 October 2020 at 11:49:28* 

Project Information:

Assessed By: Chris Mcdonald (STRO007579) Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 175.06m<sup>2</sup>

Site Reference: Broome Farm Barn

Plot Reference: Plot 1 LPG

Address: Land West of Broome Farm Barn, Broome, Craven Arms

Client Details:

Name: Neil Homer

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: Bulk LPG

Fuel factor: 1.06 (lpg)

Target Carbon Dioxide Emission Rate (TER) 15.49 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.42 kg/m²

15.42 kg/m<sup>2</sup> **OK** 

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.0 kWh/m²
Dwelling Fabric Energy Efficiency (DFEE) 52.5 kWh/m²

OK

2 Fabric U-values

Element **Average Highest** External wall 0.16 (max. 0.30) 0.16 (max. 0.70) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) **OK** OK Roof 0.10 (max. 0.20) 0.10 (max. 0.35) **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: Boiler systems with radiators or underfloor heating - LPG

Data from manufacturer

Efficiency 90.0 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.79 kWh/day

Permitted by DBSCG: 2.30 kWh/day OK

Primary pipework insulated: Yes OK

# **Regulations Compliance Report**



OK

OK

OK

# Space heating controls Hot water controls: Cylinderstat Independent timer for DHW

Boiler interlock: Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0%

OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Midlands):

Not significant

OK

Based on:

Overshading: Average or unknown

Windows facing: North9.69m²Windows facing: South21.2m²Windows facing: East2.9m²Windows facing: West1.3m²Ventilation rate:8.00

Blinds/curtains: Dark-coloured curtain or roller blind

Closed 100% of daylight hours

10 Key features

Roofs U-value Photovoltaic array 0.1 W/m<sup>2</sup>K

# **Thermal Bridge Report**



Property Details: Plot 1 LPG

Address: Land West of Broome Farm Barn, Broome, Craven Arms

Located in: England Region: Midlands

Thermal bridges

Thermal bridges: User-defined = UD

Default = D Approved = A

User-defined (individual PSI-values) Y-Value = 0.0895

#### External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.5	25.88	E1	[A]
Sill	0.04	25.88	E3	[A]
Jamb	0.05	42.3	E4	[A]
Ground floor (normal)	0.16	45	E5	[A]
Intermediate floor within a dwelling	0.07	45	E6	[A]
Eaves (insulation at ceiling level)	0.06	25.05	E10	[A]
Gable (insulation at ceiling level)	0.24	20.3	E12	[A]
Corner (normal)	0.09	37.06	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	16.62	E17	[A]

#### **Code for Sustainable Homes Report**

For use with Nov 2010 addendum 2014 England



#### **Assessor and House Details**

Assessor Name: Chris Mcdonald Assessor Number: STRO007579

**Property Address:** Land West of Broome Farm Barn

Broome Craven Arms

#### **Building regulation assessment**

**kg/m²/year** 15.49

TER 15.49 DER 15.42

#### **ENE 1 Assessment - Dwelling Emission Rate**

#### Total Energy Type CO<sub>2</sub> Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		15.42	(ZC1)
TER		15.49	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricty generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		15.42	
% improvement DER/TER	0.5		

#### **Total Energy Type CO2 Emissions for Codes Levels 6**

	kg/m²/year	
DER accounting for SAP Section 16 allowances	15.42	(ZC1)
CO2 emissions from appliances, equation (L14)	11.69	(ZC2)
CO2 emissions from cooking, equation (L16)	1.09	(ZC3)
Net CO2 emissions	27.2	(ZC8)

#### Result:

Credits awarded for ENE 1 = 0

Code Level = 3

#### **ENE 2 - Fabric energy Efficiency**

Fabric energy Efficiency: 52.46 Credits awarded for ENE 2 = 4.8

#### **ENE 7 - Low or Zero Carbon (LZC) Technologies**

#### **Reduction in CO2 Emissions**

	%	kg/m²/year
Standard Case CO2 emissions		30.21
Standard DER		17.43
Actual Case CO2 emissions		27.17
Actual DER		14.39

Reduction in CO2 emissions 10.06

#### Credits awarded for ENE 7 = 1

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA. It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

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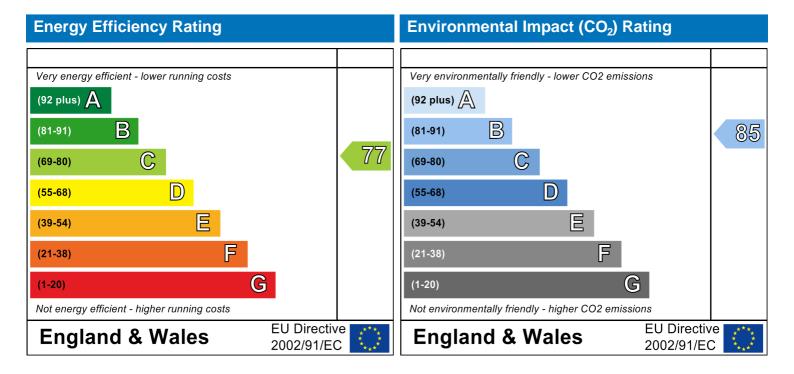
#### **Predicted Energy Assessment**



Land West of Broome Farm Barn Broome Craven Arms Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 08 October 2020 Chris Mcdonald 175.06 m<sup>2</sup>

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

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



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

#### **SAP Input**



#### Property Details: Plot 1 LPG

Address: Land West of Broome Farm Barn, Broome, Craven Arms

Located in: England Region: Midlands

**UPRN:** 

Date of assessment: 08 October 2020
Date of certificate: 09 October 2020

Assessment type: New dwelling design stage

Transaction type: Marketed sale
Tenure type: Owner-occupied
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

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

PCDF Version: 466

#### Property description:

Dwelling type: House
Detachment: Detached
Year Completed: 2020

Floor Location: Floor area:

Storey height:

1.4

1.3

1

Floor 0 92.92 m<sup>2</sup> 2.7 m Floor 1 82.14 m<sup>2</sup> 2.41 m

Living area: 25.81 m<sup>2</sup> (fraction 0.147)

Front of dwelling faces: South

#### Opening types:

West

Name:	Source:	Type:	Glazing:	Argon:	Frame:
North	Manufacturer	Solid			Wood
North	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	Wood
South	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	Wood
East	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	Wood
West	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	Wood

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
North	mm	0.7	0	1.6	1.9	1
North	16mm or more	0.7	0.63	1.4	9.69	1
South	16mm or more	0.7	0.63	1.4	21.2	1
East	16mm or more	0.7	0.63	1.4	2.9	1

0.63

Orient: Width: Height: Name: Type-Name: Location: North External wall North 0 North North 0 External wall 0 0 0 South External wall South 0 East External wall East 0 West External wall West

0.7

Overshading: Average or unknown

16mm or more

#### Onaque Flements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemer	<u>its</u>						
External wall	201.48	36.99	164.49	0.16	0	False	N/A
Flat ceiling	92.92	0	92.92	0.1	0		N/A
Ground floor	92.92			0.14			N/A

# **SAP Input**



# Internal Elements Party Elements

<u>Party Elements</u>										
Thermal bridges:										
Thermal bridges:	User-define	ed (individual F	PSI-values	) Y-Value = 0.0895						
e.mar z.nagee.	Length	Psi-value								
[Approved]	25.88	0.5	E1	Steel lintel with perforated steel base plate						
[Approved]	25.88	0.04	E3	Sill						
[Approved]	42.3	0.05	E4 E5 E6 E10	Jamb						
[Approved]	45	0.16		Ground floor (normal)						
[Approved]	45	0.07		Intermediate floor within a dwelling						
[Approved]	25.05	0.06		Eaves (insulation at ceiling level)						
[Approved]	20.3	0.24	E12	Gable (insulation at ceiling level)						
[Approved]	37.06	0.09	E16	Corner (normal)						
[Approved]	16.62	-0.09	E17	Corner (inverted internal area greater than external area)						
Ventilation:										
Pressure test:	Yes (As des	signed)								
Ventilation:	Natural ver	ntilation (extra	ct fans)							
Number of chimneys:	0									
Number of open flues:	1 (main: 0,	secondary: 1,	other: 0)							
Number of fans:	5									
Number of passive stacks:	0									
Number of sides sheltered:	0									
Pressure test:	5									
Main heating system:										
Main heating system:	Boiler syste	ems with radiat	tors or und	derfloor heating						
Wall Hoating System.	•	and oil boilers								
	Fuel: bulk L									
		e: Manufacture	er Declarat	ion						
	Manufactur									
		90.0% (SEDBL	JK2009)							
	•	ndensing with		ignition						
	Fuel Burnin	-								
	Underfloor heating, pipes in screed above insulation									
	Central hea	ating pump: 20	013 or late	er						
	Design flow	Design flow temperature: Design flow temperature <= 35°C								
	Room-seale	ed								
Main heating Control	Boiler interl	lock: Yes								
Main heating Control:	Time	o ma m o == 4:	<b>n</b> o e = :: 1	l hu quitable arrangement of almostic						
Main heating Control:		emperature zo	ne controi	by suitable arrangement of plumbing and electrical						
	services	I- 0110								
	Control cod	ie: 2110								
Secondary heating system:	None									
Secondary heating system: Water heating:	None									
-	Erom main	hoating custor	m							
Water heating:		heating syster	П							
	Water code									
	Fuel :bulk L									
	Hot water of	-	20							
	•	lume: 210 litre		2						
	-	sulation: Facto	-	II						
	Cylindersta	ework insulati	on. Hue							

Cylinderstat: True

Cylinder in heated space: True

### **SAP Input**



Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: No

Conservatory: No conservatory

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

Photovoltaics: Photovoltaic 1

Installed Peak power: 1.5 Tilt of collector: 45° Overshading: Modest Collector Orientation: South

Assess Zero Carbon Home: No



#### User Details

Assessor Name: Chris Mcdonald Stroma Number: STRO007579
Software Name: Stroma FSAP 2012 Software Version: 1.0.5.8

Software Name:	Stroma FSAP 2012	Software	n: 1.0.5.8			
	Pro	operty Address: Plo	ot 1 LPG			
Address :	Land West of Broome Farm B	Barn, Broome, Cra	en Arms			
1. Overall dwelling dime	ensions:					
Ground floor		Area(m²)	Av. Heigl	<del></del>	Volume(m <sup>3</sup>	<u>^</u>
		92.92 (1a)	X 2.7	(2a) =	250.88	(3a)
First floor		82.14 (1b)	x 2.41	(2b) =	197.96	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	175.06 (4)				
Dwelling volume		(3a	)+(3b)+(3c)+(3d)+(	(3e)+(3n) =	448.84	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total		m³ per hou	ır
Number of chimneys	0 + 0	+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 1	+ 0	= 1	x 20 =	20	(6b)
Number of intermittent fa	ns		5	x 10 =	50	(7a)
Number of passive vents	:		0	x 10 =	0	(7b)
Number of flueless gas fi	res		0	x 40 =	0	(7c)
					ongoo nor he	
Infilmation due to object	(Co) (Ch) (70	)		_	nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(7a neen carried out or is intended, proceed		70 nue from (9) to (16	÷ (5) =	0.16	(8)
Number of storeys in the		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(-) (-)	,	0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame or 0	0.35 for masonry co	onstruction		0	(11)
	resent, use the value corresponding to t	he greater wall area (af	ter			
deducting areas of openii	floor, enter 0.2 (unsealed) or 0.1	(sealed), else ente	er O		0	(12)
If no draught lobby, en	,	(000.00), 0.00 0			0	(13)
•	s and doors draught stripped				0	(14)
Window infiltration	0 11	0.25 - [0.2 x (1	4) ÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (11	1) + (12) + (13) + (1	15) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per squa	re metre of env	elope area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$	, otherwise $(18) = (16)$			0.41	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permea	ability is being used	1		
Number of sides sheltere	ed	(00) 4 50 0	75 ·· (40)]		0	(19)
Shelter factor		(20) = 1 - [0.07]			1	(20)
Infiltration rate incorporate	ting shelter factor	$(21) = (18) \times (2)$	20) =		0.41	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthl	y avera	ge wind	speed fr	om Tabl	e 7							
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7



Wind Factor (22a)	m = (22)m ÷	- 4										
	25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
								<u>!</u>	<u>l</u>	ļ		
Adjusted infiltration	<del>`</del>	<del></del>			<del>i i</del>	<del>`</del>	<del>ì ´</del>		0.40	0.40		
0.52 0.  Calculate effective		0.45	0.44 he appli	0.39 <b>cable ca</b>	0.39 ase	0.38	0.41	0.44	0.46	0.48		
If mechanical ve	•										0	(23a)
If exhaust air heat p	ump using App	endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with hea	t recovery: effic	ciency in %	allowing f	for in-use f	factor (fron	n Table 4h	) =				0	(23c)
a) If balanced m	echanical v	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced m	echanical v	entilation	without	heat red	covery (I	MV) (24b	)m = (22	2b)m + (	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house			•									
if (22b)m < 0	<del></del>	<del>- ` </del>	ŕ	<del>i                                     </del>	<del>- `</del>	<del>ŕ `</del>	<del></del>	<u> </u>	<del></del>		ı	
( )	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural vent if (22b)m = 1			•					0.51				
	63 0.62	1000000000000000000000000000000000000	0.6	0.57	0.57	0.5 + [(2	0.58	0.5]	0.6	0.61		(24d)
Effective air cha				ļ	<u> </u>	ļ		0.0	0.0	0.01		( - 7
	63 0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61		(25)
` ′		1		1	1					1		
3 Heat lesses an	d boot loca											
3. Heat losses an												
ELEMENT	Gross area (m²)	Openin Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k J/K
ELEMENT	Gross	Openin	ıgs									
ELEMENT	Gross	Openin	ıgs	A ,r	m² x	W/m2	2K = [	(W/				J/K
ELEMENT a	Gross	Openin	ıgs	A ,r	m <sup>2</sup> x	W/m2	2K = [ 0.04] = [	(W/				J/K (26)
ELEMENT  Doors  Windows Type 1	Gross	Openin	ıgs	A ,r 1.9 9.69	m² x x1 x1	W/m2 1.6 /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	3.04 12.85				J/K (26) (27)
ELEMENT Doors Windows Type 1 Windows Type 2	Gross	Openin	ıgs	A ,r 1.9 9.69 21.2	m² x x1 x1 x1	W/m2 1.6 /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}  & & & \\  & & & &$	3.04 12.85 28.11				(26) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3	Gross	Openin	ıgs	A ,r 1.9 9.69 21.2 2.9	m² x x1 x1 x1	W/m2 1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}  & & & \\  & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\$	3.04 12.85 28.11 3.84	K)			(26) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Gross	Openin	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3	m² x x1 x1 x1 x1 x1 x1	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}   & & & & \\   & & & & \\   & & & \\   & & & \\   & & \\ $	3.04 12.85 28.11 3.84 1.72	K)			(26) (27) (27) (27) (27) (27) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor	Gross area (m²)	Openin	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3	m² x1 x1 x1 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.14  0.16	K	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32	K)			(26) (27) (27) (27) (27) (27) (28) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof	201.48 92.92	Openin m	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4	m² x x1 x1 x1 x1 x2 x x1 9 x x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K	3.04 12.85 28.11 3.84 1.72	K)			(26) (27) (27) (27) (27) (27) (28) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls	201.48 92.92 ents, m <sup>2</sup>	Openin m	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)	kJ/m²-l		(26) (27) (27) (27) (27) (27) (28) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem	201.48  92.92 ents, m² windows, use	Openin m 36.9 0	ngs n² 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)	kJ/m²-l		(26) (27) (27) (27) (27) (27) (28) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof	201.48  92.92  ents, m²  windows, use both sides of i	Openin m 36.9 0 effective with the state of	ngs n² 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)	kJ/m²-l		(26) (27) (27) (27) (27) (27) (28) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on	201.48  92.92  ents, m²  windows, use both sides of i	Openin m 36.9 0 effective with the state of	ngs n² 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6  /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1	$ \begin{array}{ccc} 2K & & & & & \\  & & & & & \\  & & & & & \\  & & & &$	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)  B  Construction  B  Construction  Constr	kJ/m²-l	3.2 k	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V	201.48  92.92  ents, m² windows, use both sides of it.  J/K = S (A x k)	36.9  0  effective with internal walk (U)	ngs n² 9 indow U-va	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 x2 x x x2 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 )+  0.14  0.16  0.1	$ \begin{array}{ccc} 2K & & & & & \\  & & & & & \\  & & & & & \\  & & & &$	3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)  3  [ ] as given in  (2) + (32a).	kJ/m²-l	3.2 98.18	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V Heat capacity Cm	201.48  92.92  ents, m²  windows, use both sides of i  V/K = S (A x k )  ameter (TM is where the di	36.9  36.9  0  effective with internal walk (U)  P = Cm - etails of the	gs n² 9 indow U-va lls and pan	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	m²	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & & \\   & & & & & & \\   & & & & & \\   & & & & & \\   & & & & & \\   & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & $	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29 (e)+0.04] & & & & & & & & & & & & & & & & & & &	K)  3  (as given in 2) + (32a).  (32a).	kJ/m²·l paragraph (32e) =	98.18 12537.89	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V Heat capacity Cm Thermal mass par For design assessmen	201.48  92.92  ents, m²  windows, use both sides of i  V/K = S (A x k )  ameter (TM is where the di a detailed calc	Openin m  36.9  0  effective with ternal walk (U)  P = Cm - etails of the culation.	gs 12 9 indow U-va lls and pan ÷ TFA) in	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 x2 x 2 x 2 x 49 x 40	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & & \\   & & & & & & \\   & & & & & \\   & & & & & \\   & & & & & \\   & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & $	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29 (e)+0.04] & & & & & & & & & & & & & & & & & & &	K)  3  (as given in 2) + (32a).  (32a).	kJ/m²·l paragraph (32e) =	98.18 12537.89	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V Heat capacity Cm Thermal mass par For design assessment can be used instead of	201.48  92.92  ents, m²  windows, use both sides of it  V/K = S (A x k )  ameter (TM  ts where the da a detailed calc S (L x Y) ca	36.9  36.9  0  effective with internal walk (U)  P = Cm - etails of the culation.  Iculated	gs  9  indow U-va ils and pan e construction	A ,r  1.9  9.69  21.2  2.9  1.3  92.92  164.4  92.92  387.3  alue calculatitions  n kJ/m²K	x1 x1 x1 x1 x2 x 2 x 2 x 49 x 40	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & & \\   & & & & & & \\   & & & & & \\   & & & & & \\   & & & & & \\   & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & $	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29 (e)+0.04] & & & & & & & & & & & & & & & & & & &	K)  3  (as given in 2) + (32a).  (32a).	kJ/m²·l paragraph (32e) =	98.18 12537.89 250	(26) (27) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35)



Ventilat	tion hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	93.9	93.13	92.37	88.83	88.16	85.07	85.07	84.5	86.26	88.16	89.51	90.91		(38)
Heat tra	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	226.73	225.96	225.21	221.66	221	217.91	217.91	217.34	219.1	221	222.34	223.74		
			II D) \\	/ 21 <i>C</i>		-	-				Sum(39) <sub>1</sub> .	12 /12=	221.66	(39)
г	ss para	1.29	HLP), W/	1.27	1.26	1.24	1.24	1.24	(40)m 1.25	= (39)m ÷	1.27	1.28		
(40)m=	1.3	1.29	1.29	1.27	1.20	1.24	1.24	1.24	<u> </u>		Sum(40) <sub>1</sub> .	l	1.27	(40)
Numbe	r of day	/s in moi	nth (Tab	le 1a)						tvorage =	- Cum(40)1.	12712—	1.21	(```
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, l	N								2	97		(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		<i>51</i>		( .= /
	A £ 13.9	•	ator usac	no in litro	s par da	y Vd av	orago –	(25 x N)	± 36		40	4.70		(42)
								to achieve		se target o		4.72		(43)
not more	that 125	litres per p	person pei	r day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate		n litres per		ach month	Vd,m = fa			(43)				1		
(44)m=	115.19	111	106.82	102.63	98.44	94.25	94.25	98.44	102.63	106.82	111	115.19		7
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1256.65	(44)
(45)m=	170.83	149.41	154.17	134.41	128.97	111.29	103.13	118.34	119.76	139.56	152.35	165.44		
		<u> </u>	<u> </u>	<u> </u>		<u>!</u>	!	<u> </u>		Γotal = Su	l m(45) <sub>112</sub> =	=	1647.67	(45)
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)			•		
(46)m=	25.62	22.41	23.13	20.16	19.35	16.69	15.47	17.75	17.96	20.93	22.85	24.82		(46)
Water 5	_		includir	na anv sa	olar or M	/WHRS	storana	within sa	ame ves	امء		240		(47)
_		, ,		ink in dw			_		arric ves	301		210		(47)
		-			-			mbi boil	ers) ente	er '0' in (	47)			
Waters	-													
,				oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
• • • • • • • • • • • • • • • • • • • •			-	e, kWh/ye cylinder l		or is not		(48) x (49)	) =		2	10		(50)
•				om Tabl							0.	01		(51)
	•	_	ee secti	on 4.3										
		from Ta		OI.								83		(52)
•			m Table						. (==> (	>		54		(53)
•		m water (54) in (5	_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		97		(54)
		. , .	,	for each	month			((56)m = (	55) × (41)	m	0.	97		(55)
(56)m=	30.01	27.11	30.01	29.05	30.01	29.05	30.01	30.01	29.05	30.01	29.05	30.01		(56)
(50)111=	55.01		1 00.01	1	20.01	1	1 30.01	1 30.01	1	20.01	1	00.01		(55)



If cylinder co	ntains 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	lix H	
(57)m= 30	0.01 27.11	30.01	29.05	30.01	29.05	30.01	30.01	29.05	30.01	29.05	30.01		(57)
Primary ci	rcuit loss (ar	nual) fro	m Table	e 3							0		(58)
Primary ci	rcuit loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modifie	ed by factor f	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)		•	
(59)m= 23	3.26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi los	s calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat	required for	water he	eating ca	alculated	l for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 22	24.1 197.53	207.45	185.97	182.25	162.85	156.41	171.62	171.31	192.84	203.9	218.71		(62)
Solar DHW i	nput calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add addit	ional lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)				_	
(63)m=	0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output fro	m water hea	ter											
(64)m= 22	24.1 197.53	207.45	185.97	182.25	162.85	156.41	171.62	171.31	192.84	203.9	218.71		
	•						Outp	out from wa	ater heate	r (annual)₁	12	2274.95	(64)
Heat gain	s from water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	
· · ·	9.42 88.17	93.88	85.94	85.5	78.25	76.91	81.97	81.06	89.03	91.9	97.63		(65)
include	(57)m in cal	culation of	of (65)m	only if c	vlinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	ı ıeating	
	al gains (see			•	,		<u> </u>				,	<u> </u>	
				) <del>-</del>									
	gains (Table lan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<u> </u>	8.16 178.16	178.16	178.16	178.16	178.16	178.16	178.16	178.16	178.16	178.16	178.16		(66)
` ′	ains (calcula						<u> </u>			l			
· · ·	7.79 69.09	56.19	42.54	21.8	26.85	29.01	37.71	50.61	64.26	75	79.95	1	(67)
` ′							<u> </u>	<u> </u>		10	75.55		(0.)
	s gains (calc 7.43 522.8	509.27		444.1	409.93	387.1	381.73	395.26	424.06	460.42	494.6		(68)
` ′							<u> </u>			460.42	494.6		(00)
	ains (calcula			<del>' '</del>			<u> </u>			l		ı	(00)
` '	5.79 55.79	55.79	55.79	55.79	55.79	55.79	55.79	55.79	55.79	55.79	55.79		(69)
· -	d fans gains	r <del>`</del>					·	г		1	г	•	
(70)m=	3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.	g. evaporation	n (nega	tive valu	es) (Tab	le 5)							ī	
(71)m= -11	8.77 -118.77	-118.77	-118.77	-118.77	-118.77	-118.77	-118.77	-118.77	-118.77	-118.77	-118.77		(71)
Water hea	ating gains (1	able 5)										_	
(72)m= 13	3.63 131.21	126.19	119.36	114.92	108.68	103.38	110.17	112.59	119.66	127.64	131.22		(72)
Total inte	rnal gains =	•			(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m= 84	7.02 841.27	809.82	760.53	709	663.63	637.65	647.78	676.63	726.15	781.23	823.94		(73)
6. Solar	gains:												
Solar gains	are calculated	using sola	r flux from	Table 6a	and associ	ated equa	tions to co	nvert to th	e applicat	ole orientat	ion.		
Orientatio	n: Access F	actor	Area		Flu		-	g_ 	<del>-</del>	FF		Gains	

Table 6d

m²

Table 6a

Table 6b

Table 6c

(W)



	_		_		_		_				_		
North	0.9x	0.77	X	9.69	X	10.63	X	0.63	X	0.7	=	31.49	(74)
North	0.9x	0.77	X	9.69	X	20.32	x	0.63	X	0.7	=	60.18	(74)
North	0.9x	0.77	X	9.69	X	34.53	X	0.63	X	0.7	=	102.26	(74)
North	0.9x	0.77	X	9.69	x	55.46	X	0.63	X	0.7	=	164.25	(74)
North	0.9x	0.77	X	9.69	x	74.72	X	0.63	X	0.7	=	221.26	(74)
North	0.9x	0.77	X	9.69	x	79.99	X	0.63	x	0.7	=	236.87	(74)
North	0.9x	0.77	X	9.69	x	74.68	X	0.63	x	0.7	=	221.15	(74)
North	0.9x	0.77	X	9.69	x	59.25	x	0.63	x	0.7	=	175.45	(74)
North	0.9x	0.77	X	9.69	x	41.52	X	0.63	X	0.7	=	122.95	(74)
North	0.9x	0.77	X	9.69	x	24.19	X	0.63	X	0.7	=	71.63	(74)
North	0.9x	0.77	X	9.69	X	13.12	X	0.63	X	0.7	=	38.85	(74)
North	0.9x	0.77	X	9.69	X	8.86	X	0.63	X	0.7	=	26.25	(74)
East	0.9x	0.77	X	2.9	X	19.64	X	0.63	X	0.7	=	17.41	(76)
East	0.9x	0.77	X	2.9	X	38.42	X	0.63	X	0.7	=	34.05	(76)
East	0.9x	0.77	X	2.9	x	63.27	X	0.63	X	0.7	=	56.08	(76)
East	0.9x	0.77	X	2.9	x	92.28	X	0.63	X	0.7	=	81.79	(76)
East	0.9x	0.77	X	2.9	X	113.09	X	0.63	X	0.7	=	100.23	(76)
East	0.9x	0.77	X	2.9	X	115.77	x	0.63	x	0.7	=	102.6	(76)
East	0.9x	0.77	X	2.9	X	110.22	X	0.63	X	0.7	=	97.68	(76)
East	0.9x	0.77	X	2.9	X	94.68	X	0.63	X	0.7	=	83.91	(76)
East	0.9x	0.77	X	2.9	X	73.59	X	0.63	x	0.7	=	65.22	(76)
East	0.9x	0.77	X	2.9	x	45.59	X	0.63	X	0.7	=	40.4	(76)
East	0.9x	0.77	X	2.9	X	24.49	X	0.63	X	0.7	=	21.7	(76)
East	0.9x	0.77	X	2.9	X	16.15	X	0.63	x	0.7	=	14.31	(76)
South	0.9x	0.77	X	21.2	X	46.75	x	0.63	X	0.7	=	302.91	(78)
South	0.9x	0.77	X	21.2	x	76.57	x	0.63	x	0.7	=	496.08	(78)
South	0.9x	0.77	X	21.2	x	97.53	x	0.63	x	0.7	=	631.92	(78)
South	0.9x	0.77	X	21.2	x	110.23	x	0.63	x	0.7	=	714.21	(78)
South	0.9x	0.77	X	21.2	X	114.87	X	0.63	x	0.7	=	744.25	(78)
South	0.9x	0.77	X	21.2	X	110.55	X	0.63	X	0.7	=	716.24	(78)
South	0.9x	0.77	X	21.2	X	108.01	X	0.63	X	0.7	=	699.81	(78)
South	0.9x	0.77	X	21.2	X	104.89	X	0.63	x	0.7	=	679.61	(78)
South	0.9x	0.77	X	21.2	X	101.89	X	0.63	x	0.7	=	660.12	(78)
South	0.9x	0.77	X	21.2	x	82.59	X	0.63	x	0.7	=	535.07	(78)
South	0.9x	0.77	X	21.2	X	55.42	x	0.63	x	0.7	=	359.05	(78)
South	0.9x	0.77	X	21.2	x	40.4	x	0.63	x	0.7	=	261.74	(78)
West	0.9x	0.77	X	1.3	X	19.64	X	0.63	X	0.7	=	7.8	(80)
West	0.9x	0.77	X	1.3	x	38.42	x	0.63	x	0.7	=	15.26	(80)
West	0.9x	0.77	X	1.3	x	63.27	x	0.63	x	0.7	=	25.14	(80)
West	0.9x	0.77	X	1.3	x	92.28	x	0.63	x	0.7	=	36.66	(80)
West	0.9x	0.77	X	1.3	X	113.09	X	0.63	X	0.7	=	44.93	(80)



West	0.9x	0.77	х	1.	3	x [	11	15.77	x		0.63	x	0.7	=	46	(80)
West	0.9x	0.77	x	1.	3	x [	11	10.22	х		0.63	x [	0.7	=	43.79	(80)
West	0.9x	0.77	х	1.	3	х	9	4.68	х		0.63	x	0.7	=	37.61	(80)
West	0.9x	0.77	x	1.	3	х	7	3.59	х		0.63	×	0.7	=	29.24	(80)
West	0.9x	0.77	x	1.	3	х	4	5.59	x		0.63	×	0.7	=	18.11	(80)
West	0.9x	0.77	x	1.	3	х	2	4.49	x		0.63	×	0.7	=	9.73	(80)
West	0.9x	0.77	x	1.	3	х	1	6.15	х		0.63	×	0.7	=	6.42	(80)
	_					Ī			•							
Solar ga	ains in	watts, ca	alculated	d for eac	h month				(83)m	n = Si	um(74)m .	(82)m				
(83)m=	359.61	605.58	815.39	996.91	1110.67	110	01.71	1062.43	976	5.59	877.52	665.22	429.33	308.72		(83)
Total ga	ains – ii	nternal a	nd sola	r (84)m =	= (73)m	+ (8	3)m ,	, watts							_	
(84)m=	1206.63	1446.85	1625.21	1757.44	1819.67	176	65.33	1700.08	1624	4.36	1554.15	1391.37	1210.56	1132.66		(84)
7. Mea	an inter	nal temp	erature	(heating	season	)										
Tempe	erature	during h	eating p	eriods ir	n the livi	ng a	area f	rom Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for	living are	ea, h1,m	ı (se	е Та	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ť,	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	]	
(86)m=	1	0.99	0.98	0.95	0.87	0	.72	0.55	0.5	59	0.81	0.96	0.99	1		(86)
Mean	interna	l tompor	atura in	living ar	oa T1 /f/	حالم	w sto	ns 3 to 7	l 7 in T	I	2 00)		_	ļ.	J	
(87)m=	19.93	20.08	20.28	20.54	20.76		0.89	20.93	20.		20.84	20.56	20.2	19.91	]	(87)
_						_			<u> </u>	!				ļ	J	
(88)m=	19.84	19.85	19.85	periods in	19.87	т —	9.88	19.88	19.		12 (°C) 19.88	19.87	19.86	19.86	1	(88)
_										09	19.00	19.07	19.00	19.00		(00)
г		Ť		rest of d		т —	<u> </u>		<del>–</del>				_	ı	1	
(89)m=	1	0.99	0.97	0.93	0.82	0	.62	0.42	0.4	46	0.73	0.94	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing <sup>·</sup>	T2 (fc	ollow ste	ps 3	8 to 7	in Tabl	e 9c)				
(90)m=	18.42	18.64	18.94	19.32	19.6	19	9.77	19.8	19	.8	19.72	19.36	18.83	18.4		(90)
				-	-		_		-		f	LA = Livi	ng area ÷ (	4) =	0.15	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llinc	1) = fl	A x T1	+ (1	– fL	A) x T2					
(92)m=	18.65	18.85	19.14	19.5	19.77	$\overline{}$	9.93	19.96	19.		19.89	19.54	19.03	18.63	]	(92)
Apply	adjustn	nent to th	ne mear	n interna	l temper	atur	re fro	m Table	4e,	whe	re appro	priate	1	<u>!</u>	ı	
(93)m=	18.65	18.85	19.14	19.5	19.77	19	9.93	19.96	19.	96	19.89	19.54	19.03	18.63		(93)
8. Spa	ice hea	ting requ	uiremen	t									•			
				•		ned	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the util				using Ta	i								1		1	
L	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Г		tor for g		1	0.00	Ι.,		0.40		4-7	0.70	0.00	1 000	0.00	1	(04)
(94)m=	0.99	0.98	0.97	0.92	0.82	0	.62	0.43	0.4	+7	0.73	0.93	0.99	0.99		(94)
				4)m x (8- 1615.36	<del></del>	110	01 21	725	762	01	1136.98	1298.4	1102 16	1126.84	1	(95)
L				perature	<u> </u>			723	702	01	1130.90	1290.4	1193.16	1120.04		(33)
(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	1	(96)
L				nal tempe	l .	<u> </u>			l					L <u>-</u>	J	(-5)
				2349.53		_			774		1267.51	Ī	2653.38	3227.75	]	(97)
L				r each n	<u> </u>										J	• •
		1161.52	950.24	528.6	223.69	T	0	0	C	1	0	503.2	T	1563.08	]	
` ′			<u> </u>	L	<u> </u>	—							1		J	



						Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	7509.95	(98)
Space heating require	ement in	kWh/m²	/year							Ī	42.9	(99)
9a. Energy requiremen	ıts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)			_		
Space heating:										_		_
Fraction of space hea	t from so	econdar	y/supple	mentary	system						0	(201)
Fraction of space hea		-	. ,			(202) = 1 -	` '				1	(202)
Fraction of total heating	·	-				(204) = (204)	02) × [1 –	(203)] =		L	1	(204)
Efficiency of main spa											90.9	(206)
Efficiency of secondar	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating require	950.24					_		502.2	1051 25	1562.00		
		528.6	223.69	0	0	0	0	503.2	1051.35	1563.08		(5.4.1)
$(211)m = \{[(98)m \times (20)] \\ 1681.28  1277.79 \}$		00 ÷ (20 581.52	246.08	0	0	0	0	553.57	1156.6	1719.56		(211)
1001.20 1277.70	1040.07	001.02	240.00						211) <sub>15.1012</sub>		8261.77	(211)
Space heating fuel (se	econdar	v). kWh/	month							L		<b>」</b> ` ′
$= \{[(98)m \times (201)]\} \times 10^{-1}$		• , .										
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		
						Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>=</b>	0	(215)
Water heating	. , ,											
Output from water hear	ter (calc 207.45	ulated al	182.25	162.85	156.41	171.62	171.31	192.84	203.9	218.71		
Efficiency of water hea											80.8	(216)
(217)m= 89.47 89.28	88.91	88.04	86.07	80.8	80.8	80.8	80.8	87.86	89.09	89.53		(217)
Fuel for water heating,					<u>.                                    </u>				!			
$(219)m = (64)m \times 100$ (219)m = 250.48  221.25	÷ (217) 233.33	m 211.24	211.75	201.55	193.57	212.4	212.02	219.49	228.87	244.3		
(219)111= 230.46   221.23	233.33	211.24	211.75	201.55	193.57		I = Sum(2	<u> </u>	220.07	244.3	2640.25	(219)
Annual totals							`		Wh/year	. L	kWh/year	
Space heating fuel use	d, main	system	1						, cu.		8261.77	7
Water heating fuel use	d									Ī	2640.25	Ħ
Electricity for pumps, fa	ans and	electric	keep-ho	t						L		_
central heating pump:			•							30		(230c)
boiler with a fan-assis										45		(230e)
Total electricity for the		(Mh/yρa	r			sum	of (230a).	(230a) =			75	(231)
•	above, i	(VVIII) y Ca				ou	o. (200a).	(2009)		L		╣
Electricity for lighting	5) (									L	549.53	(232)
Electricity generated by										L	-1025.35	(233)
10a. Fuel costs - indiv	ridual he	eating sy	stems:									
				Fu	el /b/voor			Fuel P	rice		Fuel Cost	

kWh/year

£/year

(Table 12)



Space heating - main system 1	(211) x	7.6 x 0.01	627.89 (240)
Space heating - main system 2	(213) x	0 x 0.01	0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	0 (242)
Water heating cost (other fuel)	(219)	7.6 × 0.01	200.66 (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 (230g) so Energy for lighting	eparately as applicable and (232)	d apply fuel price according to	
Additional standing charges (Table 12)		10.10	70 (251)
The state of the s	and of (222) to (225) v)	V 0.04	
A	one of (233) to (235) x)	13.19 × 0.01	-135.24 (252)
Appendix Q items: repeat lines (253) and (254) <b>Total energy cost</b> (245)(	as needed (247) + (250)(254) =		845.69 (255)
11a. SAP rating - individual heating systems			,
Energy cost deflator (Table 12)			0.42 (256)
, ,	(256)] ÷ [(4) + 45.0] =		1.61 (257)
SAP rating (Section 12)			77.48 (258)
12a. CO2 emissions – Individual heating syste	ems including micro-CHP		
	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh  0.241 =	1991.09 (261)
Space heating (main system 1) Space heating (secondary)	•		
	(211) x	0.241 =	1991.09 (261)
Space heating (secondary)	(211) x (215) x	0.241 = 0.519 = 0.241 =	1991.09 (261)
Space heating (secondary) Water heating	(211) x (215) x (219) x (261) + (262) + (263) + (26	0.241 = 0.519 = 0.241 =	1991.09 (261) 0 (263) 636.3 (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (26	0.241 = 0.519 = 0.241 = 4) =	1991.09 (261) 0 (263) 636.3 (264) 2627.39 (265)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 =	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year  CO2 emissions per m²	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)  13.82 (273)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (26 t (231) x	0.241 = 0.519 = 0.519 = 0.519 = 0.519 = sum of (265)(271) =	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)  13.82 (273)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (263) t t (231) x (232) x	0.241 = 0.519	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)  13.82 (273)  85 (274)  P. Energy
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)  13a. Primary Energy	(211) x (215) x (219) x (261) + (262) + (263) + (263) t (231) x (232) x  Energy kWh/year	0.241 = 0.519	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)  13.82 (273)  85 (274)  P. Energy kWh/year
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)  13a. Primary Energy  Space heating (main system 1)	(211) x (215) x (219) x (261) + (262) + (263) + (263) + (263) x (232) x  Energy kWh/year (211) x	0.241 = 0.519	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)  13.82 (273)  85 (274)  P. Energy kWh/year  9005.33 (261)
Space heating (secondary)  Water heating  Space and water heating  Electricity for pumps, fans and electric keep-ho  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)  13a. Primary Energy  Space heating (main system 1)  Space heating (secondary)	(211) x (215) x (219) x (261) + (262) + (263) + (263) t (231) x (232) x   Energy kWh/year (211) x (215) x	0.241 = 0.519 = 0.241 = 0.519	1991.09 (261)  0 (263)  636.3 (264)  2627.39 (265)  38.93 (267)  285.21 (268)  -532.16 (269)  2419.37 (272)  13.82 (273)  85 (274)  P. Energy kWh/year  9005.33 (261)  0 (263)



Primary energy kWh/m²/year		$(272) \div (4) =$		60.85	(273)
'Total Primary Energy		sum of (265)(271) =		10652.71	(272)
Energy saving/generation technologies Item 1		3.07	- [	-3147.82	(269)
Electricity for lighting	(232) x	0 =	• [	1687.07	(268)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	= [	230.25	(267)



#### User Details:

Assessor Name: Chris Mcdonald Stroma Number: STRO007579
Software Name: Stroma FSAP 2012 Software Version: 1.0.5.8

#### Property Address: Plot 1 LPG Land West of Broome Farm Barn, Broome, Craven Arms Address: 1. Overall dwelling dimensions: Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 92.92 (1a) x 2.7 (2a) =250.88 (3a) First floor (1b) x (2b) (3b) 82.14 2.41 197.96 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)175.06 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =(5) 448.84 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 0 0 0 0 x 20 =Number of open flues 0 1 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 40 4 Number of passive vents x 10 =(7b)0 0 Number of flueless gas fires x 40 =(7c)0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div$ (5) = 0.09 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.34 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20) $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.34

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthl	y avera	ge wind	speed fr	om Tabl	e 7							
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7



Wind Factor (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	]	
(223)	1.20	0	<u> </u>		0.00	1 0.00	1 0.02	<u> </u>	1.00		1	J	
Adjusted infiltr		<u> </u>				speed) =	(21a) x	(22a)m	T	1		1	
0.43 Calculate effec	0.42	0.42	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
If mechanica		_	iale ioi l	пе арри	cable ca	136						0	(23a)
If exhaust air h			endix N, (2	(23a) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	``
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If balance	d mech	anical ve	entilation	without	heat red	covery (ľ	MV) (24b	m = (22)	2b)m + (	23b)		•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	e input	ventilatio	on from o	outside	•	•	•	•	
if (22b)n	n < 0.5 ×	< (23b), t	then (24)	c) = (23b	o); other	wise (24	c) = (22h	o) m + 0.	.5 × (23b	) )			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural				•	•				0.51				
	n = 1, tn $0.59$	en (24d) <sub>0.59</sub>	m = (221)	0.57	0.55	$\frac{(4a)m}{0.55}$	$\frac{0.5 + [(2)]{0.55}}{}$	2b)m² x 0.56	<del></del>	0.57	0.58	1	(24d)
` '	<u> </u>	ļ		<u> </u>		ļ	<u>.                                    </u>		0.57	0.57	0.56	J	(240)
Effective air (25)m= 0.59	0.59	0.59	0.57	0.57	0.55 or (24	c) or (24 0.55	0.55	0.56	0.57	0.57	0.58	1	(25)
(23)111= 0.39	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.30	0.57	0.57	0.56		(20)
3. Heat losse	s and he	ant look r											
		•											
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
	Gros	SS	Openin	gs									
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/				kJ/K
<b>ELEMENT</b> Doors	Gros area	SS	Openin	gs	A ,r	m² x x1	W/m2	eK =   0.04] =	(W/ 1.9				kJ/K (26)
ELEMENT  Doors  Windows Type	Gros area e 1	SS	Openin	gs	A ,r	m <sup>2</sup> x x1 x1	W/m2 1 /[1/( 1.4 )+	eK =   0.04] =   0.04] =	1.9 12.85				kJ/K (26) (27)
ELEMENT  Doors  Windows Type  Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 1.9 9.69 21.2	m <sup>2</sup> x x1 x1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	1.9 12.85 28.11				(26) (27) (27)
Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 1.9 9.69 21.2 2.9	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	1.9 12.85 28.11 3.84	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	ss (m²)	Openin	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] =	1.9 12.85 28.11 3.84 1.72	k)			(26) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04]	1.9 12.85 28.11 3.84 1.72	k)			(26) (27) (27) (27) (27) (28)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls	Gros area 1 2 2 2 3 4 2 201.	ss (m²)	Openin m	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18	0.04] = 0.04]	(W// 1.9 12.85 28.11 3.84 1.72 12.079( 29.61	k)			(26) (27) (27) (27) (27) (28) (29)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls Roof	Gros area  1 2 3 4 201. 92.9	48 92 5, m <sup>2</sup>	Openin m	gs 1 <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13  0.18  0.13	K	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K) 	kJ/m²-	k	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area	Gros area  1 201.  92.5  elements	48 92 s, m² lows, use e	36.9  0  effective winternal wal	gs 1 <sup>2</sup> 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13	0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K) 	kJ/m²-	k	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e  * for windows and ** include the area Fabric heat los	Gros area  1 1 2 2 3 3 4 4  201.  92.5  Elements  I roof windas on both  ss, W/K =	48 32 3, m <sup>2</sup> 3, m <sup>2</sup> 3, ows, use end sides of interest of int	36.9  0  effective winternal wal	gs 1 <sup>2</sup> 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13  0.18  0.13	0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K) 	kJ/m²-	k	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity	Gros area  1 1 2 2 3 3 4 4  201.  92.5  Plements  I roof winder as on both as	48 92 92 90	36.9  36.9  0  effective winternal wall	gs 1 <sup>2</sup> Indow U-va Is and pan	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 x2 x x x2 x x x x2 x x x x2 x x x x	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13	EK	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K)  6  [ as given in	kJ/m²-l	13.2	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass	Gros area  1 1 2 2 3 3 4 4  201.  92.9  Plements  Proof winder  as on both  as, W/K:  Cm = S(  parame	48 92 92 90 ws, use elesides of interest (TMF) eter (TMF)	36.9  36.9  offective winternal wall  U)  P = Cm -	gs 12 Indow U-va Is and pan	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 2 x x x 2 x x x 2 x x x 2 x x x 2 x x x 2 x	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	EK	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	1 3.2 102.19	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity	Gros area  1 1 2 2 3 3 4 4  201.  92.9  Plements  I roof winder as on both as on both cases, W/K:  Cm = S( parame as ments who	48  22  3, m²  cows, use end sides of interpretation (A x k)  eter (TMF)	36.9  36.9  0  effective winternal wall U)  P = Cm -	gs 12 Indow U-va Is and pan	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 2 x x x 2 x x x 2 x x x 2 x x x 2 x x x 2 x	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	EK	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	7 3.2 102.19	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	Gros area  1 1 2 2 3 3 4 4  201.  92.9 Plements Froof winder as on both as, W/K: Cm = S( parame and of a de	48 32 35, m² dows, use ele sides of interpretation (A x k) eter (TMF) are the de stailed calculation (TMF)	36.90 36.90 0 effective winternal wall U) P = Cm - stails of the ulation.	gs  9  Indow U-ve Is and part  - TFA) ir	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 2 x 2 x 2 x dated using	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	EK	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	7 3.2 102.19	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste	Gros area  1 1 2 2 3 3 4 4 201.  92.5 Selements 1 roof winder as on both as o	48  92  92  90 ws, use end sides of interpretation (A x k)  eter (TMF)  eter the decentation (TMF)  eter the decentation (TMF)	36.9  36.9  0  effective winternal wall U)  P = Cm - etails of the ulation. culated to	gs  9  Indow U-ve  Is and pan  - TFA) ir  construction	A ,r  1.9  9.69  21.2  2.9  1.3  92.92  164.4  92.92  387.3  alue calculatitions  n kJ/m²K  ion are no	x1 x1 x1 x1 2 x 2 x 2 x dated using	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	K	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	1 3.2 102.19 12537.89 250	(26) (27) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35)



Ventilat	tion hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
[	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	87.9	87.37	86.84	84.36	83.9	81.75	81.75	81.35	82.58	83.9	84.84	85.82		(38)
Heat tra	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	206.56	206.02	205.49	203.02	202.55	200.4	200.4	200	201.23	202.55	203.49	204.47		
Lloot lo	aa nara	motor (l	-II D) \\\	/m21/						_	Sum(39) <sub>1</sub> .	12 /12=	203.01	(39)
(40)m=	1.18	1.18	HLP), W/	1.16	1.16	1.14	1.14	1.14	1.15	= (39)m ÷	1.16	1.17		
(40)111=	1.10	1.10	'.''	1.10	1.10	1.17	1.17	1.17			Sum(40) <sub>1</sub> .		1.16	(40)
Numbe	r of day	s in mo	nth (Tab	le 1a)					•	Worago =	Cum (10)	12712—	1.10	``
	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. Wat	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Δeeuma	ad occi	ipancy, I	N									07		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		97		(42)
	A £ 13.9	•												
			ater usaç hot water							se target o		4.72		(43)
		_	person pei	• .		-	-			J				
ſ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	<u>.                                    </u>		<u> </u>			
(44)m=	115.19	111	106.82	102.63	98.44	94.25	94.25	98.44	102.63	106.82	111	115.19		
						400 - 1/-/ -		T (000)			m(44) <sub>112</sub> =		1256.65	(44)
г		1	used - cal	1					ı		ı			
(45)m=	170.83	149.41	154.17	134.41	128.97	111.29	103.13	118.34	119.76	139.56	152.35	165.44	4047.07	7(45)
If instanta	aneous w	ater heati	ng at point	t of use (no	hot water	storage),	enter 0 in	boxes (46		rotai = Sui	m(45) <sub>112</sub> =	•	1647.67	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water s	storage	loss:	<u> </u>	Į										
Storage	e volum	e (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-	and no ta		-			, ,		(01.1	4>			
Water s			hot wate	er (this in	icludes i	nstantar	neous co	ilod idmo	ers) ente	er 'O' in (	47)			
	_		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table			`	,					0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49	) =			0		(50)
•			eclared o	-										
		_	factor fr		e 2 (kW	h/litre/da	ay)					0		(51)
	•	າeating s from Ta	ee secti ble 2a	on 4.3								0		(52)
			m Table	2b								0		(53)
•			storage		ear			(47) x (51	) x (52) x (	53) =		0		(54)
• • •		(54) in (5	_	, ,						,		0		(55)
Waters	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)
L		1	1		1	1					1			



•	er contains	dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (	H11)] ÷ (5	u), eise (s	<i>i</i> )iii = (30)	iii wiieie (	1111) 15 110	iii Append	ІХ П	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primai	ry circuit	loss (an	nual) fro	m Table	3	-	-		-	-		0		(58)
	y circuit	`	,			59)m = (	(58) ÷ 36	55 × (41)	m					
(mo	dified by	factor fr	rom Tabl	le H5 if t	here is s	olar 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)
Comb	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 h	neat 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=	145.2	127	131.05	114.25	109.63	94.6	87.66	100.59	101.79	118.63	129.49	140.62		(62)
Solar Di	HW input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	<u>3)</u>				ı	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from wa	ater hea	ter											
(64)m=	145.2	127	131.05	114.25	109.63	94.6	87.66	100.59	101.79	118.63	129.49	140.62		_
								Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	1400.52	(64)
Heat g	ains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	1] + 0.8 >	د [(46)m	+ (57)m	+ (59)m	]	
(65)m=	36.3	31.75	32.76	28.56	27.41	23.65	21.92	25.15	25.45	29.66	32.37	35.16		(65)
inclu	ude (57)r	n in calc	culation of	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. In	ternal ga	ins (see	Table 5	and 5a	):									
					, ·									
Metab	olic gain	s (Table			, .									
Metab	olic gain Jan	s (Table Feb			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metab (66)m=			5), Wat	ts		Jun 148.47	Jul 148.47	Aug 148.47	Sep 148.47	Oct	Nov 148.47	Dec 148.47		(66)
(66)m=	Jan	Feb 148.47	5), Wat Mar 148.47	ts Apr 148.47	May 148.47	148.47	148.47	148.47	148.47		-			(66)
(66)m=	Jan 148.47	Feb 148.47	5), Wat Mar 148.47	ts Apr 148.47	May 148.47	148.47	148.47	148.47	148.47		-			(66) (67)
(66)m= Lightir (67)m=	Jan 148.47 ng gains	Feb 148.47 (calculated) 27.64	5), Wat Mar 148.47 ted in Ap	Apr 148.47 opendix I 17.02	May 148.47 L, equati	148.47 ion L9 oi 10.74	148.47 r L9a), a 11.6	148.47 Iso see	148.47 Table 5	148.47 25.7	148.47	148.47		. ,
(66)m= Lightir (67)m= Applia	Jan 148.47 ng gains 31.12	Feb 148.47 (calculated 27.64 ns (calculated 27.64)	Mar 148.47 ted in Ap 22.48	Apr 148.47 opendix I 17.02	May 148.47 L, equati 12.72	148.47 ion L9 oi 10.74 uation L	148.47 r L9a), a 11.6 13 or L1	148.47 Iso see 15.08 3a), also	148.47 Table 5	148.47 25.7	148.47	148.47		. ,
(66)m= Lightir (67)m= Applia (68)m=	Jan 148.47 ng gains 31.12 nces gai	Feb 148.47 (calculat 27.64 ns (calc 350.27	148.47 ted in Ap 22.48 ulated in 341.21	Apr 148.47 ppendix I 17.02 Append 321.91	May 148.47 L, equati 12.72 dix L, equalization (297.55)	148.47 ion L9 or 10.74 uation L 274.65	148.47 r L9a), a 11.6 13 or L1 259.35	148.47 Iso see 15.08 3a), also	148.47 Table 5 20.24 see Ta 264.82	25.7 ble 5 284.12	30	148.47 31.98		(67)
(66)m= Lightir (67)m= Applia (68)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains	Feb 148.47 (calculat 27.64 ns (calc 350.27	148.47 ted in Ap 22.48 ulated in 341.21	Apr 148.47 ppendix I 17.02 Append 321.91	May 148.47 L, equati 12.72 dix L, equalization (297.55)	148.47 ion L9 or 10.74 uation L 274.65	148.47 r L9a), a 11.6 13 or L1 259.35	148.47 Iso see 15.08 3a), also	148.47 Table 5 20.24 see Ta 264.82	25.7 ble 5 284.12	30	148.47 31.98		(67)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains	Feb 148.47 (calculate 27.64 ns (calculate 350.27 (calculate 37.85	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 tted in Ap 37.85	Apr 148.47 opendix 1 17.02 Append 321.91 opendix 37.85	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat	148.47 ion L9 of 10.74 uation L 274.65 ion L15	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a)	148.47 Iso see 15.08 3a), also 255.76	148.47 Table 5 20.24 See Ta 264.82 ee Table	25.7 ble 5 284.12	30 308.48	31.98 331.38		(67) (68)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m=	Jan 148.47 ng gains 31.12 nces gai 346.68 ng gains 37.85	Feb 148.47 (calculate 27.64 ns (calculate 350.27 (calculate 37.85	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 tted in Ap 37.85	Apr 148.47 opendix 1 17.02 Append 321.91 opendix 37.85	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat	148.47 ion L9 of 10.74 uation L 274.65 ion L15	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a)	148.47 Iso see 15.08 3a), also 255.76	148.47 Table 5 20.24 See Ta 264.82 ee Table	148.47 25.7 ble 5 284.12	30 308.48	31.98 331.38		(67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far	Feb 148.47 (calculated 27.64 ns (calculated 350.27) (calculated 37.85) ns gains 0	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 ted in Ap 37.85 (Table 5	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 37.85	148.47 Table 5 20.24 see Ta 264.82 ee Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 a and far 0	Feb 148.47 (calculated processing contents of the contents of	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 ted in Ap 37.85 (Table 5	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 37.85	148.47 Table 5 20.24 see Ta 264.82 ee Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 a and far 0 s e.g. ev	Feb  148.47 (calculated processing spains of the content of the co	22.48 ulated in Ap 37.85 (Table 5 on (negat -118.77	Apr 148.47 ppendix I 17.02 Append 321.91 ppendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5)	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far 0 s e.g. ev -118.77	Feb  148.47 (calculated processing spains of the content of the co	22.48 ulated in Ap 37.85 (Table 5 on (negat -118.77	Apr 148.47 ppendix I 17.02 Append 321.91 ppendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5)	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 a and far 0 s e.g. ev -118.77 heating	Feb  148.47 (calculated processes and proces	22.48 ulated in Ap 37.85 (Table 5 0 n (negat	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 Ga) 0 tive value	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85  0 -118.77	148.47  25.7  ble 5  284.12  5  37.85  0  -118.77	30 308.48 37.85 0 -118.77	31.98 331.38 37.85 0 -118.77		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far 0 s e.g. ev -118.77 heating 48.79	Feb  148.47 (calculated processes and proces	22.48 ulated in Ap 37.85 (Table 5 0 n (negat	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 Ga) 0 tive value	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85  0 -118.77	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85  0 -118.77	148.47  25.7  ble 5  284.12  5  37.85  0  -118.77	30 308.48 37.85 0 -118.77	31.98 331.38 37.85 0 -118.77		(67) (68) (69) (70)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far 0 s e.g. ev -118.77 heating 48.79 internal	Feb  148.47 (calculated 27.64)  ns (calculated 350.27) (calculated 37.85) ns gains 0 aporation -118.77 gains (Talculated 47.25)  gains = 492.7	148.47 ted in Ap 22.48 ulated in 341.21 ted in Ap 37.85 (Table 5 0 on (negat -118.77 Table 5) 44.04	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 5a) 0 tive value -118.77	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85  0 es) (Tab -118.77	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85  0 le 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85  0 -118.77  29.46 m + (67)m	148.47 Iso see 15.08 3a), also 255.76 0, also se 37.85 0	148.47 Table 5 20.24 see Ta 264.82 ee Table 37.85  0  -118.77  35.34 + (69)m + (	148.47  25.7  ble 5  284.12  5  37.85  0  -118.77  39.86  (70)m + (7	30 308.48 37.85 0 -118.77 44.96 1)m + (72)	31.98 331.38 37.85 0 -118.77		(67) (68) (69) (70) (71)

Flux

Table 6a

Table 6b

Table 6c

Area

m²

Orientation: Access Factor

Table 6d

Gains

(W)



North														
North	North	0.9x	0.77	x	9.69	x	10.63	x	0.63	x	0.7	] =	31.49	(74)
North	North	0.9x	0.77	x	9.69	x	20.32	x	0.63	x	0.7	] =	60.18	(74)
North	North	0.9x	0.77	x	9.69	X	34.53	x	0.63	x	0.7	=	102.26	(74)
North	North	0.9x	0.77	x	9.69	X	55.46	x	0.63	x	0.7	=	164.25	(74)
North	North	0.9x	0.77	x	9.69	X	74.72	x	0.63	x	0.7	=	221.26	(74)
North	North	0.9x	0.77	x	9.69	x	79.99	X	0.63	x	0.7	] =	236.87	(74)
North	North	0.9x	0.77	x	9.69	x	74.68	x	0.63	x	0.7	] =	221.15	(74)
North	North	0.9x	0.77	x	9.69	X	59.25	X	0.63	x	0.7	=	175.45	(74)
North	North	0.9x	0.77	x	9.69	X	41.52	X	0.63	x	0.7	=	122.95	(74)
North 0.9x 0.77	North	0.9x	0.77	x	9.69	X	24.19	X	0.63	x	0.7	=	71.63	(74)
East	North	0.9x	0.77	x	9.69	X	13.12	X	0.63	x	0.7	=	38.85	(74)
East	North	0.9x	0.77	x	9.69	X	8.86	X	0.63	X	0.7	=	26.25	(74)
East	East	0.9x	0.77	x	2.9	X	19.64	X	0.63	x	0.7	=	17.41	(76)
East	East	0.9x	0.77	x	2.9	X	38.42	X	0.63	x	0.7	=	34.05	(76)
East	East	0.9x	0.77	x	2.9	X	63.27	X	0.63	x	0.7	=	56.08	(76)
East	East	0.9x	0.77	x	2.9	X	92.28	X	0.63	x	0.7	=	81.79	(76)
East	East	0.9x	0.77	x	2.9	X	113.09	X	0.63	x	0.7	=	100.23	(76)
East 0.9x 0.77 x 2.9 x 94.68 x 0.63 x 0.7 = 83.91 (76)  East 0.9x 0.77 x 2.9 x 45.59 x 0.63 x 0.7 = 65.22 (76)  East 0.9x 0.77 x 2.9 x 45.59 x 0.63 x 0.7 = 40.4 (76)  East 0.9x 0.77 x 2.9 x 45.59 x 0.63 x 0.7 = 40.4 (76)  East 0.9x 0.77 x 2.9 x 16.15 x 0.63 x 0.7 = 14.31 (76)  South 0.9x 0.77 x 2.12 x 46.75 x 0.63 x 0.7 = 496.08 (78)  South 0.9x 0.77 x 2.12 x 97.53 x 0.63 x 0.7 = 496.08 (78)  South 0.9x 0.77 x 2.12 x 110.23 x 0.63 x 0.7 = 631.92 (78)  South 0.9x 0.77 x 2.12 x 110.23 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 2.12 x 110.23 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 2.12 x 110.55 x 0.63 x 0.7 = 714.25 (78)  South 0.9x 0.77 x 2.12 x 110.55 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 110.89 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 2.12 x 108.01 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.89 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.89 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.89 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.89 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.89 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.89 x 0.63 x 0.7 = 606.12 (78)  South 0.9x 0.77 x 2.12 x 108.80 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 7.8 (80)	East	0.9x	0.77	X	2.9	X	115.77	X	0.63	X	0.7	=	102.6	(76)
East 0.9x 0.77 x 2.9 x 73.59 x 0.63 x 0.7 = 65.22 (76)  East 0.9x 0.77 x 2.9 x 45.59 x 0.63 x 0.7 = 40.4 (76)  East 0.9x 0.77 x 2.9 x 16.15 x 0.63 x 0.7 = 21.7 (76)  East 0.9x 0.77 x 2.9 x 16.15 x 0.63 x 0.7 = 14.31 (76)  South 0.9x 0.77 x 21.2 x 46.75 x 0.63 x 0.7 = 302.91 (78)  South 0.9x 0.77 x 21.2 x 76.57 x 0.63 x 0.7 = 496.08 (78)  South 0.9x 0.77 x 21.2 x 110.23 x 0.63 x 0.7 = 631.92 (78)  South 0.9x 0.77 x 21.2 x 110.23 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 714.25 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 714.25 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 714.25 (78)  South 0.9x 0.77 x 21.2 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 679.61 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 744.25 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 744.25 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 744.25 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 744.25 (78)  South 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 744.25 (78)	East	0.9x	0.77	X	2.9	X	110.22	X	0.63	X	0.7	=	97.68	(76)
East 0.9x 0.77 x 2.9 x 45.59 x 0.63 x 0.7 = 40.4 (76)  East 0.9x 0.77 x 2.9 x 16.15 x 0.63 x 0.7 = 21.7 (76)  South 0.9x 0.77 x 21.2 x 46.75 x 0.63 x 0.7 = 332.91 (78)  South 0.9x 0.77 x 21.2 x 97.53 x 0.63 x 0.7 = 496.08 (78)  South 0.9x 0.77 x 21.2 x 11.23 x 0.63 x 0.7 = 631.92 (78)  South 0.9x 0.77 x 21.2 x 11.25 x 0.63 x 0.7 = 631.92 (78)  South 0.9x 0.77 x 21.2 x 11.25 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 11.25 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 11.023 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 11.055 x 0.63 x 0.7 = 716.24 (78)  South 0.9x 0.77 x 21.2 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 659.61 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 659.61 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 78 (80)  West 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 78 (80)  West 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 251.4 (80)  West 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 251.4 (80)	East	0.9x	0.77	X	2.9	X	94.68	X	0.63	X	0.7	=	83.91	(76)
East 0.9x 0.77 x 2.9 x 16.15 x 0.63 x 0.7 = 21.7 (76)  South 0.9x 0.77 x 21.2 x 46.75 x 0.63 x 0.7 = 302.91 (78)  South 0.9x 0.77 x 21.2 x 76.57 x 0.63 x 0.7 = 496.08 (78)  South 0.9x 0.77 x 21.2 x 110.23 x 0.63 x 0.7 = 631.92 (78)  South 0.9x 0.77 x 21.2 x 110.23 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 716.24 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 716.24 (78)  South 0.9x 0.77 x 21.2 x 110.89 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 679.61 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 679.61 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 25.14 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 25.14 (80)	East	0.9x	0.77	X	2.9	X	73.59	X	0.63	X	0.7	=	65.22	(76)
East 0.9x 0.77 x 2.9 x 16.15 x 0.63 x 0.7 = 14.31 (76)  South 0.9x 0.77 x 21.2 x 46.75 x 0.63 x 0.7 = 302.91 (78)  South 0.9x 0.77 x 21.2 x 76.57 x 0.63 x 0.7 = 496.08 (78)  South 0.9x 0.77 x 21.2 x 97.53 x 0.63 x 0.7 = 631.92 (78)  South 0.9x 0.77 x 21.2 x 110.23 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 110.23 x 0.63 x 0.7 = 714.21 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 714.25 (78)  South 0.9x 0.77 x 21.2 x 110.55 x 0.63 x 0.7 = 716.24 (78)  South 0.9x 0.77 x 21.2 x 108.01 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 699.81 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 101.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 660.12 (78)  South 0.9x 0.77 x 21.2 x 104.89 x 0.63 x 0.7 = 535.07 (78)  South 0.9x 0.77 x 1.3 x 1.3 x 19.64 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 7.8 (80)  West 0.9x 0.77 x 1.3 x 38.42 x 0.63 x 0.7 = 25.14 (80)  West 0.9x 0.77 x 1.3 x 1.3 x 92.28 x 0.63 x 0.7 = 36.66 (80)	East	0.9x	0.77	X	2.9	X	45.59	X	0.63	X	0.7	=	40.4	(76)
South         0.9x         0.77         x         21.2         x         46.75         x         0.63         x         0.7         =         302.91         (78)           South         0.9x         0.77         x         21.2         x         76.57         x         0.63         x         0.7         =         496.08         (78)           South         0.9x         0.77         x         21.2         x         97.53         x         0.63         x         0.7         =         631.92         (78)           South         0.9x         0.77         x         21.2         x         110.23         x         0.63         x         0.7         =         631.92         (78)           South         0.9x         0.77         x         21.2         x         114.87         x         0.63         x         0.7         =         714.21         (78)           South         0.9x         0.77         x         21.2         x         110.55         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104	East	0.9x	0.77	X	2.9	X	24.49	X	0.63	X	0.7	=	21.7	(76)
South         0.9x         0.77         x         21.2         x         76.57         x         0.63         x         0.7         =         496.08         (78)           South         0.9x         0.77         x         21.2         x         97.53         x         0.63         x         0.7         =         631.92         (78)           South         0.9x         0.77         x         21.2         x         110.23         x         0.63         x         0.7         =         631.92         (78)           South         0.9x         0.77         x         21.2         x         110.23         x         0.63         x         0.7         =         714.21         (78)           South         0.9x         0.77         x         21.2         x         110.55         x         0.63         x         0.7         =         716.24         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         10	East	0.9x	0.77	X	2.9	X	16.15	X	0.63	X	0.7	=	14.31	(76)
South         0.9x         0.77         x         21.2         x         97.53         x         0.63         x         0.7         =         631.92         (78)           South         0.9x         0.77         x         21.2         x         110.23         x         0.63         x         0.7         =         714.21         (78)           South         0.9x         0.77         x         21.2         x         111.87         x         0.63         x         0.7         =         714.25         (78)           South         0.9x         0.77         x         21.2         x         110.55         x         0.63         x         0.7         =         716.24         (78)           South         0.9x         0.77         x         21.2         x         108.01         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         679.61         (78)           South         0.9x         0.77         x         21.2         x         8	South	0.9x	0.77	X	21.2	X	46.75	X	0.63	X	0.7	=	302.91	(78)
South         0.9x         0.77         x         21.2         x         110.23         x         0.63         x         0.7         =         714.21         (78)           South         0.9x         0.77         x         21.2         x         111.87         x         0.63         x         0.7         =         744.25         (78)           South         0.9x         0.77         x         21.2         x         110.55         x         0.63         x         0.7         =         716.24         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         101.89         x         0.63         x         0.7         =         660.12         78)           South         0.9x         0.77         x         21.2         x         5	South	0.9x	0.77	X	21.2	X	76.57	X	0.63	X	0.7	=	496.08	(78)
South         0.9x         0.77         x         21.2         x         114.87         x         0.63         x         0.7         =         744.25         (78)           South         0.9x         0.77         x         21.2         x         110.55         x         0.63         x         0.7         =         744.25         (78)           South         0.9x         0.77         x         21.2         x         108.01         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         679.61         (78)           South         0.9x         0.77         x         21.2         x         82.59         x         0.63         x         0.7         =         535.07         (78)           South         0.9x         0.77         x         21.2         x         5	South	0.9x	0.77	X	21.2	X	97.53	X	0.63	X	0.7	=	631.92	(78)
South         0.9x         0.77         x         21.2         x         110.55         x         0.63         x         0.7         =         716.24         (78)           South         0.9x         0.77         x         21.2         x         108.01         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         101.89         x         0.63         x         0.7         =         669.12         (78)           South         0.9x         0.77         x         21.2         x         82.59         x         0.63         x         0.7         =         535.07         (78)           South         0.9x         0.77         x         21.2         x         40.4         x         0.63         x         0.7         =         535.07         (78)           South         0.9x         0.77         x         21.2         x         40.		0.9x	0.77	X	21.2	X	110.23	X	0.63	X	0.7	=	714.21	(78)
South         0.9x         0.77         x         21.2         x         108.01         x         0.63         x         0.7         =         699.81         (78)           South         0.9x         0.77         x         21.2         x         104.89         x         0.63         x         0.7         =         679.61         (78)           South         0.9x         0.77         x         21.2         x         82.59         x         0.63         x         0.7         =         660.12         (78)           South         0.9x         0.77         x         21.2         x         82.59         x         0.63         x         0.7         =         535.07         (78)           South         0.9x         0.77         x         21.2         x         55.42         x         0.63         x         0.7         =         359.05         (78)           South         0.9x         0.77         x         21.2         x         40.4         x         0.63         x         0.7         =         261.74         (78)           West         0.9x         0.77         x         1.3         x         19.64 </td <td></td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>21.2</td> <td>X</td> <td>114.87</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>744.25</td> <td>(78)</td>		0.9x	0.77	x	21.2	X	114.87	X	0.63	X	0.7	=	744.25	(78)
South       0.9x       0.77       x       21.2       x       104.89       x       0.63       x       0.7       =       679.61       (78)         South       0.9x       0.77       x       21.2       x       101.89       x       0.63       x       0.7       =       660.12       (78)         South       0.9x       0.77       x       21.2       x       82.59       x       0.63       x       0.7       =       535.07       (78)         South       0.9x       0.77       x       21.2       x       55.42       x       0.63       x       0.7       =       359.05       (78)         South       0.9x       0.77       x       21.2       x       40.4       x       0.63       x       0.7       =       261.74       (78)         West       0.9x       0.77       x       1.3       x       19.64       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       15.26       (80)         West		0.9x	0.77	x	21.2	X	110.55	x	0.63	X	0.7	=	716.24	(78)
South       0.9x       0.77       x       21.2       x       101.89       x       0.63       x       0.7       =       660.12       (78)         South       0.9x       0.77       x       21.2       x       82.59       x       0.63       x       0.7       =       535.07       (78)         South       0.9x       0.77       x       21.2       x       55.42       x       0.63       x       0.7       =       359.05       (78)         South       0.9x       0.77       x       21.2       x       40.4       x       0.63       x       0.7       =       261.74       (78)         West       0.9x       0.77       x       1.3       x       19.64       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       38.42       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West <th< td=""><td></td><td>0.9x</td><td>0.77</td><td>x</td><td>21.2</td><td>X</td><td>108.01</td><td>X</td><td>0.63</td><td>X</td><td>0.7</td><td>=</td><td>699.81</td><td>(78)</td></th<>		0.9x	0.77	x	21.2	X	108.01	X	0.63	X	0.7	=	699.81	(78)
South       0.9x       0.77       x       21.2       x       82.59       x       0.63       x       0.7       =       535.07       (78)         South       0.9x       0.77       x       21.2       x       55.42       x       0.63       x       0.7       =       359.05       (78)         South       0.9x       0.77       x       21.2       x       40.4       x       0.63       x       0.7       =       261.74       (78)         West       0.9x       0.77       x       1.3       x       19.64       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       38.42       x       0.63       x       0.7       =       15.26       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West       0.9x       0.77       x       1.3       x       92.28       x       0.63       x       0.7       =       36.66       (80)		0.9x	0.77	x	21.2	X	104.89	X	0.63	X	0.7	=	679.61	(78)
South       0.9x       0.77       x       21.2       x       55.42       x       0.63       x       0.7       =       359.05       (78)         South       0.9x       0.77       x       21.2       x       40.4       x       0.63       x       0.7       =       261.74       (78)         West       0.9x       0.77       x       1.3       x       19.64       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       38.42       x       0.63       x       0.7       =       15.26       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West       0.9x       0.77       x       1.3       x       92.28       x       0.63       x       0.7       =       36.66       (80)		0.9x	0.77	X	21.2	X	101.89	X	0.63	X	0.7	=	660.12	(78)
South       0.9x       0.77       x       21.2       x       40.4       x       0.63       x       0.7       =       261.74       (78)         West       0.9x       0.77       x       1.3       x       19.64       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       38.42       x       0.63       x       0.7       =       15.26       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West       0.9x       0.77       x       1.3       x       92.28       x       0.63       x       0.7       =       36.66       (80)		0.9x	0.77	X	21.2	X	82.59	X	0.63	X	0.7	=	535.07	(78)
West       0.9x       0.77       x       1.3       x       19.64       x       0.63       x       0.7       =       7.8       (80)         West       0.9x       0.77       x       1.3       x       38.42       x       0.63       x       0.7       =       15.26       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West       0.9x       0.77       x       1.3       x       92.28       x       0.63       x       0.7       =       36.66       (80)	South	0.9x	0.77	X	21.2	X	55.42	X	0.63	X	0.7	=	359.05	(78)
West       0.9x       0.77       x       1.3       x       38.42       x       0.63       x       0.7       =       15.26       (80)         West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West       0.9x       0.77       x       1.3       x       92.28       x       0.63       x       0.7       =       36.66       (80)		0.9x	0.77	x	21.2	X	40.4	X	0.63	x	0.7	] =	261.74	(78)
West       0.9x       0.77       x       1.3       x       63.27       x       0.63       x       0.7       =       25.14       (80)         West       0.9x       0.77       x       1.3       x       92.28       x       0.63       x       0.7       =       36.66       (80)		0.9x	0.77	x	1.3	X	19.64	X	0.63	x	0.7	] =	7.8	(80)
West 0.9x 0.77 x 1.3 x 92.28 x 0.63 x 0.7 = 36.66 (80)		0.9x	0.77	x	1.3	X	38.42	X	0.63	x	0.7	] =	15.26	(80)
0 0 0 0 0 0 0 0	West	0.9x	0.77	x	1.3	x	63.27	X	0.63	x	0.7	=	25.14	(80)
West 0.9x 0.77 x 1.3 x 113.09 x 0.63 x 0.7 = 44.93 (80)		0.9x	0.77	x	1.3	×	92.28	X	0.63	x	0.7	] =	36.66	(80)
	West	0.9x	0.77	X	1.3	x	113.09	X	0.63	X	0.7	=	44.93	(80)



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West	0.9x	0.77	×	1.	3	x L	11	5.77	X		0.63	X	0.7	=	46	(80)
West	0.9x	0.77	X	1.	3	x	11	0.22	X		0.63	X	0.7	=	43.79	(80)
West	0.9x	0.77	X	1.	3	x	9	4.68	X		0.63	x [	0.7	=	37.61	(80)
West	0.9x	0.77	X	1.	3	x	7:	3.59	X		0.63	x	0.7	=	29.24	(80)
West	0.9x	0.77	X	1.	3	x [	4:	5.59	x		0.63	x	0.7	=	18.11	(80)
West	0.9x	0.77	×	1.	3	x [	2	4.49	x		0.63	x	0.7	=	9.73	(80)
West	0.9x	0.77	X	1.	3	x	10	6.15	X		0.63	x	0.7	=	6.42	(80)
					_											
Solar gair	ns in v	vatts, ca	alculate	d for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 35	59.61	605.58	815.39	996.91	1110.67	110	1.71	1062.43	976	.59	877.52	665.22	429.33	308.72		(83)
Total gain	ns – in	iternal a	nd sola	r (84)m =	= (73)m	+ (83	3)m ,	watts							_	
(84)m= 85	53.73	1098.27	1290.65	1443.04	1525.32	148	7.48	1430.38	1348	3.77	1265.47	1082.45	880.31	786.87		(84)
7. Mean	interr	nal temp	erature	(heating	season	)										
Tempera	ature (	during h	eating	periods i	n the livi	ng a	rea f	rom Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisatio		-				_					, ,					
	Jan	Feb	Mar	Apr	May	Ò	un	Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(86)m=	1	1	0.99	0.97	0.91	0.	_	0.59	0.6	<del>-</del>	0.87	0.98	1	1	1	(86)
Moon int	tornal	tompor	oturo in	living or	00 T4 /f/	المال		2 to 7	 7 in T		2 (10)				J	
Mean int (87)m= 19	9.61	19.81	20.09	20.43	20.73	T	.92	20.98	20.		20.85	20.44	19.96	19.58	1	(87)
` '									<u> </u>			20.44	13.30	13.50		(0.)
Tempera				1	1	T	Ť		r		<u> </u>	Ι	1	1	1	(00)
(88)m= 19	9.94	19.94	19.94	19.95	19.95	19.	.96	19.96	19.	97	19.96	19.95	19.95	19.95		(88)
Utilisatio	n fact	or for g	ains for	rest of d	welling,	h2,m	ı (se	e Table	9a)						•	
(89)m=	1	1	0.99	0.96	0.87	0.6	68	0.47	0.5	52	0.8	0.97	1	1		(89)
Mean int	ternal	tempera	ature in	the rest	of dwell	ing T	2 (fc	ollow ste	ps 3	to 7	in Tabl	e 9c)				
	8.67	18.87	19.15	19.49	19.77	19.		19.96	19.		19.87	19.5	19.02	18.64	]	(90)
				•	!						f	LA = Livi	ng area ÷ (	4) =	0.15	(91)
Mean int	ternal	temner	ature (fo	or the wh	nole dwe	llina)	۱ – fl	Δ <b>∨</b> T1	<b>⊥</b> (1	_ fl	Δ) <b>v</b> T2					
	8.81	19.01	19.29	19.63	19.91	20.		20.11	20.	$\neg$	20.02	19.64	19.16	18.78	1	(92)
Apply ad				<u> </u>	<u> </u>							<u> </u>			J	
	8.81	19.01	19.29	19.63	19.91	1	.08	20.11	20.		20.02	19.64	19.16	18.78	]	(93)
8. Space	e heat	ing requ	ıiremen	t											J	
Set Ti to	the n	nean int	ernal te	mperatu	re obtair	ned a	at ste	p 11 of	Tabl	e 9b	o, so tha	t Ti,m=	(76)m an	d re-cal	culate	
the utilis	ation	factor fo	r gains	using Ta	able 9a										•	
	Jan	Feb	Mar	Apr	May	J	un	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisatio		Ť		1		_			1			i		ı	1	
(94)m=	1	0.99	0.98	0.95	0.87	0.6	69	0.48	0.5	54	0.81	0.97	1	1		(94)
Useful g				<del>-                                    </del>	r <u> </u>							T	T		1	(05)
` ′				1374.92	I			693.47	725	.01	1022.08	1049.12	876.89	786.1		(95)
Monthly	avera	ge exte	rnal ten 6.5	nperature 8.9	11.7	able 14		16.6	16		14.1	10.6	7.1	4.2	1	(96)
` ′				l	l	<u> </u>							7.1	4.2		(90)
Heat loss (97)m= 29	s rate 996.6	2906.5		2178.33		_		703.59	X [(9.	<del>'</del>	- (96)m 1190.61	] 1831.45	2453.75	2981.79	1	(97)
Space h												<u> </u>		2301.79	J	(01)
	ř	1218.91	1009.27	1	253.23	т —	2	0.02	24 X [	Ť	0	582.05	1135.34	1633.59	1	
(55)=	55.25	.210.01	.505.27	1 57 5.75	1 200.20	Ш,		Ū	Щ		Ū	1 552.00	1 . 100.04	1 .500.59	J	



8006.07 (98) Total per year (kWh/year) =  $Sum(98)_{1...5,9...12}$  = Space heating requirement in kWh/m²/year (99)45.73 8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar May Jun Jul Aug Sep Oct Nov Dec Apr Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 1883.73 1482.94 1519.98 (100)(100)m =0 0 Utilisation factor for loss hm (101)(101)m =0 0.83 0.9 0.88 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m=1567.36 1341.1 1337.23 0 0 0 (102)Gains (solar gains calculated for applicable weather region, see Table 10) (103)m=1872.5 1802.53 1709.87 (103)Space cooling requirement for month, whole dwelling, continuous (kWh) =  $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m  $< 3 \times (98)$ m (104)m =0 219.7 343.31 277.24 0 0 0 Total = Sum(104)(104)840.25 Cooled fraction  $f C = cooled area \div (4) =$ (105)Intermittency factor (Table 10b) 0 0 0 0.25 0.25 0.25 0 0 0 (106)m =0 0 0 Total = Sum(104)(106)0 Space cooling requirement for month = (104)m × (105) × (106)m 54.93 85.83 69.31 0 0 (107)m =0 0 0 0 0 Total = Sum(107)(107)210.06 (108) Space cooling requirement in kWh/m²/year  $(107) \div (4) =$ 1.2 8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11) (109)Fabric Energy Efficiency (99) + (108) =46.93 **Target Fabric Energy Efficiency (TFEE)** (109)53.97



#### User Details

Assessor Name:Chris McdonaldStroma Number:STRO007579Software Name:Stroma FSAP 2012Software Version:Version: 1.0.5.8

Software Name:	Stroma FSAP 2012	Software	Version:	Versio	n: 1.0.5.8	
	Pro	perty Address: Plo	t 1 LPG			
Address :	Land West of Broome Farm B	Barn, Broome, Crav	en Arms			
1. Overall dwelling dime	ensions:					
Ground floor		Area(m²)	Av. Heigh	<del>``</del>	Volume(m <sup>3</sup>	<u> </u>
		92.92 (1a)	x 2.7	(2a) =	250.88	(3a)
First floor		82.14 (1b)	x 2.41	(2b) =	197.96	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	175.06 (4)				
Dwelling volume		(3a)	+(3b)+(3c)+(3d)+(3	Be)+(3n) =	448.84	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total		m³ per hou	ır
Number of chimneys		+ 0 :	0	x 40 =	0	(6a)
Number of open flues	0 + 1	+ 0	= 1	x 20 =	20	(6b)
Number of intermittent fa	ins		4	x 10 =	40	(7a)
Number of passive vents	3		0	x 10 =	0	(7b)
Number of flueless gas f	ires		0	x 40 =	0	(7c)
					anges per ho	—
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)	)+(7h)+(7c) =		_		_
	peen carried out or is intended, proceed		60 ue from (9) to (16)	÷ (5) =	0.13	(8)
Number of storeys in t		,,,	( ) ( )		0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame or 0	0.35 for masonry co	nstruction		0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding to the	he greater wall area (aft	er			
=	floor, enter 0.2 (unsealed) or 0.1	(sealed), else ente	r 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0				0	(13)
Percentage of window	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) + (1	5) =	0	(16)
•	q50, expressed in cubic metres		e metre of enve	elope area	5	(17)
·	lity value, then $(18) = [(17) \div 20] + (8)$				0.38	(18)
	es if a pressurisation test has been done	or a degree air permeal	oility is being used		_	7(40)
Number of sides sheltere Shelter factor	tu	(20) = 1 - [0.075	5 x (19)] =		0	(19)
Infiltration rate incorpora	ting shelter factor	(21) = (18) x (20			0.38	(21)
auci. rato moorpora		( ) ( -) (-)	•		0.36	(~1)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthl	y avera	ge wind	speed fr	om Tabl	e 7							
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7



Wind Factor (22	?a)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	]	
									ļ	<u>I</u>	!	J	
Adjusted infiltrat		<u> </u>				<del>`                                    </del>	<del>`</del>	<del>ì ´</del>		0.40		1	
0.49 Calculate effecti	0.48 ive air c	0.47 hanae i	0.42 rate for t	0.41 he appli	0.36 Cable ca	0.36 se	0.35	0.38	0.41	0.43	0.45	J	
If mechanical		-		ire appin								0	(23a)
If exhaust air hea	at pump us	sing Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with h	neat recov	ery: effici	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balanced	l mechai	nical ve	ntilation	with hea	at recov	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		(24a)
b) If balanced	l mechai	nical ve	ntilation	without	heat red	covery (N	MV) (24b	)m = (22	2b)m + (2	23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•									
if (22b)m		<u>`</u>		<u> </u>	<u> </u>		<del>ŕ `</del>	<del></del>	<u> </u>	<del></del>		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ve if (22b)m									0.51				
(24d)m = 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.5 + [(2	0.57	0.59	0.59	0.6	1	(24d)
Effective air c							ļ		0.00	0.00		J	(= : ::)
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	1	(25)
` /					0.0.	1 0.0.	1 0.00	1 0.0.	0.00	0.00	1 0.0	l	( - /
3. Heat losses	and had	1 1000 r											
		·							A >/ 11				• > / 1
ELEMENT	Gross area (	6	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	≺)	k-value kJ/m²-l		A X k <j k<="" td=""></j>
	Gross	6	Openin	gs						<) 			
ELEMENT	Gross area (	6	Openin	gs	A ,r	m² x	W/m2	2K = [	(W/I	<) 			kJ/K
<b>ELEMENT</b> Doors	Gross area ( 1	6	Openin	gs	A ,r	m² x x1	W/m2	2K = [ 0.04] = [	(W/I	<) 			(26)
ELEMENT  Doors  Windows Type	Gross area ( 1	6	Openin	gs	A ,r	m² x x1 x1	W/m2 1.6 /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	3.04 12.85	<)			(26) (27)
ELEMENT  Doors  Windows Type 2	Gross area ( 1 2	6	Openin	gs	A ,r 1.9 9.69 21.2	m <sup>2</sup> x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.6 /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}  & & & \\  & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\$	(W/I 3.04 12.85 28.11	<) 			(26) (27) (27)
ELEMENT  Doors  Windows Type 2  Windows Type 3	Gross area ( 1 2	6	Openin	gs	A ,r 1.9 9.69 21.2 2.9	m <sup>2</sup>	W/m2 1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}  & & & \\  & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\$	(W/I 3.04 12.85 28.11 3.84				(26) (27) (27) (27)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4	Gross area ( 1 2	s m²)	Openin	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3	m <sup>2</sup>	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}   & & & & \\   & & & & \\   & & & \\   & & & \\   & & \\ $	(W/I 3.04 12.85 28.11 3.84 1.72				(26) (27) (27) (27) (27) (27)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4  Floor	Gross area ( 1 2 3 4	s m²)	Openin m	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3	m <sup>2</sup>	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K	(W/I 3.04 12.85 28.11 3.84 1.72				(26) (27) (27) (27) (27) (27) (28)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls  Roof	Gross area (	3 3	Openin m	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4	m <sup>2</sup>	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.14  0.16	K	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32				(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls	Gross area (	3 m²) m²	36.99 0	gs 2	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	m <sup>2</sup>	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29		kJ/m²-l	K	(26) (27) (27) (27) (27) (28) (29)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls  Roof  Total area of electors	Gross area (	m²)  m²  m²  ws, use e	Openin m  36.99	gs 2 Indow U-ve	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	x1 x1 x1 x1 x2 x x2 x x2 x x2 x x2 x x2	W/m2  1.6  /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1	EK	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29		kJ/m²-l	K	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls  Roof  Total area of ele  * for windows and ro  ** include the areas  Fabric heat loss	Gross area (	m <sup>2</sup> )  m <sup>2</sup> m <sup>2</sup> ws, use e ides of in	36.99	gs 2 Indow U-ve	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	x1 x1 x1 x1 x2 x x2 x x2 x x2 x x2 x x2	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29		kJ/m²-l	K	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type 2  Windows Type 2  Windows Type 2  Windows Type 2  Floor  Walls  Roof  Total area of ele  * for windows and ro  ** include the areas  Fabric heat loss  Heat capacity C	Gross area (1) 1 2 3 4 201.48 92.92 ements, oof window on both s s, W/K = em = S(A)	m <sup>2</sup> ) m <sup>2</sup> m <sup>2</sup> ws, use e ides of in S (A x	36.99 0 ffective winternal walk	gs 2 ndow U-va	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculations	x1 x1 x1 x1 x2 x x x 2 x x x 2 x x x 2 x x x 2 x x x 2 x x x 2 x x x x 2 x x x x 2 x	W/m2  1.6  /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1	$ \begin{array}{ccc} 2K & & & & & \\  & & & & & \\  & & & & & \\  & & & &$	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29	Bas given in	kJ/m²-l	n 3.2	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls  Roof  Total area of ele  * for windows and ro  ** include the areas  Fabric heat loss	Gross area (1) 1 2 3 4 201.48 92.92 ements, oof window on both s s, W/K = em = S(A)	m <sup>2</sup> ) m <sup>2</sup> m <sup>2</sup> ws, use e ides of in S (A x	36.99 0 ffective winternal walk	gs 2 ndow U-va	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculations	x1 x1 x1 x1 x2 x x x 2 x x x 2 x x x 2 x x x 2 x x x 2 x x x 2 x x x x 2 x x x x 2 x	W/m2  1.6  /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1	$ \begin{array}{ccc} 2K & & & & & \\  & & & & & \\  & & & & & \\  & & & &$	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29	3 [ ] as given in	kJ/m²-l	3.2 98.18	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type 2  Windows Type 2  Windows Type 2  Windows Type 2  Floor  Walls  Roof  Total area of ele  * for windows and ro  ** include the areas  Fabric heat loss  Heat capacity C	Gross area (1) 1 2 3 4 201.48 92.92 ements, oof window on both s s, W/K = cm = S(A) paramete ments when	m <sup>2</sup> ) m <sup>2</sup> ws, use e ides of in S (A x A x k ) er (TMF	36.99  36.99  0  ffective winternal walk U)  P = Cm ÷	gs 2 ndow U-va ds and part	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculations	x1 x1 x1 x1 x2 x x2 x 2 x 2 x 2 x 2 x 2	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & & \\   & & & & & & \\   & & & & & \\   & & & & & \\   & & & & & \\   & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & $	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29 (e)+0.04] a	3 [ ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ]	kJ/m²·l  paragraph(32e) =	7 3.2 98.18 12537.89	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type 2  Windows Type 2  Windows Type 2  Windows Type 2  Floor  Walls  Roof  Total area of ele  * for windows and ro  ** include the areas  Fabric heat loss  Heat capacity C  Thermal mass p  For design assessment	Gross area (1)  1  2  3  4  201.48  92.92  ements, oof window on both s s, W/K = Em = S(A) paramete ments when d of a deta	m <sup>2</sup> ) m <sup>2</sup> ws, use e ides of in S (A x A x K ) er (TMF re the deiled calculation	36.99  36.99  ffective winternal walk  U)  P = Cm ÷  tails of the ulation.	gs 2 ndow U-ve ls and part - TFA) ir constructi	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculations	x1 x1 x1 x1 x1 x2 x 2 x 2 x 2 x t known pr	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & & \\   & & & & & & \\   & & & & & \\   & & & & & \\   & & & & & \\   & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & $	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29 (e)+0.04] a	3 [ ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ]	kJ/m²·l  paragraph(32e) =	7 3.2 98.18 12537.89	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type 2  Windows Type 3  Windows Type 3  Windows Type 4  Floor  Walls  Roof  Total area of ele  * for windows and ro  ** include the areas  Fabric heat loss  Heat capacity C  Thermal mass p  For design assessment and be used instead	Gross area (1)  1  2  3  4  201.48  92.92  ements, poof window on both s  s, W/K =  ements when d of a deta s : S (L x) bridging a	m <sup>2</sup> ) m <sup>2</sup> ws, use e ides of in S (A x A x k) er (TMF re the dei iled calcu x Y) calc	36.99 36.99 0 ffective winternal wall U) P = Cm = tails of the ulation. culated to	gs 2  Indow U-vals and part constructions	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculations kJ/m²K	x1 x1 x1 x1 x1 x2 x 2 x 2 x 2 x t known pr	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	EK	(W/I 3.04 12.85 28.11 3.84 1.72 13.0088 26.32 9.29 (e)+0.04] a	3 [ ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ]	kJ/m²·l  paragraph(32e) =	7 3.2 98.18 12537.89 250	(26) (27) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35)



Ventila	ition hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	91.78	91.09	90.42	87.25	86.66	83.9	83.9	83.39	84.96	86.66	87.86	89.11		(38)
Heat tr	ansfer c	coefficier	nt, W/K					•	(39)m	= (37) + (37)	38)m			
(39)m=	224.62	223.93	223.25	220.09	219.49	216.73	216.73	216.22	217.8	219.49	220.69	221.95		
			\				•	•			Sum(39) <sub>1</sub>	12 /12=	220.08	(39)
1		· · · ·	HLP), W/	i						= (39)m ÷				
(40)m=	1.28	1.28	1.28	1.26	1.25	1.24	1.24	1.24	1.24	1.25	1.26	1.27	4.00	7(40)
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	4verage =	Sum(40) <sub>1</sub>	12 /12=	1.26	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
'				•	•	•	•	•	•		•	•		
4. Wa	iter heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	inancy I	N									.97		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.97		(42)
	A £ 13.9	•						<b></b>						
			ater usag hot water							se target o		4.72		(43)
		_	person per			_	_			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	· · ·					
(44)m=	115.19	111	106.82	102.63	98.44	94.25	94.25	98.44	102.63	106.82	111	115.19		
<b>-</b>		<i>t1</i>				100 - 1/-/-		T (000)			m(44) <sub>112</sub> =		1256.65	(44)
Energy o			used - cal	ı	onthly = 4. r	1		r	) KWN/mor	ith (see Ta				
(45)m=	170.83	149.41	154.17	134.41	128.97	111.29	103.13	118.34	119.76	139.56	152.35	165.44		<b>_</b>
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1647.67	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage	loss:		<u> </u>			<u> </u>	<u> </u>						
Storag	e volum	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		210		(47)
	-	_	ind no ta		_			. ,						
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage		eclared l	oss facti	nr is kno	wn (k\/\/l	n/day)·					0		(48)
•			m Table		JI 10 KI10	WII (ICVVI	i, day).							(49)
•			storage		aar			(48) x (49	١ –			0		
٠.			eclared o			or is not		(40) X (40)	, –			0		(50)
,			factor fr	-								0		(51)
	•	_	ee secti	on 4.3										
	e factor			O.b.								0		(52)
			m Table									0		(53)
• • • • • • • • • • • • • • • • • • • •			storage	, kWh/ye	ear			(47) x (51	) x (52) x (	53) =		0		(54)
	(50) or (	, ,	•	for oach	month			((E6)~ ·	55\ ~ (44\)	<b>~</b>		0		(55)
1			culated f			_		((56)m = (			_			(50)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)



•	er contains	dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (	H11)] ÷ (5	u), eise (s	<i>i</i> )iii = (30)	iii wiieie (	1111) 15 110	iii Append	ІХ П	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primai	ry circuit	loss (an	nual) fro	m Table	3	-	-		-	-		0		(58)
	y circuit	`	,			59)m = (	(58) ÷ 36	55 × (41)	m					
(mo	dified by	factor fr	rom Tabl	le H5 if t	here is s	olar 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)
Comb	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 h	neat 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=	145.2	127	131.05	114.25	109.63	94.6	87.66	100.59	101.79	118.63	129.49	140.62		(62)
Solar Di	HW input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	<u>3)</u>				ı	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from wa	ater hea	ter											
(64)m=	145.2	127	131.05	114.25	109.63	94.6	87.66	100.59	101.79	118.63	129.49	140.62		_
								Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	1400.52	(64)
Heat g	ains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	1] + 0.8 >	د [(46)m	+ (57)m	+ (59)m	]	
(65)m=	36.3	31.75	32.76	28.56	27.41	23.65	21.92	25.15	25.45	29.66	32.37	35.16		(65)
inclu	ude (57)r	n in calc	culation of	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. In	ternal ga	ins (see	Table 5	and 5a	):									
					, ·									
Metab	olic gain	s (Table			, .									
Metab	olic gain Jan	s (Table Feb			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metab (66)m=			5), Wat	ts		Jun 148.47	Jul 148.47	Aug 148.47	Sep 148.47	Oct	Nov 148.47	Dec 148.47		(66)
(66)m=	Jan	Feb 148.47	5), Wat Mar 148.47	ts Apr 148.47	May 148.47	148.47	148.47	148.47	148.47		-			(66)
(66)m=	Jan 148.47	Feb 148.47	5), Wat Mar 148.47	ts Apr 148.47	May 148.47	148.47	148.47	148.47	148.47		-			(66) (67)
(66)m= Lightir (67)m=	Jan 148.47 ng gains	Feb 148.47 (calculated) 27.64	5), Wat Mar 148.47 ted in Ap	Apr 148.47 opendix I 17.02	May 148.47 L, equati	148.47 ion L9 oi 10.74	148.47 r L9a), a 11.6	148.47 Iso see	148.47 Table 5	148.47 25.7	148.47	148.47		. ,
(66)m= Lightir (67)m= Applia	Jan 148.47 ng gains 31.12	Feb 148.47 (calculated 27.64 ns (calculated 27.64)	Mar 148.47 ted in Ap 22.48	Apr 148.47 opendix I 17.02	May 148.47 L, equati 12.72	148.47 ion L9 oi 10.74 uation L	148.47 r L9a), a 11.6 13 or L1	148.47 Iso see 15.08 3a), also	148.47 Table 5	148.47 25.7	148.47	148.47		. ,
(66)m= Lightir (67)m= Applia (68)m=	Jan 148.47 ng gains 31.12 nces gai	Feb 148.47 (calculat 27.64 ns (calc 350.27	148.47 ted in Ap 22.48 ulated in 341.21	Apr 148.47 ppendix I 17.02 Append 321.91	May 148.47 L, equati 12.72 dix L, equalization (297.55)	148.47 ion L9 or 10.74 uation L 274.65	148.47 r L9a), a 11.6 13 or L1 259.35	148.47 Iso see 15.08 3a), also	148.47 Table 5 20.24 see Ta 264.82	25.7 ble 5 284.12	30	148.47 31.98		(67)
(66)m= Lightir (67)m= Applia (68)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains	Feb 148.47 (calculat 27.64 ns (calc 350.27	148.47 ted in Ap 22.48 ulated in 341.21	Apr 148.47 ppendix I 17.02 Append 321.91	May 148.47 L, equati 12.72 dix L, equalization (297.55)	148.47 ion L9 or 10.74 uation L 274.65	148.47 r L9a), a 11.6 13 or L1 259.35	148.47 Iso see 15.08 3a), also	148.47 Table 5 20.24 see Ta 264.82	25.7 ble 5 284.12	30	148.47 31.98		(67)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains	Feb 148.47 (calculate 27.64 ns (calculate 350.27 (calculate 37.85	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 tted in Ap 37.85	Apr 148.47 opendix 1 17.02 Append 321.91 opendix 37.85	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat	148.47 ion L9 of 10.74 uation L 274.65 ion L15	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a)	148.47 Iso see 15.08 3a), also 255.76	148.47 Table 5 20.24 See Ta 264.82 ee Table	148.47 25.7 ble 5 284.12	30 308.48	31.98 331.38		(67) (68)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m=	Jan 148.47 ng gains 31.12 nces gai 346.68 ng gains 37.85	Feb 148.47 (calculate 27.64 ns (calculate 350.27 (calculate 37.85	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 tted in Ap 37.85	Apr 148.47 opendix 1 17.02 Append 321.91 opendix 37.85	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat	148.47 ion L9 of 10.74 uation L 274.65 ion L15	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a)	148.47 Iso see 15.08 3a), also 255.76	148.47 Table 5 20.24 See Ta 264.82 ee Table	148.47 25.7 ble 5 284.12	30 308.48	31.98 331.38		(67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far	Feb 148.47 (calculated 27.64 ns (calculated 350.27) (calculated 37.85) ns gains 0	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 ted in Ap 37.85 (Table 5	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 37.85	148.47 Table 5 20.24 see Ta 264.82 ee Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 a and far 0	Feb 148.47 (calculated processing contents of the contents of	5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 ted in Ap 37.85 (Table 5	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 37.85	148.47 Table 5 20.24 see Ta 264.82 ee Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 a and far 0 s e.g. ev	Feb  148.47 (calculated processing spains of the content of the co	22.48 ulated in Ap 37.85 (Table 5 on (negat -118.77	Apr 148.47 ppendix I 17.02 Append 321.91 ppendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5)	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far 0 s e.g. ev -118.77	Feb  148.47 (calculated processing spains of the content of the co	22.48 ulated in Ap 37.85 (Table 5 on (negat -118.77	Apr 148.47 ppendix I 17.02 Append 321.91 ppendix 37.85 5a) 0	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5)	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 a and far 0 s e.g. ev -118.77 heating	Feb  148.47 (calculated processes and proces	22.48 ulated in Ap 37.85 (Table 5 0 n (negat	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 Ga) 0 tive value	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85  0 -118.77	148.47  25.7  ble 5  284.12  5  37.85  0  -118.77	30 308.48 37.85 0 -118.77	31.98 331.38 37.85 0 -118.77		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far 0 s e.g. ev -118.77 heating 48.79	Feb  148.47 (calculated processes and proces	22.48 ulated in Ap 37.85 (Table 5 0 n (negat	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 Ga) 0 tive value	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  0 ile 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85  0 -118.77	148.47 Iso see 15.08 3a), also 255.76 , also se 37.85	148.47 Table 5 20.24 See Ta 264.82 EE Table 37.85  0 -118.77	148.47  25.7  ble 5  284.12  5  37.85  0  -118.77	30 308.48 37.85 0 -118.77	31.98 331.38 37.85 0 -118.77		(67) (68) (69) (70)
(66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	Jan 148.47 ag gains 31.12 nces gai 346.68 ag gains 37.85 and far 0 s e.g. ev -118.77 heating 48.79 internal	Feb  148.47 (calculated 27.64)  ns (calculated 350.27) (calculated 37.85) ns gains 0 aporation -118.77 gains (Talculated 47.25)  gains = 492.7	148.47 ted in Ap 22.48 ulated in 341.21 ted in Ap 37.85 (Table 5 0 on (negat -118.77 Table 5) 44.04	Apr 148.47 opendix I 17.02 Appendix 321.91 opendix 37.85 5a) 0 tive value -118.77	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85  0 es) (Tab -118.77	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85  0 le 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85  0 -118.77  29.46 m + (67)m	148.47 Iso see 15.08 3a), also 255.76 0, also se 37.85 0	148.47 Table 5 20.24 see Ta 264.82 ee Table 37.85  0  -118.77  35.34 + (69)m + (	148.47  25.7  ble 5  284.12  5  37.85  0  -118.77  39.86  (70)m + (7	30 308.48 37.85 0 -118.77 44.96 1)m + (72)	31.98 331.38 37.85 0 -118.77		(67) (68) (69) (70) (71)

Flux

Table 6a

Table 6b

Table 6c

Area

m²

Orientation: Access Factor

Table 6d

Gains

(W)



North	0.9x	0.77	x	9.69	x	10.63	x	0.63	x	0.7	=	31.49	(74)
North	0.9x	0.77	x	9.69	x	20.32	x	0.63	x	0.7	j =	60.18	(74)
North	0.9x	0.77	x	9.69	x	34.53	x	0.63	x	0.7	=	102.26	(74)
North	0.9x	0.77	X	9.69	x	55.46	x	0.63	x	0.7	=	164.25	(74)
North	0.9x	0.77	x	9.69	x	74.72	x	0.63	x	0.7	=	221.26	(74)
North	0.9x	0.77	X	9.69	x	79.99	x	0.63	x	0.7	=	236.87	(74)
North	0.9x	0.77	X	9.69	x	74.68	x	0.63	X	0.7	=	221.15	(74)
North	0.9x	0.77	X	9.69	x	59.25	x	0.63	x	0.7	=	175.45	(74)
North	0.9x	0.77	X	9.69	x	41.52	X	0.63	x	0.7	=	122.95	(74)
North	0.9x	0.77	X	9.69	X	24.19	X	0.63	x	0.7	=	71.63	(74)
North	0.9x	0.77	X	9.69	X	13.12	X	0.63	x	0.7	=	38.85	(74)
North	0.9x	0.77	X	9.69	X	8.86	X	0.63	X	0.7	=	26.25	(74)
East	0.9x	0.77	X	2.9	x	19.64	X	0.63	x	0.7	=	17.41	(76)
East	0.9x	0.77	X	2.9	X	38.42	X	0.63	X	0.7	=	34.05	(76)
East	0.9x	0.77	X	2.9	X	63.27	X	0.63	x	0.7	=	56.08	(76)
East	0.9x	0.77	X	2.9	x	92.28	X	0.63	x	0.7	=	81.79	(76)
East	0.9x	0.77	X	2.9	X	113.09	X	0.63	X	0.7	=	100.23	(76)
East	0.9x	0.77	X	2.9	X	115.77	X	0.63	X	0.7	=	102.6	(76)
East	0.9x	0.77	X	2.9	X	110.22	X	0.63	X	0.7	=	97.68	(76)
East	0.9x	0.77	X	2.9	X	94.68	X	0.63	X	0.7	=	83.91	(76)
East	0.9x	0.77	X	2.9	X	73.59	x	0.63	x	0.7	=	65.22	(76)
East	0.9x	0.77	X	2.9	X	45.59	X	0.63	X	0.7	=	40.4	(76)
East	0.9x	0.77	X	2.9	X	24.49	X	0.63	X	0.7	=	21.7	(76)
East	0.9x	0.77	X	2.9	X	16.15	x	0.63	x	0.7	=	14.31	(76)
South	0.9x	0.77	X	21.2	X	46.75	x	0.63	x	0.7	=	302.91	(78)
South	0.9x	0.77	X	21.2	X	76.57	x	0.63	x	0.7	=	496.08	(78)
South	0.9x	0.77	X	21.2	X	97.53	X	0.63	X	0.7	=	631.92	(78)
South	0.9x	0.77	X	21.2	X	110.23	X	0.63	X	0.7	=	714.21	(78)
South	0.9x	0.77	X	21.2	X	114.87	X	0.63	X	0.7	=	744.25	(78)
South	0.9x	0.77	X	21.2	X	110.55	X	0.63	X	0.7	=	716.24	(78)
South	0.9x	0.77	X	21.2	X	108.01	X	0.63	X	0.7	=	699.81	(78)
South	0.9x	0.77	X	21.2	X	104.89	X	0.63	X	0.7	=	679.61	(78)
South	0.9x	0.77	X	21.2	X	101.89	X	0.63	X	0.7	=	660.12	(78)
South	0.9x	0.77	X	21.2	X	82.59	X	0.63	X	0.7	=	535.07	(78)
South	0.9x	0.77	X	21.2	X	55.42	X	0.63	X	0.7	=	359.05	(78)
South	0.9x	0.77	X	21.2	X	40.4	X	0.63	X	0.7	=	261.74	(78)
West	0.9x	0.77	X	1.3	x	19.64	x	0.63	x	0.7	=	7.8	(80)
West	0.9x	0.77	X	1.3	x	38.42	x	0.63	x	0.7	=	15.26	(80)
West	0.9x	0.77	X	1.3	x	63.27	x	0.63	x	0.7	=	25.14	(80)
West	0.9x	0.77	×	1.3	×	92.28	x	0.63	x	0.7	=	36.66	(80)
West	0.9x	0.77	×	1.3	x	113.09	x	0.63	x	0.7	=	44.93	(80)



West	0.9x	0.77	X	1.	3	x	1	15.77	x		0.63	x	0.7		=	46	(80)
West	0.9x	0.77	×	1.	3	x	1	10.22	x		0.63	x [	0.7		=	43.79	(80)
West	0.9x	0.77	X	1.	3	x	9	4.68	х		0.63	x [	0.7		=	37.61	(80)
West	0.9x	0.77	X	1.	3	x	7	3.59	x		0.63	x [	0.7	一	=	29.24	(80)
West	0.9x	0.77	×	1.	3	x	4	5.59	x		0.63	x [	0.7	一	=	18.11	(80)
West	0.9x	0.77	x	1.	3	x	2	4.49	x		0.63	×	0.7	司	=	9.73	(80)
West	0.9x	0.77	X	1.	3	x	1	6.15	x		0.63	x [	0.7	一	=	6.42	(80)
	_					,			•								_
Solar gai	ins in	watts, ca	alculate	d for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m					
(83)m= 3	359.61	605.58	815.39	996.91	1110.67	11	01.71	1062.43	976	.59	877.52	665.22	429.33	308.	72		(83)
Total gai	ins – ir	nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts									
(84)m= 8	353.73	1098.27	1290.65	1443.04	1525.32	14	87.48	1430.38	1348	3.77	1265.47	1082.45	880.31	786.	87		(84)
7. Mear	n inter	nal temp	erature	(heating	seasor	)											
Temper	rature	during h	eating <sub>l</sub>	periods i	n the livi	ng	area 1	from Tab	ole 9	, Th	1 (°C)					21	(85)
Utilisati	on fac	tor for g	ains for	living are	ea, h1,m	) (S	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	De	ec		
(86)m=	1	1	0.99	0.97	0.92		0.8	0.63	0.6	88	0.89	0.98	1	1			(86)
— Mean ir	nterna	l tampar	atura in	living ar	22 T1 (f	مالہ	w eta	ne 3 to 7	in T	ahle	2 9c)						
	19.48	19.68	19.97	20.34	20.66		0.89	20.97	20.		20.8	20.36	19.85	19.4	15	Į	(87)
` '									<u> </u>	!						I	
· -	19.85	auring n	19.86	periods ii	19.88	т —	eiiing 9.89	19.89	19.		12 (°C)	19.88	19.87	19.8	7		(88)
` '										09	19.00	19.00	19.67	19.0	07		(00)
		Ť		rest of d		т —			T			ı	_	1		I	
(89)m=	1	1	0.99	0.96	0.88		0.7	0.49	0.5	54	0.82	0.98	1	1			(89)
Mean ir	nterna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7	7 in Tabl	e 9c)					
(90)m=	18.47	18.68	18.96	19.33	19.64	1	9.84	19.88	19.	88	19.77	19.36	18.85	18.4	5		(90)
											f	LA = Livi	ng area ÷ (	4) =		0.15	(91)
Mean ir	nterna	l temper	ature (fo	or the wh	ole dwe	llin	g) = fl	_A × T1	+ (1	– fL	A) × T2						
_	18.62	18.82	19.11	19.48	19.79	_	9.99	20.04	20.		19.92	19.51	19	18.0	6		(92)
Apply a	ıdjustn	nent to the	he mea	n interna	l temper	atu	re fro	m Table	4e,	whe	re appro	opriate	· l				
(93)m=	18.62	18.82	19.11	19.48	19.79	1	9.99	20.04	20.	04	19.92	19.51	19	18.6	6		(93)
8. Spac	e hea	ting requ	uiremen	t													
				•		ned	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-c	calc	ulate	
the utilis				using Ta	i	_							1			1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	De	ec		
(94)m=	on fac	tor for ga	0.99	0.96	0.88	Ι,	).71	0.51	0.5	56 T	0.83	0.97	1	1			(94)
				4)m x (8		Г,	).1 1	0.51	0.0		0.03	0.97	<u> </u>				(04)
	352.34		· ·	1380.57	<del></del>	10	62.27	729.53	760	.39	1045.31	1051.23	876.76	786	3		(95)
` ′				nperature	<u> </u>			. 20.00					1 0.0		_		, ,
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16	.4	14.1	10.6	7.1	4.2			(96)
	ss rate	e for mea		nal temp	l .	<u> </u>			l		– (96)m	 ]	1			ı	•
(97)m= 3				<del></del>		_			786	<del>-</del> -	1267.96	<del>-</del>	2625.83	3196	.15		(97)
Space h	heatin	g require	ement fo	or each n	nonth, k	Wh	/mont	h = 0.02	24 x	<u>_</u> [(97)	m – (95	)m] x (4	11)m				
		1361.09	1149.06	ĭ	322.06		0	0	C	Í	0	672.58	T	1793	.15		
				-	•	•			-			-	•	•			



(98) Total per year (kWh/year) =  $Sum(98)_{1...5,9...12}$  = 8999.01 Space heating requirement in kWh/m²/year (99)51.41 8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar May Jun Jul Aug Sep Oct Nov Dec Apr Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 2037.29 1603.82 1643.29 (100)(100)m =0 0 Utilisation factor for loss hm (101)(101)m =0 0.79 0.87 0.84 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m=1607.87 1395.75 0 0 0 0 (102)Gains (solar gains calculated for applicable weather region, see Table 10) (103)m=1872.5 1802.53 1709.87 (103)Space cooling requirement for month, whole dwelling, continuous (kWh) =  $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m  $< 3 \times (98)$ m (104)m =0 190.54 302.65 242.68 0 0 Total = Sum(104)(104)735.86 Cooled fraction  $f C = cooled area \div (4) =$ (105)1 Intermittency factor (Table 10b) (106)m= 0 0 0 0.25 0.25 0.25 0 0 0 0 0 Total = Sum(104)(106)0 Space cooling requirement for month = (104)m × (105) × (106)m 47.63 75.66 60.67 0 0 (107)m =0 0 0 0 Total = Sum(107)(107)183.97 (108)Space cooling requirement in kWh/m²/year  $(107) \div (4) =$ 1.05 8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11) (109)Fabric Energy Efficiency (99) + (108) =52.46



#### User Details:

Assessor Name:Chris McdonaldStroma Number:STRO007579Software Name:Stroma FSAP 2012Software Version:Version: 1.0.5.8

Software Name:	Stroma FSAP 2012	Software	Version:	Versio	n: 1.0.5.8	
	Pro	operty Address: Plo	ot 1 LPG			
Address :	Land West of Broome Farm B	Barn, Broome, Cra	en Arms			
1. Overall dwelling dime	ensions:					
Ground floor		Area(m²)	Av. Heigl	<del></del>	Volume(m <sup>3</sup>	<u>^</u>
		92.92 (1a)	X 2.7	(2a) =	250.88	(3a)
First floor		82.14 (1b)	x 2.41	(2b) =	197.96	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	175.06 (4)				
Dwelling volume		(3a	)+(3b)+(3c)+(3d)+(	(3e)+(3n) =	448.84	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total		m³ per hou	ır
Number of chimneys	0 + 0	+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 1	+ 0	= 1	x 20 =	20	(6b)
Number of intermittent fa	ns		5	x 10 =	50	(7a)
Number of passive vents	:		0	x 10 =	0	(7b)
Number of flueless gas fi	res		0	x 40 =	0	(7c)
					ongoo nor he	
Infilmation due to object	(Co) (Ch) (70	)		_	nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(7a neen carried out or is intended, proceed		70 nue from (9) to (16	÷ (5) =	0.16	(8)
Number of storeys in the		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(-) (-)	,	0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame or 0	0.35 for masonry co	onstruction		0	(11)
	resent, use the value corresponding to t	he greater wall area (af	ter			
deducting areas of openii	floor, enter 0.2 (unsealed) or 0.1	(sealed), else ente	er O		0	(12)
If no draught lobby, en	,	(000.00), 0.00 0			0	(13)
•	s and doors draught stripped				0	(14)
Window infiltration	0 11	0.25 - [0.2 x (1	4) ÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (11	1) + (12) + (13) + (1	15) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per squa	re metre of env	elope area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$	, otherwise $(18) = (16)$			0.41	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permea	ability is being used	1		
Number of sides sheltere	ed	(00) 4 50 00	75 ·· (40)]		0	(19)
Shelter factor		(20) = 1 - [0.07]			1	(20)
Infiltration rate incorporate	ting shelter factor	$(21) = (18) \times (2)$	20) =		0.41	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthl	y avera	ge wind	speed fr	om Tabl	e 7							
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7



Wind Factor (22a)	m = (22)m ÷	- 4										
	25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
								<u>l</u>	<u>l</u>	ļ		
Adjusted infiltration	<del>`</del>	<del></del>			<del>i i</del>	<del>`</del>	<del>ì ´</del>		0.40	0.40		
0.52 0.  Calculate effective		0.45	0.44 he appli	0.39 <b>cable ca</b>	0.39 ase	0.38	0.41	0.44	0.46	0.48		
If mechanical ve	•										0	(23a)
If exhaust air heat p	ump using App	endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with hea	t recovery: effic	ciency in %	allowing f	for in-use f	factor (fron	n Table 4h	) =				0	(23c)
a) If balanced m	echanical v	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced m	echanical v	entilation	without	heat red	covery (I	MV) (24b	)m = (22	2b)m + (	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole hous			•									
if (22b)m < 0	<del></del>	<del>- ` </del>	ŕ	<del>i                                     </del>	<del>- `</del>	<del>ŕ `</del>	<del></del>	<u> </u>	<del></del>		ı	
( )	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural vent if (22b)m = 1			•					0.51				
	63 0.62	1000000000000000000000000000000000000	0.6	0.57	0.57	0.5 + [(2	0.58	0.5]	0.6	0.61		(24d)
Effective air cha				ļ	<u> </u>	ļ		0.0	0.0	0.01		( - 7
	63 0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61		(25)
` ′		1		1	1					1		
3 Heat lesses an	d boot loca											
3. Heat losses an												
ELEMENT	Gross area (m²)	Openin Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k J/K
ELEMENT	Gross	Openin	ıgs									
ELEMENT	Gross	Openin	ıgs	A ,r	m² x	W/m2	2K = [	(W/				J/K
ELEMENT a	Gross	Openin	ıgs	A ,r	m <sup>2</sup> x	W/m2	2K = [ 0.04] = [	(W/				J/K (26)
ELEMENT  Doors  Windows Type 1	Gross	Openin	ıgs	A ,r 1.9 9.69	m² x x1 x1	W/m2 1.6 /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	3.04 12.85				J/K (26) (27)
ELEMENT Doors Windows Type 1 Windows Type 2	Gross	Openin	ıgs	A ,r 1.9 9.69 21.2	m² x x1 x1 x1	W/m2 1.6 /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}  & & & \\  & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\$	3.04 12.85 28.11				(26) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3	Gross	Openin	ıgs	A ,r 1.9 9.69 21.2 2.9	m² x x1 x1 x1	W/m2 1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}  & & & \\  & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\  & & & \\$	3.04 12.85 28.11 3.84	K)			(26) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Gross	Openin	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3	m² x x1 x1 x1 x1 x1 x1	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc}   & & & & \\   & & & & \\   & & & \\   & & & \\   & & \\ $	3.04 12.85 28.11 3.84 1.72	K)			(26) (27) (27) (27) (27) (27) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor	Gross area (m²)	Openin	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3	m² x1 x1 x1 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.14  0.16	K	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32	K)			(26) (27) (27) (27) (27) (27) (28) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof	201.48 92.92	Openin m	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4	m² x x1 x1 x1 x1 x2 x x1 9 x x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K	3.04 12.85 28.11 3.84 1.72	K)			(26) (27) (27) (27) (27) (27) (28) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls	201.48 92.92 ents, m <sup>2</sup>	Openin m	ngs n²	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)	kJ/m²-l		(26) (27) (27) (27) (27) (27) (28) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem	201.48  92.92 ents, m² windows, use	Openin m 36.9 0	ngs n² 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)	kJ/m²-l		(26) (27) (27) (27) (27) (27) (28) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof	201.48  92.92  ents, m²  windows, use both sides of i	Openin m 36.9 0 effective with the state of	ngs n² 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16	EK	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)	kJ/m²-l		(26) (27) (27) (27) (27) (27) (28) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on	201.48  92.92  ents, m²  windows, use both sides of i	Openin m 36.9 0 effective with the state of	ngs n² 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m² x1 x1 x1 x1 2 x x1 22 x x2 2 x	W/m2  1.6  /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1	$ \begin{array}{ccc} 2K & & & & & \\  & & & & & \\  & & & & & \\  & & & &$	(W// 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)  B  Construction  B  Construction  Constr	kJ/m²-l	3.2 k	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V	201.48  92.92  ents, m² windows, use both sides of it.  J/K = S (A x k)	36.9  0  effective with internal walk (U)	ngs n² 9 indow U-va	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 x2 x x x2 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 )+  0.14  0.16  0.1	$ \begin{array}{ccc} 2K & & & & & \\  & & & & & \\  & & & & & \\  & & & &$	3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29	K)  3  [ ] as given in  (2) + (32a).	kJ/m²-l	3.2 98.18	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V Heat capacity Cm	201.48  92.92  ents, m²  windows, use both sides of i  V/K = S (A x k )  ameter (TM is where the di	36.9  36.9  0  effective with internal walk (U)  P = Cm - etails of the	gs n² 9 indow U-va lls and pan	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	m²	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & & \\   & & & & & & \\   & & & & & \\   & & & & & \\   & & & & & \\   & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & & \\   & & & $	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29 (e)+0.04] & & & & & & & & & & & & & & & & & & &	K)  3  (as given in 2) + (32a).  (32a).	kJ/m²·l paragraph (32e) =	98.18 12537.89	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V Heat capacity Cm Thermal mass par For design assessmen	201.48  92.92  ents, m²  windows, use both sides of i  V/K = S (A x k )  ameter (TM is where the di a detailed calc	Openin m  36.9  0  effective with ternal walk (U)  P = Cm - etails of the culation.	gs 12 9 indow U-va lls and pan ÷ TFA) in	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 x2 x 2 x 2 x 49 x 40	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & \\   & & & & \\   & & & \\   & & & \\   & & $	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29 (e)+0.04] & & & & & & & & & & & & & & & & & & &	K)  3  (as given in 2) + (32a).  (32a).	kJ/m²·l paragraph (32e) =	98.18 12537.89	(26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Roof Total area of elem * for windows and roof ** include the areas on Fabric heat loss, V Heat capacity Cm Thermal mass par For design assessment can be used instead of	201.48  92.92  ents, m²  windows, use both sides of it  V/K = S (A x k )  ameter (TM  ts where the da a detailed calc S (L x Y) ca	36.9  36.9  0  effective with internal walk (U)  P = Cm - etails of the culation.  Iculated	gs  9  indow U-va ils and pan e construction	A ,r  1.9  9.69  21.2  2.9  1.3  92.92  164.4  92.92  387.3  alue calculatitions  n kJ/m²K	x1 x1 x1 x1 x2 x 2 x 2 x 49 x 40	W/m2  1.6 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.14  0.16  0.1  g formula 1 (26)(30)	$ \begin{array}{ccc}   & & & & & \\   & & & & \\   & & & \\   & & & \\   & & $	(W/) 3.04 12.85 28.11 3.84 1.72 13.008 26.32 9.29 (e)+0.04] & & & & & & & & & & & & & & & & & & &	K)  3  (as given in 2) + (32a).  (32a).	kJ/m²·l paragraph (32e) =	98.18 12537.89 250	(26) (27) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35)



Ventilat	tion hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	93.9	93.13	92.37	88.83	88.16	85.07	85.07	84.5	86.26	88.16	89.51	90.91		(38)
Heat tra	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	226.73	225.96	225.21	221.66	221	217.91	217.91	217.34	219.1	221	222.34	223.74		
			II D) \\	/ 21 <i>C</i>		-	-				Sum(39) <sub>1</sub> .	12 /12=	221.66	(39)
г	ss para	1.29	HLP), W/	1.27	1.26	1.24	1.24	1.24	(40)m 1.25	= (39)m ÷	1.27	1.28		
(40)m=	1.3	1.29	1.29	1.27	1.20	1.24	1.24	1.24	<u> </u>		Sum(40) <sub>1</sub> .	l	1.27	(40)
Numbe	r of day	/s in moi	nth (Tab	le 1a)						tvorage =	- Cum(40)1.	12712—	1.21	(```
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, l	N								2	97		(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		<i>51</i>		( .= /
	A £ 13.9	•	ator usac	no in litro	s par da	y Vd av	orago –	(25 x N)	± 36		40	4.70		(42)
								to achieve		se target o		4.72		(43)
not more	that 125	litres per p	person pei	r day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate		n litres per		ach month	Vd,m = fa			(43)				1		
(44)m=	115.19	111	106.82	102.63	98.44	94.25	94.25	98.44	102.63	106.82	111	115.19		7
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1256.65	(44)
(45)m=	170.83	149.41	154.17	134.41	128.97	111.29	103.13	118.34	119.76	139.56	152.35	165.44		
		<u> </u>	<u> </u>	<u> </u>		<u>!</u>	!	<u> </u>		Γotal = Su	l m(45) <sub>112</sub> =	=	1647.67	(45)
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)			•		
(46)m=	25.62	22.41	23.13	20.16	19.35	16.69	15.47	17.75	17.96	20.93	22.85	24.82		(46)
Water 5	_		includir	na anv sa	olar or M	/WHRS	storana	within sa	ame ves	امء		240		(47)
_		, ,		ink in dw			_		arric ves	301		210		(47)
		-			-			mbi boil	ers) ente	er '0' in (	47)			
Waters	-													
,				oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
• • • • • • • • • • • • • • • • • • • •			-	e, kWh/ye cylinder l		or is not		(48) x (49)	) =		2	10		(50)
•				om Tabl							0.	01		(51)
	•	_	ee secti	on 4.3										
		from Ta		OI.								83		(52)
•			m Table						. (==> (	>		54		(53)
•		m water (54) in (5	_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		97		(54)
		. , .	,	for each	month			((56)m = (	55) × (41)	m	0.	97		(55)
(56)m=	30.01	27.11	30.01	29.05	30.01	29.05	30.01	30.01	29.05	30.01	29.05	30.01		(56)
(50)111=	55.01		1 00.01	1	20.01	1	1 30.01	1 30.01	1	20.01	1	00.01		(55)



,	ler contains	s dedicate	a solar sto	rage, (57)i	111(00)111	x [(50) – (	п i i)] <del>-</del> (э	u), eise (s	<i>i</i> )iii = (56)	m where (	H11) is fro	m Appena	IX H	
(57)m=	30.01	27.11	30.01	29.05	30.01	29.05	30.01	30.01	29.05	30.01	29.05	30.01		(57)
Prima	ry circuit	loss (ar	nual) fro	m Table	3		-	-	_			0		(58)
	ry circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m				'	
(mc	dified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Comb	i loss cal	lculated	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	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=	224.1	197.53	207.45	185.97	182.25	162.85	156.41	171.62	171.31	192.84	203.9	218.71		(62)
Solar D	HW input of	calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add a	additiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from wa	ater hea	ter	-	-	-	-	-	-		-	-		
(64)m=	224.1	197.53	207.45	185.97	182.25	162.85	156.41	171.62	171.31	192.84	203.9	218.71		
								Outp	out from wa	ater heate	r (annual)₁	12	2274.95	(64)
Heat (	gains froi	m 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=	99.42	88.17	93.88	85.94	85.5	78.25	76.91	81.97	81.06	89.03	91.9	97.63		(65)
incl	ude (57)ı	m in cald	culation of	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a	):									
Metab	olic gain	s (Table			, -									
Metab	olic gain Jan	s (Table Feb		ts	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metab (66)m=	Jan		5), Wat			Jun 148.47	Jul 148.47	Aug 148.47	Sep 148.47	Oct	Nov 148.47	Dec 148.47		(66)
(66)m=	Jan	Feb 148.47	5), Wat Mar 148.47	ts Apr 148.47	May 148.47	148.47	148.47	148.47	148.47					(66)
(66)m=	Jan 148.47 ng gains	Feb 148.47	5), Wat Mar 148.47	ts Apr 148.47	May 148.47	148.47	148.47	148.47	148.47					(66) (67)
(66)m= Lightin (67)m=	Jan 148.47 ng gains	Feb 148.47 (calcula 27.64	5), Wat Mar 148.47 ted in Ap	Apr 148.47 opendix 17.02	May 148.47 L, equati	148.47 ion L9 oi 10.74	148.47 r L9a), a 11.6	148.47 Iso see	148.47 Table 5	148.47 25.7	148.47	148.47		
(66)m= Lightin (67)m= Applia	Jan 148.47 ng gains 31.12	Feb 148.47 (calcula 27.64 ins (calc	Mar 148.47 ted in Ap 22.48	Apr 148.47 ppendix 17.02	May 148.47 L, equati 12.72 dix L, eq	148.47 ion L9 or 10.74 uation L	148.47 r L9a), a 11.6 13 or L1	148.47 Iso see 15.08 3a), also	148.47 Table 5 20.24 see Tal	148.47 25.7 ble 5	148.47	148.47		
(66)m= Lightin (67)m= Applia (68)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68	Feb 148.47 (calcula 27.64 ins (calcula 350.27	22.48 ulated in 341.21	Apr 148.47 ppendix 17.02 Appendix 321.91	May 148.47 L, equati 12.72 dix L, eq 297.55	148.47 ion L9 or 10.74 uation L 274.65	148.47 r L9a), a 11.6 13 or L1 259.35	148.47 Iso see 15.08 3a), also 255.76	148.47 Table 5 20.24 see Tal 264.82	25.7 ble 5 284.12	148.47 30	148.47 31.98		(67)
(66)m= Lightin (67)m= Applia (68)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains	Feb 148.47 (calcula 27.64 ins (calcula 350.27	22.48 ulated in 341.21	Apr 148.47 ppendix 17.02 Appendix 321.91	May 148.47 L, equati 12.72 dix L, eq 297.55	148.47 ion L9 or 10.74 uation L 274.65	148.47 r L9a), a 11.6 13 or L1 259.35	148.47 Iso see 15.08 3a), also 255.76	148.47 Table 5 20.24 see Tal 264.82	25.7 ble 5 284.12	148.47 30	148.47 31.98		(67)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains	Feb 148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85	22.48 ulated in Ap 37.85	Apr 148.47 opendix 17.02 Append 321.91 opendix 37.85	May 148.47 L, equati 12.72 dix L, eq 297.55 L, equat	148.47 ion L9 or 10.74 uation L 274.65 ion L15	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a	148.47 Iso see 15.08 3a), also 255.76 ), also se	148.47 Table 5 20.24 See Tal 264.82 ee Table	25.7 ble 5 284.12	30 308.48	31.98 331.38		(67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m=	Jan 148.47  ang gains 31.12  ances gains 346.68  ang gains 37.85  s and far	Feb 148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85	22.48 ulated in Ap 37.85	Apr 148.47 opendix 17.02 Append 321.91 opendix 37.85	May 148.47 L, equati 12.72 dix L, eq 297.55 L, equat	148.47 ion L9 or 10.74 uation L 274.65 ion L15	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a	148.47 Iso see 15.08 3a), also 255.76 ), also se	148.47 Table 5 20.24 See Tal 264.82 ee Table	25.7 ble 5 284.12	30 308.48	31.98 331.38		(67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m=	Jan 148.47  ang gains 31.12  ances gains 346.68  ang gains 37.85  s and far	Feb 148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85 ns gains	22.48 ulated in Ap 37.85 (Table 5	Apr 148.47 opendix 17.02 Append 321.91 opendix 37.85 5a)	May 148.47 L, equati 12.72 dix L, equati 297.55 L, equati 37.85	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85	148.47 Table 5 20.24 see Tal 264.82 ee Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains 37.85 s and far 3 s e.g. ev	Feb 148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85 ns gains 3	22.48 ulated in Ap 37.85 (Table 5	Apr 148.47 opendix 17.02 Append 321.91 opendix 37.85 5a)	May 148.47 L, equati 12.72 dix L, equati 297.55 L, equati 37.85	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85	148.47 Table 5 20.24 see Tal 264.82 ee Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains 37.85 s and far 3 s e.g. ev	Feb 148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85 ns gains 3 aporatio -118.77	e 5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 ated in Ap 37.85 (Table 5 3 on (negat	Apr 148.47 opendix 17.02 Appendix 321.91 opendix 37.85 5a) 3	May 148.47 L, equati 12.72 dix L, eq 297.55 L, equat 37.85  a	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85 3	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a 37.85	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85	148.47 Table 5 20.24 See Tal 264.82 See Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m=	Jan 148.47 ng gains 31.12 nnces gains 346.68 ng gains 37.85 s and far 3 s e.g. ev -118.77 heating	Feb 148.47 (calcular 27.64 ins (calcular 350.27 (calcular 37.85 ns gains 3 raporatior -118.77 gains (T	e 5), Wat Mar 148.47 ted in Ap 22.48 ulated in 341.21 ated in Ap 37.85 (Table 5 3 on (negat	Apr 148.47 opendix 17.02 Appendix 321.91 opendix 37.85 5a) 3	May 148.47 L, equati 12.72 dix L, eq 297.55 L, equat 37.85  a	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85 3	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a 37.85	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85	148.47 Table 5 20.24 See Tal 264.82 See Table 37.85	25.7 ble 5 284.12 5 37.85	30 308.48 37.85	31.98 331.38 37.85		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains 37.85 s and far 3 s e.g. ev -118.77 heating	Feb  148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85 ns gains 3 aporatic -118.77 gains (T	22.48 ulated in Ap 37.85 (Table 5 3 on (negates) 126.19	Apr 148.47 opendix 17.02 Append 321.91 opendix 37.85 5a) 3 tive valu	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85  3 es) (Tab	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  3 le 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a 37.85  3 -118.77	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85 3	148.47 Table 5 20.24 See Table 264.82 See Table 37.85	25.7 ble 5 284.12 5 37.85 3 -118.77	30 308.48 37.85 3 -118.77	31.98 331.38 37.85 3 -118.77		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains 37.85 s and far 3 s e.g. ev -118.77 heating 133.63 internal	Feb  148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85 ns gains 3 aporatic -118.77 gains (T	22.48 ulated in Ap 37.85 (Table 5 3 on (negates) 126.19	Apr 148.47 opendix 17.02 Append 321.91 opendix 37.85 5a) 3 tive valu	May 148.47 L, equati 12.72 dix L, equ 297.55 L, equat 37.85  3 es) (Tab	148.47 ion L9 oi 10.74 uation L 274.65 ion L15 37.85  3 le 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a 37.85  3 -118.77	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85 3	148.47 Table 5 20.24 See Tal 264.82 See Table 37.85  3 -118.77	25.7 ble 5 284.12 5 37.85 3 -118.77	30 308.48 37.85 3 -118.77	31.98 331.38 37.85 3 -118.77		(67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m= Total (73)m=	Jan 148.47 ng gains 31.12 nnces gai 346.68 ng gains 37.85 s and far 3 s e.g. ev -118.77 heating 133.63 internal	Feb  148.47 (calcular 27.64 ins (calcular 350.27 (calcular 37.85 ns gains 3 raporation -118.77 gains (Tal.21) gains = 579.66	25), Wat Mar 148.47 ted in Ap 22.48 ulated in Ap 37.85 (Table 5 3 on (negation of the following states	Apr 148.47 opendix 17.02 Appendix 321.91 opendix 37.85 5a) 3 tive valu -118.77	May 148.47 L, equati 12.72 dix L, equati 297.55 L, equati 37.85  3 es) (Tab -118.77	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85  3 le 5) -118.77	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85  3 -118.77  103.38 m + (67)m	148.47 Iso see 15.08 3a), also 255.76 ), also se 37.85 3 -118.77	148.47 Table 5 20.24 See Tall 264.82 See Table 37.85  -118.77  112.59 + (69)m + (	148.47  25.7 ble 5 284.12 5 37.85  3  -118.77  119.66 (70)m + (7	30 308.48 37.85 3 -118.77 127.64 1)m + (72)	31.98 331.38 37.85 3 -118.77		(67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m= Total (73)m= 6. So	Jan  148.47  ng gains  31.12  nnces gains  346.68  ng gains  37.85  s and far  3  s e.g. ev  -118.77  heating  133.63  internal  581.96	Feb  148.47 (calcula 27.64 ins (calcula 350.27 (calcula 37.85 ns gains 3 aporatio -118.77 gains (T 131.21 gains = 579.66	# 5), Wat Mar 148.47 ted in Ap 22.48 ulated in Ap 37.85 (Table 5 3 on (negation -118.77 able 5) 126.19	Apr 148.47 opendix 17.02 Appendix 321.91 opendix 37.85 5a) 3 tive valu -118.77	May 148.47 L, equati 12.72 dix L, eq 297.55 L, equat 37.85  3 es) (Tab -118.77  114.92	148.47 ion L9 or 10.74 uation L 274.65 ion L15 37.85  3 le 5) -118.77  108.68 (66) 464.61	148.47 r L9a), a 11.6 13 or L1 259.35 or L15a) 37.85  3 -118.77  103.38 m + (67)m 444.87	148.47 lso see 15.08 3a), also 255.76 ), also se 37.85  -118.77  110.17 1+ (68)m - 451.55	148.47 Table 5 20.24 See Tal 264.82 See Table 37.85  -118.77  112.59 + (69)m + (468.2)	148.47  25.7 ble 5  284.12  5  37.85  3  -118.77  119.66  (70)m + (7  500.02	30 308.48 37.85 3 -118.77 127.64 1)m + (72) 536.66	31.98 331.38 37.85 3 -118.77 131.22 m 565.12		(67) (68) (69) (70) (71) (72)

Flux

Table 6a

Table 6b

Table 6c

Area

m²

Orientation: Access Factor

Table 6d

Gains

(W)



	_		_		_		_				_		
North	0.9x	0.77	X	9.69	X	10.63	X	0.63	X	0.7	=	31.49	(74)
North	0.9x	0.77	X	9.69	X	20.32	x	0.63	X	0.7	=	60.18	(74)
North	0.9x	0.77	X	9.69	X	34.53	X	0.63	X	0.7	=	102.26	(74)
North	0.9x	0.77	X	9.69	x	55.46	X	0.63	X	0.7	=	164.25	(74)
North	0.9x	0.77	X	9.69	x	74.72	X	0.63	X	0.7	=	221.26	(74)
North	0.9x	0.77	X	9.69	x	79.99	X	0.63	x	0.7	=	236.87	(74)
North	0.9x	0.77	X	9.69	x	74.68	X	0.63	x	0.7	=	221.15	(74)
North	0.9x	0.77	X	9.69	x	59.25	x	0.63	x	0.7	=	175.45	(74)
North	0.9x	0.77	X	9.69	x	41.52	X	0.63	X	0.7	=	122.95	(74)
North	0.9x	0.77	X	9.69	x	24.19	X	0.63	X	0.7	=	71.63	(74)
North	0.9x	0.77	X	9.69	X	13.12	X	0.63	X	0.7	=	38.85	(74)
North	0.9x	0.77	X	9.69	X	8.86	X	0.63	X	0.7	=	26.25	(74)
East	0.9x	0.77	X	2.9	X	19.64	X	0.63	X	0.7	=	17.41	(76)
East	0.9x	0.77	X	2.9	X	38.42	X	0.63	X	0.7	=	34.05	(76)
East	0.9x	0.77	X	2.9	x	63.27	X	0.63	X	0.7	=	56.08	(76)
East	0.9x	0.77	X	2.9	x	92.28	X	0.63	X	0.7	=	81.79	(76)
East	0.9x	0.77	X	2.9	X	113.09	X	0.63	X	0.7	=	100.23	(76)
East	0.9x	0.77	X	2.9	X	115.77	X	0.63	x	0.7	=	102.6	(76)
East	0.9x	0.77	X	2.9	X	110.22	X	0.63	X	0.7	=	97.68	(76)
East	0.9x	0.77	X	2.9	X	94.68	X	0.63	X	0.7	=	83.91	(76)
East	0.9x	0.77	X	2.9	X	73.59	X	0.63	x	0.7	=	65.22	(76)
East	0.9x	0.77	X	2.9	x	45.59	X	0.63	X	0.7	=	40.4	(76)
East	0.9x	0.77	X	2.9	X	24.49	X	0.63	X	0.7	=	21.7	(76)
East	0.9x	0.77	X	2.9	X	16.15	X	0.63	x	0.7	=	14.31	(76)
South	0.9x	0.77	X	21.2	X	46.75	x	0.63	x	0.7	=	302.91	(78)
South	0.9x	0.77	X	21.2	x	76.57	X	0.63	x	0.7	=	496.08	(78)
South	0.9x	0.77	X	21.2	x	97.53	x	0.63	x	0.7	=	631.92	(78)
South	0.9x	0.77	X	21.2	x	110.23	x	0.63	x	0.7	=	714.21	(78)
South	0.9x	0.77	X	21.2	X	114.87	X	0.63	x	0.7	=	744.25	(78)
South	0.9x	0.77	X	21.2	X	110.55	X	0.63	X	0.7	=	716.24	(78)
South	0.9x	0.77	X	21.2	X	108.01	X	0.63	X	0.7	=	699.81	(78)
South	0.9x	0.77	X	21.2	X	104.89	X	0.63	x	0.7	=	679.61	(78)
South	0.9x	0.77	X	21.2	X	101.89	X	0.63	x	0.7	=	660.12	(78)
South	0.9x	0.77	X	21.2	x	82.59	x	0.63	x	0.7	=	535.07	(78)
South	0.9x	0.77	X	21.2	X	55.42	x	0.63	x	0.7	=	359.05	(78)
South	0.9x	0.77	X	21.2	x	40.4	x	0.63	x	0.7	=	261.74	(78)
West	0.9x	0.77	X	1.3	X	19.64	X	0.63	X	0.7	=	7.8	(80)
West	0.9x	0.77	X	1.3	x	38.42	x	0.63	x	0.7	=	15.26	(80)
West	0.9x	0.77	X	1.3	x	63.27	x	0.63	x	0.7	=	25.14	(80)
West	0.9x	0.77	X	1.3	x	92.28	x	0.63	x	0.7	=	36.66	(80)
West	0.9x	0.77	X	1.3	X	113.09	X	0.63	X	0.7	=	44.93	(80)



					_		-							
West 0.9	9x 0.77	х	1.	3	X	115.77	X		0.63	X	0.7	=	46	(80)
West 0.9	9x 0.77	X	1.	3	X	110.22	X		0.63	Х	0.7	=	43.79	(80)
West 0.9	0.77	X	1.	3	х	94.68	x		0.63	x	0.7	=	37.61	(80)
West 0.9	9x 0.77	х	1.	3	x	73.59	x		0.63	х	0.7	=	29.24	(80)
West 0.9	0.77	x	1.	3	x	45.59	x		0.63	_ x	0.7		18.11	(80)
West 0.9	0.77	x	1.	3	x	24.49	x		0.63	_ x _	0.7	=	9.73	(80)
West 0.9	9x 0.77	x	1.	3	x	16.15	x		0.63	_ x [	0.7	=	6.42	(80)
							_							
Solar gains	in watts, c	alculated	for eac	h month			(83)m	n = Su	um(74)m .	(82)m				
(83)m= 359.	61 605.58	815.39	996.91	1110.67	1101.7	1 1062.43	976	.59	877.52	665.22	429.33	308.72		(83)
Total gains	<ul><li>internal a</li></ul>	and solar	(84)m =	= (73)m ·	+ (83)	n , watts		•		•			_	
(84)m= 941.	57 1185.24	1375.81	1525.73	1606.41	1566.3	32 1507.3	1428	3.14	1345.72	1165.25	965.99	873.84		(84)
7. Mean in	ternal tem	perature	(heating	season	)									
Temperatu	ire during h	neating p	eriods ir	n the livii	ng are	a from Ta	ble 9.	, Th′	1 (°C)				21	(85)
•	factor for g	•			•		•	,	( )					`
Ja	<del></del> _	Mar	Apr	May	Jur	<del></del>	T A	ug	Sep	Oct	Nov	Dec	]	
(86)m= 1	1	0.99	0.97	0.91	0.77	0.61	0.6	-	0.87	0.98	1	1	1	(86)
Moon into	mal tampa	roturo in	living or	OO T4 /f/	مالمس	tono 2 to :	7 in T		. 00)				_	
(87)m= 19.8	rnal tempei	20.19	20.47	20.71	20.87	-i	20.		20.81	20.49	20.1	19.81	1	(87)
` ′	!	ļ.	<u> </u>	<u> </u>	<u> </u>					20.43	20.1	13.01	]	(0.)
· -	re during h	<del></del>	1	1	r	<u> </u>	1		· '		T	T	1	(00)
(88)m= 19.8	19.85	19.85	19.87	19.87	19.88	19.88	19.	89	19.88	19.87	19.86	19.86	]	(88)
Utilisation	factor for g	ains for	rest of d	welling,	h2,m (	see Table	9a)			,			-	
(89)m= 1	0.99	0.98	0.95	0.87	0.68	0.47	0.5	52	0.8	0.97	1	1		(89)
Mean inte	nal tempe	rature in	the rest	of dwelli	ng T2	(follow ste	eps 3	to 7	' in Tabl	le 9c)				
(90)m= 18.2	27 18.5	18.82	19.22	19.55	19.75	19.79	19.	79	19.68	19.25	18.7	18.26	]	(90)
	•	•	•	•	•	•	•		f	fLA = Livir	ng area ÷ (	4) =	0.15	(91)
Mean inte	rnal tempei	rature (fo	r the wh	ole dwe	llina) =	· fl Δ <b>√</b> T1	+ (1	_ fl	Δ) <b>v</b> T2					
(92)m= 18.	_ <del>-</del>	19.02	19.4	19.72	19.92	1	19.		19.85	19.44	18.9	18.49	1	(92)
Apply adju		he mear	interna	L I temper	L ature f	rom Table	4e.	whe	re appro	L opriate	<u>!</u>	<u>!</u>	_	
(93)m= 18.		19.02	19.4	19.72	19.92	ì	19.		19.85	19.44	18.9	18.49	]	(93)
8. Space h	neating req	uirement											1	
Set Ti to th	ne mean in	ternal tei	mperatu	re obtair	ed at	step 11 of	Tabl	le 9b	, so tha	ıt Ti,m=(	76)m an	d re-cal	culate	
the utilisat	ion factor for	or gains	using Ta	ble 9a									-	
Ja	n Feb	Mar	Apr	May	Jur	Jul	A	ug	Sep	Oct	Nov	Dec		
	factor for g	<del> </del>		ı						1	1	ı	7	
(94)m= 1	0.99	0.98	0.95	0.86	0.68	0.48	0.5	53	0.8	0.96	0.99	1		(94)
	ns, hmGm	· ·	<u> </u>	<del> </del>	·		T			·	T	l	1	(05)
(95)m= 939.		1349.33	<u> </u>	<u> </u>		719.58	753	.25	1071.49	1120.62	960.09	872.26	]	(95)
	verage exte	ernal tem	perature 8.9	trom Ta	1	16.6	16.	<u>, 1</u>	111	40.0	7.1	1 4 0	1	(96)
` /		l .	l .	l .	14.6		<u> </u>		14.1	10.6	/.1	4.2	J	(30)
(97)m= 3220	rate for me			1772.12		<del></del>	X [(9,		• •	1952.52	2624.56	3196.33	1	(97)
` '	ating requir	ļ	<u> </u>	<u> </u>								1 3130.33	J	(01)
	.11 1307.31	1093.63	636	288.92	0	0.02	24 X [	Ť	0	618.94	<del></del>	1729.11	1	
(00)111- 1097	1007.01	1 1000.00	1 330	200.92					U	1 010.34	1 100.42	1,23.11	J	



					Tota	l per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	8569.44	(98)
Space heating requirement in	kWh/m²	²/year							İ	48.95	(99)
9a. Energy requirements – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)			·		
Space heating:									,		_
Fraction of space heat from se	econdar	y/supple	mentary	system						0	(201)
Fraction of space heat from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total heating from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main space heat	ing syste	em 1								90.9	(206)
Efficiency of secondary/supple	ementar	y heating	g system	າ, %						0	(208)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (c	alculate	d above)								1	
1697.11 1307.31 1093.63	636	288.92	0	0	0	0	618.94	1198.42	1729.11		
$(211)m = \{[(98)m \times (204)] \} \times 1$	00 ÷ (20	06)								1	(211)
1867.01 1438.18 1203.12	699.67	317.84	0	0	0	0	680.9	1318.39			_
					Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	9427.32	(211)
Space heating fuel (secondary		month									
$= \{[(98)m \times (201)]\} \times 100 \div (200)$ $(215)m = 0                                  $	8) 0	0	0	0	0	0	0	0	0		
(213)111= 0 0 0	U	U	U	U		l (kWh/yea				0	(215)
Water heating						. (		715,1012			(210)
Output from water heater (calc	ulated a	bove)									
224.1 197.53 207.45	185.97	182.25	162.85	156.41	171.62	171.31	192.84	203.9	218.71		
Efficiency of water heater										80.8	(216)
(217)m= 89.59 89.43 89.12	88.4	86.71	80.8	80.8	80.8	80.8	88.28	89.28	89.64		(217)
Fuel for water heating, kWh/mo											
$(219)$ m = $(64)$ m x $100 \div (217)$ (219)m = $250.13$ $220.87$ $232.77$	m 210.37	210.19	201.55	193.57	212.4	212.02	218.45	228.39	243.99		
(210)111- 200.10   220.01   202.11	210.07	210.10	201.00	100.07		I = Sum(2		220.00	240.00	2634.69	(219)
Annual totals								Wh/year		kWh/yea	
Space heating fuel used, main	system	1						.,		9427.32	7
Water heating fuel used									İ	2634.69	₹
Electricity for pumps, fans and	electric	keep-hot	t						·		_
central heating pump:		·							30		(230c)
boiler with a fan-assisted flue									45		(230e)
	ΛΛh h roo				eum	of (230a).	(330a) <b>–</b>		45	75	(231)
Total electricity for the above, k	(vvii/yea	li			Suili	01 (230a).	(230g) =			75	=
Electricity for lighting										549.53	(232)
Electricity generated by PVs										-1025.35	(233)
12a. CO2 emissions – Individ	ual heat	ing syste	ms inclu	uding mi	cro-CHF						
				<b>ergy</b> /h/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	



Space heating (main system 1)	(211) x	0.241	=	2271.99	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.241	=	634.96	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2906.95	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	285.21	(268)
Energy saving/generation technologies					_
Item 1		0.519	=	-532.16	(269)
Total CO2, kg/year	sum	of (265)(271) =		2698.92	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		15.42	(273)
El rating (section 14)				84	(274)



#### User Details

Assessor Name:Chris McdonaldStroma Number:STRO007579Software Name:Stroma FSAP 2012Software Version:Version: 1.0.5.8

Software Name:	Stroma FSAP 2012		vare Ve		Versio	n: 1.0.5.8	
		operty Addres					
Address :	Land West of Broome Farm E	Barn, Broome	, Craven A	Arms			
1. Overall dwelling dime	nsions:	A ( 0)				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	2)
Ground floor		Area(m²)	7(4-) ;;	Av. Heigh	<u>`</u>	Volume(m	<u>-</u>
		92.92	(1a) x	2.7	(2a) =	250.88	(3a)
First floor		82.14	(1b) x	2.41	(2b) =	197.96	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	175.06	(4)				
Dwelling volume			(3a)+(3b	)+(3c)+(3d)+(3	e)+(3n) =	448.84	(5)
2. Ventilation rate:							_
	main secondary heating heating	other		total		m³ per hou	ır
Number of chimneys		+ 0		0	x 40 =	0	(6a)
Number of open flues	0 + 1	+ 0	<b>=</b>	0	x 20 =	0	(6b)
Number of intermittent far	ns	<u> </u>		4	x 10 =	40	(7a)
Number of passive vents				0	x 10 =	0	(7b)
Number of flueless gas fir	res			0	x 40 =	0	(7c)
			_		Air oh	anges per b	<u> </u>
Leftford Const. Les Const. Const.	- (L   (C-) - (Ch) - (7-	) . ( <b>7</b> 5) . ( <b>7</b> 5)	_		7	nanges per ho	_
·	rs, flues and fans = (6a)+(6b)+(7a een carried out or is intended, proceed		e continue fr	40	÷ (5) =	0.09	(8)
Number of storeys in th		to (11), otherwise	o continuo n	011 (0) 10 (10)		0	(9)
Additional infiltration	3 ( 1)				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame or (	0.35 for maso	nry constr	uction		0	(11)
	esent, use the value corresponding to t	the greater wall a	rea (after				_
deducting areas of openin	gs); if equal user 0.35 oor, enter 0.2 (unsealed) or 0.1	(coalod) als	o ontor O				7(42)
If no draught lobby, ent	,	(Sealed), els	e enter o			0	(12)
	and doors draught stripped					0	(14)
Window infiltration	and doors draught surpped	0.25 - [0	).2 x (14) ÷ 1	00] =		0	(15)
Infiltration rate		(8) + (10	0) + (11) + (1	2) + (13) + (15	5) =	0	(16)
	q50, expressed in cubic metres	per hour per	square m	etre of enve	lope area	5	(17)
	ty value, then $(18) = [(17) \div 20] + (8)$		•		·	0.34	(18)
Air permeability value applies	s if a pressurisation test has been done	or a degree air p	permeability	is being used			<b>_</b>
Number of sides sheltered	d					0	(19)
Shelter factor		(20) = 1	- [0.075 x (1	9)] =		1	(20)
Infiltration rate incorporati	ng shelter factor	(21) = (	18) x (20) =			0.34	(21)

Infiltration rate modified	for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthl	y avera	ge wind	speed fr	om Tabl	e 7							
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7



Wind Factor (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	]	
(223)	1.20	0	<u> </u>		0.00	1 0.00	1 0.02	<u> </u>	1.00		1	J	
Adjusted infiltr		<u> </u>				speed) =	(21a) x	(22a)m	T	1		1	
0.43 Calculate effec	0.42	0.42	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
If mechanica		_	iale ioi l	пе арри	cable ca	136						0	(23a)
If exhaust air h			endix N, (2	(23a) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	``
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If balance	d mech	anical ve	entilation	without	heat red	covery (ľ	MV) (24b	m = (22)	2b)m + (	23b)		•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	e input	ventilatio	on from o	outside	•	•	•	•	
if (22b)n	n < 0.5 ×	< (23b), t	then (24)	c) = (23b	o); other	wise (24	c) = (22h	o) m + 0.	.5 × (23b	) )			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural				•	•				0.51				
	n = 1, tn $0.59$	en (24d) <sub>0.59</sub>	m = (221)	0.57	0.55	$\frac{(4a)m}{0.55}$	$\frac{0.5 + [(2)]{0.55}}{}$	2b)m² x 0.56	<del></del>	0.57	0.58	1	(24d)
` '	<u> </u>	ļ		<u> </u>		ļ	<u>.                                    </u>		0.57	0.57	0.56	J	(240)
Effective air (25)m= 0.59	0.59	0.59	0.57	0.57	0.55 or (24	c) or (24 0.55	0.55	0.56	0.57	0.57	0.58	1	(25)
(23)111= 0.39	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.30	0.57	0.57	0.56		(20)
3. Heat losse	s and he	ant look r											
		•											
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
	Gros	SS	Openin	gs									
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/				kJ/K
<b>ELEMENT</b> Doors	Gros area	SS	Openin	gs	A ,r	m² x x1	W/m2	eK =   0.04] =	(W/ 1.9				kJ/K (26)
ELEMENT  Doors  Windows Type	Gros area e 1	SS	Openin	gs	A ,r	m <sup>2</sup> x x1 x1	W/m2 1 /[1/( 1.4 )+	eK =   0.04] =   0.04] =	1.9 12.85				kJ/K (26) (27)
ELEMENT  Doors  Windows Type  Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 1.9 9.69 21.2	m <sup>2</sup> x x1 x1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	1.9 12.85 28.11				(26) (27) (27)
Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 1.9 9.69 21.2 2.9	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	1.9 12.85 28.11 3.84	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	ss (m²)	Openin	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] =	1.9 12.85 28.11 3.84 1.72	k)			(26) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04]	1.9 12.85 28.11 3.84 1.72	k)			(26) (27) (27) (27) (27) (28)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls	Gros area 1 2 2 2 3 4 2 201.	ss (m²)	Openin m	gs <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18	0.04] = 0.04]	(W// 1.9 12.85 28.11 3.84 1.72 12.079( 29.61	k)			(26) (27) (27) (27) (27) (28) (29)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls Roof	Gros area  1 2 3 4 201. 92.9	48 92 5, m <sup>2</sup>	Openin m	gs 1 <sup>2</sup>	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13  0.18  0.13	K	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K) 	kJ/m²-	k	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area	Gros area  1 201.  92.5  elements	48 92 s, m² lows, use e	36.9  0  effective winternal wal	gs 1 <sup>2</sup> 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13	0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K) 	kJ/m²-	k	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e  * for windows and ** include the area Fabric heat los	Gros area  1 1 2 2 3 3 4 4  201.  92.5  Elements  I roof windas on both  ss, W/K =	48 32 3, m <sup>2</sup> 3, m <sup>2</sup> 3, ows, use end sides of interest of int	36.9  0  effective winternal wal	gs 1 <sup>2</sup> 9	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calcul	m <sup>2</sup>	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13  0.18  0.13	0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K)	kJ/m²-	k	(26) (27) (27) (27) (27) (28) (29) (30)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity	Gros area  1 1 2 2 3 3 4 4  201.  92.5  Plements  I roof winder as on both as	48 92 92 90	36.9  36.9  0  effective winternal wall	gs 1 <sup>2</sup> Indow U-va Is and pan	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 x2 x x x2 x x x x2 x x x x2 x x x x	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13	EK	(W// 1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08	K)  6  [ as given in	kJ/m²-l	13.2	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass	Gros area  1 1 2 2 3 3 4 4  201.  92.9  Plements  Proof winder  as on both  as, W/K:  Cm = S(  parame	48 92 92 90 ws, use elesides of interest (TMF) eter (TMF)	36.9  36.9  offective winternal wall  U)  P = Cm -	gs 12 Indow U-va Is and pan	A ,r  1.9  9.69  21.2  2.9  1.3  92.92  164.4  92.92  387.3  alue calculatitions	x1 x1 x1 x1 2 x x x 2 x x x 2 x x x x 2 x	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	EK	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	1 3.2 102.19	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity	Gros area  1 1 2 2 3 3 4 4  201.  92.9  Plements  I roof winder as on both as on both cases, W/K:  Cm = S( parame as ments who	48  22  3, m²  cows, use end sides of interpretation (A x k)  eter (TMF)	36.9  36.9  0  effective winternal wall U)  P = Cm -	gs 12 Indow U-va Is and pan	A ,r  1.9  9.69  21.2  2.9  1.3  92.92  164.4  92.92  387.3  alue calculatitions	x1 x1 x1 x1 2 x x x 2 x x x 2 x x x x 2 x	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	EK	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	7 3.2 102.19	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	Gros area  1 1 2 2 3 3 4 4  201.  92.9 Plements Froof winder as on both as, W/K: Cm = S( parame and of a de	48 32 35, m² dows, use ele sides of interpretation (A x k) eter (TMF) are the de stailed calculation (TMF)	36.90 36.90 0 effective winternal wall U) P = Cm - stails of the ulation.	gs  9  Indow U-ve Is and part  - TFA) ir	A ,r 1.9 9.69 21.2 2.9 1.3 92.92 164.4 92.92 387.3 alue calculatitions	x1 x1 x1 x1 2 x 2 x 2 x dated using	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	EK	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	7 3.2 102.19	(26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste	Gros area  1 1 2 2 3 3 4 4 201.  92.5 Selements 1 roof winder as on both as o	48  92  92  90 ws, use end sides of interpretation (A x k)  eter (TMF)  eter the decentation (TMF)  eter the decentation (TMF)	36.9  36.9  0  effective winternal wall U)  P = Cm - etails of the ulation. culated to	gs  9  Indow U-ve  Is and pan  - TFA) ir  construction	A ,r  1.9  9.69  21.2  2.9  1.3  92.92  164.4  92.92  387.3  alue calculatitions  n kJ/m²K  ion are no	x1 x1 x1 x1 2 x 2 x 2 x dated using	W/m2  1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+  0.13  0.18  0.13  g formula 1 (26)(30)	K	1.9 12.85 28.11 3.84 1.72 12.079 29.61 12.08 10)+0.04] & & & & & & & & & & & & & & & & & & &	K)  6  1  as given in  2) + (32a).  : Medium	kJ/m²-l	1 3.2 102.19 12537.89 250	(26) (27) (27) (27) (27) (28) (29) (30) (31) (33) (34) (35)



/ontile	tion had	t loop of	alculated	l manthl					(29)m	_ 0.22 v./	25)m x (5)			
venilla	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	87.9	87.37	86.84	84.36	83.9	81.75	81.75	81.35	82.58	83.9	84.84	85.82		(38
· ′	ansfer o			0 1.00	00.0	01.70	01.70	01.00	<u> </u>	= (37) + (37)	<u> </u>	00.02		(
(39)m=	206.56	206.02	205.49	203.02	202.55	200.4	200.4	200	201.23	202.55	203.49	204.47		
(55)111=	200.50	200.02	200.40	200.02	202.00	200.4	200.4	200			Sum(39) <sub>1</sub>		203.01	(39
Heat Ic	oss para	meter (H	HLP), W	m²K						= (39)m ÷				
(40)m=	1.18	1.18	1.17	1.16	1.16	1.14	1.14	1.14	1.15	1.16	1.16	1.17		
Vlumbe	er of day	rs in moi	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub>	12 /12=	1.16	(40
varribe	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		(4
											ļ.			
4 Wa	ater heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
			igy roqui										Jan.	
	ed occu		N + 1.76 x	[1 ovo	( 0 0003	) 40 v /TE	-A 12 O	\2\1 + O (	1012 v /	TEA 12		97		(4
	A > 13.8		+ 1.70 X	[i - exp	(-0.0003	949 X (17	- H - 13.9	)2)] + 0.(	JU 13 X (	IFA - 13.	.9)			
			ater usaç	,	•		_	` ,				4.72		(4
		-	hot water person per	• •		•	-	to achieve	a water us	se target o	f			
ot more								l .			l			
lot wate	Jan	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
ĺ				i	·		i							
44)m=	115.19	111	106.82	102.63	98.44	94.25	94.25	98.44	102.63	106.82	111	115.19	4050.05	<b>—</b> ,,
nergy o	content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1256.65	(4
45)m=	170.83	149.41	154.17	134.41	128.97	111.29	103.13	118.34	119.76	139.56	152.35	165.44		
!										Total = Su	m(45) <sub>112</sub> =	=	1647.67	(4
f instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)				•	
46)m=	25.62	22.41	23.13	20.16	19.35	16.69	15.47	17.75	17.96	20.93	22.85	24.82		(4
	storage		includin	va opv o	olor or M	MAILDO	otorogo	within o	ama vaa	ool			1	
·		` ,					•		airie ves	SEI		150		(4
	-	•	ind no ta hot wate		_			. ,	ers) ente	er 'O' in <i>(</i>	47)			
	storage			. (					o. o, o	· · · · · ·	,			
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1	.7		(4
empe	erature f	actor fro	m Table	2b							0.	54		(4
nergy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		0.	92		(5
,			eclared o	-										
		_	factor fr		e 2 (kW	h/litre/da	ıy)					0		(5
	munity h e factor	•	ee secti	on 4.3										
			bie ∠a m Table	2b							-	0		(5 (5
•			storage		aar			(47) x (51)	\ v (52\ v (	53) –				·
	/ 10st 110 (50) or (		_	, NVII/Y	zai			(41) X (31)	, x (32) X (	JJ) =		0 92		(5 (5
	. ,	, ,	culated f	for each	month			((56)m = (	55) × (41)	m	0.	<b>3</b> 2		(6
val <del>o</del> i	28.48	25.73				07.57					07.57	20.40	1	/-
56)m=			28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48	1	(5



If cylinde	r 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=	28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(57)
Primary	v circuit	loss (an	nual) fro	m Table	3				•			0		(58)
•	•	•	culated f			59)m = (	(58) ÷ 36	55 × (41)	m				'	
(mod	lified by	factor fr	om Tabl	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss 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 he	eat requ	ired for	water he	eating ca	alculated	for each	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	222.57	196.15	205.92	184.49	180.72	161.37	154.88	170.09	169.83	191.31	202.42	217.18		(62)
Solar DH	IW input c	alculated	using App	endix G or	Appendix	H (negativ	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ac	dditional	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 wa	ter hea	ter											
(64)m=	222.57	196.15	205.92	184.49	180.72	161.37	154.88	170.09	169.83	191.31	202.42	217.18		_
								Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2256.94	(64)
Heat ga	ains fron	n 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=	98.2	87.07	92.66	84.75	84.28	77.07	75.69	80.75	79.88	87.8	90.72	96.41		(65)
inclu	de (57)n	n in calc	culation of	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. Inte	ernal ga	ins (see	Table 5	and 5a	):									
Metabo	olic gains	s (Table	5), Wat	ts										
[	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	148.47	148.47	148.47	148.47	148.47	148.47	148.47	148.47	148.47	148.47	148.47	148.47		(66)
Lighting	g gains (	calculat	ted in Ap	pendix	L, equati	on L9 oı	r L9a), a	lso see	Table 5					
(67)m=	31.12	27.64	22.48	17.02	12.72	10.74	11.6	15.08	20.24	25.7	30	31.98		(67)
Applian	nces gai	ns (calc	ulated in	Append	dix L, equ	uation L	13 or L1	3a), alsc	see Tal	ble 5				
(68)m=	346.68	350.27	341.21	321.91	297.55	274.65	259.35	255.76	264.82	284.12	308.48	331.38		(68)
Cooking	g gains	(calcula	ted in Ap	opendix	L, equat	ion L15	or L15a)	, also se	ee Table	5				
(69)m=	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85		(69)
Pumps	and fan													
	and lan	s gains	(Table 5	āa)										
(70)m=	3	s gains 3	(Table 5	5a) 3	3	3	3	3	3	3	3	3		(70)
(70)m=	3	3	<u> </u>	3			3	3	3	3	3	3		(70)
(70)m= [ Losses	3	3 aporatio	3	3			3 -118.77	3 -118.77	3 -118.77	3 -118.77	-118.77	3 -118.77		(70) (71)
(70)m= [ Losses (71)m= [	3 e.g. eva	3 aporatio -118.77	3 n (negat -118.77	3 tive valu	es) (Tab	le 5)					ļ			
(70)m= [ Losses (71)m= [	3 e.g. eva	3 aporatio -118.77	3 n (negat -118.77	3 tive valu	es) (Tab	le 5)					ļ			
(70)m= [ Losses (71)m= [ Water r (72)m= [	3 e.g. eva -118.77 heating	3 aporatio -118.77 gains (T	3 n (negat -118.77 fable 5)	3 :ive valu -118.77	es) (Tab -118.77	le 5) -118.77	-118.77 101.73	-118.77 108.53	-118.77	-118.77 118.01	-118.77 126	-118.77 129.58		(71)
(70)m= [ Losses (71)m= [ Water r (72)m= [	3 e.g. eva -118.77 heating	3 aporatio -118.77 gains (T	3 n (negat -118.77 fable 5)	3 :ive valu -118.77	es) (Tab -118.77	le 5) -118.77	-118.77 101.73	-118.77 108.53	-118.77 110.95	-118.77 118.01	-118.77 126	-118.77 129.58		(71)
(70)m= [ Losses (71)m= [ Water It (72)m= [ Total it (73)m= [	3 e.g. eva -118.77 heating (131.99 nternal	3 aporatio -118.77 gains (T 129.57 gains = 578.02	3 n (negat -118.77 Table 5)	3 tive valu -118.77	es) (Tab -118.77	le 5) -118.77 107.04 (66)	-118.77 101.73 m + (67)m	-118.77 108.53 1 + (68)m +	-118.77 110.95 + (69)m + (	-118.77 118.01 (70)m + (7	-118.77 126 1)m + (72)	-118.77		(71) (72)
(70)m= [ Losses (71)m= [ Water It (72)m= [ Total in (73)m= [ 6. Sola	3 e.g. eva -118.77 heating ( 131.99 nternal ( 580.32 ar gains	3 aporatio -118.77 gains (T 129.57 gains = 578.02	3 n (negat -118.77 Table 5) 124.54	3 tive valu -118.77 117.71 527.18	es) (Tab -118.77 113.28	107.04 (66) 462.97	-118.77 101.73 m + (67)m 443.23	-118.77 108.53 1 + (68)m + 449.91	-118.77 110.95 + (69)m + (	-118.77 118.01 (70)m + (7 498.38	-118.77 126 1)m + (72) 535.02	-118.77 129.58 m 563.48		(71) (72)

Flux

Table 6a

Area

m²

Orientation: Access Factor

Table 6d

Gains

(W)

FF

Table 6c

Table 6b



	_				_		_				_		
North	0.9x	0.77	X	9.69	X	10.63	X	0.63	X	0.7	=	31.49	(74)
North	0.9x	0.77	x	9.69	x	20.32	x	0.63	X	0.7	=	60.18	(74)
North	0.9x	0.77	X	9.69	x	34.53	x	0.63	X	0.7	=	102.26	(74)
North	0.9x	0.77	X	9.69	x	55.46	x	0.63	x	0.7	=	164.25	(74)
North	0.9x	0.77	X	9.69	X	74.72	x	0.63	x	0.7	=	221.26	(74)
North	0.9x	0.77	X	9.69	x	79.99	x	0.63	x	0.7	=	236.87	(74)
North	0.9x	0.77	X	9.69	x	74.68	x	0.63	x	0.7	] =	221.15	(74)
North	0.9x	0.77	X	9.69	x	59.25	x	0.63	x	0.7	=	175.45	(74)
North	0.9x	0.77	X	9.69	X	41.52	X	0.63	X	0.7	=	122.95	(74)
North	0.9x	0.77	X	9.69	x	24.19	x	0.63	x	0.7	=	71.63	(74)
North	0.9x	0.77	X	9.69	X	13.12	X	0.63	X	0.7	=	38.85	(74)
North	0.9x	0.77	X	9.69	x	8.86	x	0.63	X	0.7	=	26.25	(74)
East	0.9x	0.77	X	2.9	x	19.64	x	0.63	X	0.7	=	17.41	(76)
East	0.9x	0.77	X	2.9	X	38.42	X	0.63	X	0.7	=	34.05	(76)
East	0.9x	0.77	X	2.9	x	63.27	X	0.63	x	0.7	=	56.08	(76)
East	0.9x	0.77	X	2.9	x	92.28	x	0.63	x	0.7	] =	81.79	(76)
East	0.9x	0.77	X	2.9	x	113.09	x	0.63	x	0.7	=	100.23	(76)
East	0.9x	0.77	X	2.9	x	115.77	x	0.63	x	0.7	=	102.6	(76)
East	0.9x	0.77	X	2.9	x	110.22	x	0.63	x	0.7	=	97.68	(76)
East	0.9x	0.77	X	2.9	x	94.68	x	0.63	x	0.7	=	83.91	(76)
East	0.9x	0.77	X	2.9	x	73.59	x	0.63	X	0.7	=	65.22	(76)
East	0.9x	0.77	X	2.9	x	45.59	x	0.63	x	0.7	] =	40.4	(76)
East	0.9x	0.77	X	2.9	x	24.49	x	0.63	x	0.7	=	21.7	(76)
East	0.9x	0.77	X	2.9	x	16.15	x	0.63	x	0.7	=	14.31	(76)
South	0.9x	0.77	X	21.2	x	46.75	X	0.63	X	0.7	=	302.91	(78)
South	0.9x	0.77	X	21.2	X	76.57	X	0.63	X	0.7	=	496.08	(78)
South	0.9x	0.77	X	21.2	x	97.53	x	0.63	x	0.7	=	631.92	(78)
South	0.9x	0.77	X	21.2	x	110.23	x	0.63	X	0.7	=	714.21	(78)
South	0.9x	0.77	X	21.2	x	114.87	x	0.63	X	0.7	=	744.25	(78)
South	0.9x	0.77	X	21.2	x	110.55	x	0.63	x	0.7	=	716.24	(78)
South	0.9x	0.77	X	21.2	x	108.01	x	0.63	X	0.7	=	699.81	(78)
South	0.9x	0.77	X	21.2	x	104.89	x	0.63	X	0.7	=	679.61	(78)
South	0.9x	0.77	X	21.2	x	101.89	x	0.63	x	0.7	=	660.12	(78)
South	0.9x	0.77	X	21.2	X	82.59	X	0.63	X	0.7	=	535.07	(78)
South	0.9x	0.77	X	21.2	x	55.42	X	0.63	x	0.7	=	359.05	(78)
South	0.9x	0.77	×	21.2	x	40.4	x	0.63	x	0.7	] =	261.74	(78)
West	0.9x	0.77	×	1.3	x	19.64	x	0.63	x	0.7	=	7.8	(80)
West	0.9x	0.77	×	1.3	x	38.42	x	0.63	x	0.7	=	15.26	(80)
West	0.9x	0.77	x	1.3	x	63.27	x	0.63	x	0.7	=	25.14	(80)
West	0.9x	0.77	×	1.3	x	92.28	x	0.63	x	0.7	=	36.66	(80)
West	0.9x	0.77	x	1.3	x	113.09	x	0.63	x	0.7	=	44.93	(80)



					_		,							
West 0.	9x 0.77	X	1.	3	X _	115.77	X		0.63	X	0.7	=	46	(80)
West 0.	9x 0.77	×	1.	3	x	110.22	X		0.63	X	0.7	=	43.79	(80)
West 0.	9x 0.77	×	1.	3	x	94.68	X		0.63	X	0.7	=	37.61	(80)
West 0.	9x 0.77	×	1.	3	x	73.59	X		0.63	X	0.7	=	29.24	(80)
West 0.	9x 0.77	X	1.	3	x	45.59	X		0.63	x [	0.7	=	18.11	(80)
West 0.	9x 0.77	X	1.	3	x	24.49	X		0.63	x	0.7	=	9.73	(80)
West 0.	9x 0.77	X	1.	3	x	16.15	X		0.63	x	0.7		6.42	(80)
Solar gains	in watts, c	alculate	d for eac	h month			(83)m	n = Si	um(74)m .	(82)m				
(83)m= 359	.61 605.58	815.39	996.91	1110.67	1101.	71 1062.43	976	5.59	877.52	665.22	429.33	308.72		(83)
Total gains	- internal	and sola	r (84)m =	= (73)m	+ (83)	m , watts								
(84)m= 939	.92 1183.59	1374.16	1524.09	1604.76	1564.	67 1505.66	142	6.5	1344.07	1163.6	964.35	872.2		(84)
7. Mean ir	nternal tem	perature	(heating	season	)									
Temperat	ure during	neating p	periods i	n the livi	ng are	a from Tal	ble 9	, Th	1 (°C)				21	(85)
•	factor for g	٠.			•				, ,					
Ja		Mar	Apr	May	Ju	<del></del>	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.96	0.89	0.74	_	0.6	<del>-</del>	0.85	0.98	1	1		(86)
Moon into	rnal tampa	roturo in	living or	00 T1 /f/	امال	otopo 2 to	7 in T	I	2 () ()				l	
(87)m= 19.	rnal tempe 66 19.86	20.13	20.47	20.76	20.9	_i	20.		20.87	20.48	20	19.63		(87)
` '							<u> </u>			20.10		10.00		(- /
· -	ure during	T .	1			<u> </u>	T		<u>`</u>		T		1	(00)
(88)m= 19.	94 19.94	19.94	19.95	19.95	19.9	6 19.96	19.	97	19.96	19.95	19.95	19.95		(88)
Utilisation	factor for g	ains for	rest of d	welling,	h2,m	(see Table	T -						1	
(89)m= 1	0.99	0.98	0.95	0.85	0.65	0.44	0.4	49	0.78	0.96	1	1		(89)
Mean inte	rnal tempe	rature in	the rest	of dwelli	ng T2	(follow ste	eps 3	3 to 7	in Tabl	e 9c)				
(90)m= 18.	15 18.44	18.84	19.33	19.71	19.9	2 19.96	19.	96	19.85	19.35	18.65	18.11		(90)
	•	•	•	•	•	•	•	•	f	LA = Livi	ng area ÷ (4	1) =	0.15	(91)
Mean inte	rnal tempe	rature (fo	or the wh	ole dwe	lling) :	- fl Δ <b>√</b> T1	<b>±</b> (1	_ fl	Δ\ <b>v</b> T2					
(92)m= 18.		19.03	19.49	19.87	20.0	1	20.	$\neg$	20	19.52	18.85	18.33		(92)
` '	I ustment to t	the mear	n interna	I temper	L ature	<u> </u>	4e.	whe	re appro	Doriate	1		l	
(93)m= 18.		19.03	19.49	19.87	20.0	1	20.		20	19.52	18.85	18.33		(93)
8. Space	neating req	uiremen	t											
Set Ti to t	ne mean in	ternal te	mperatu	re obtair	ned at	step 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the utilisat	ion factor f	or gains	using Ta	able 9a									1	
Ja		Mar	Apr	May	Ju	n Jul	A	ug	Sep	Oct	Nov	Dec		
	factor for g	1	1	ī	ı						1		1	(5.1)
(94)m= 1		0.98	0.94	0.85	0.66	0.46	0.5	51	0.78	0.96	0.99	1		(94)
	ns, hmGm	<u> </u>	<del>r `</del>	<del></del>			T				T		1	(05)
(95)m= 937			l				728	3.34	1046.49	1114.11	958.08	870.6		(95)
	verage exte	1	<del> </del>	1			16		111	10.6	7.4	4.0	]	(06)
(96)m= 4.3		6.5	8.9	11.7	14.6	!	16 x [(0)		14.1	10.6	7.1	4.2		(96)
(97)m= 2905	rate for me		<del></del>	1654.24		<del></del>	X [(9,			] 1805.78	2391.33	2889.36	]	(97)
· · · · <u> </u>	ating requir		<u> </u>	<u> </u>								2003.30	I	(01)
	1.58 1113.99	1	516.93	220.97	0	$\frac{3\Pi\Pi = 0.02}{0}$	24 X [	Ť	0 0	)III] X (4 514.6	T	1501.96		
(00)111-		1 010.02	1 010.00	1	<u> </u>				· ·	317.0	1 .551.55	1001.00	I	



Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	7279.97	(98)
Space heating requirement in kWh/m²/year	41.59	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		<b>7.</b>
Fraction of space heat from secondary/supplementary system	0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1	(204)
Efficiency of main space heating system 1	93.5	(206)
Efficiency of secondary/supplementary heating system, %	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/yea	ar
Space heating requirement (calculated above)  1464.58 1113.99 915.02 516.93 220.97 0 0 0 514.6 1031.93 1501.96		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$		(211)
1566.4 1191.43 978.63 552.86 236.33 0 0 0 550.37 1103.67 1606.37		(= )
Total (kWh/year) =Sum(211) <sub>15,1012</sub> =	7786.07	(211)
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 Total (kWh/year) =Sum(215) <sub>151012</sub> =		7(245)
Water heating	0	(215)
Output from water heater (calculated above)		
222.57 196.15 205.92 184.49 180.72 161.37 154.88 170.09 169.83 191.31 202.42 217.18		
Efficiency of water heater	79.8	(216)
(217)m= 88.93 88.72 88.32 87.42 85.35 79.8 79.8 79.8 79.8 87.33 88.55 88.99		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m		
(219)m= 250.29 221.09 233.14 211.05 211.74 202.22 194.08 213.15 212.82 219.08 228.59 244.05		
Total = Sum(219a) <sub>112</sub> =	2641.29	(219)
Annual totals kWh/year	kWh/year	- -
Space heating fuel used, main system 1	7786.07	_
Water heating fuel used	2641.29	
Electricity for pumps, fans and electric keep-hot		
central heating pump:		(230c)
boiler with a fan-assisted flue		(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =	75	(231)
Electricity for lighting	549.53	(232)
12a. CO2 emissions – Individual heating systems including micro-CHP		
Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/yea	



Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	570.52 (264)
Space and water heating	(261) + (262) + (263) + (264) =		2252.31 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	285.21 (268)
Total CO2, kg/year	sum	of (265)(271) =	2576.44 (272)

TER = 15.49 (273)