### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.58 Printed on 29 November 2022 at 15:06:55

Proiect Information:

Assessed By: Liam Mason (STRO033679) Building Type: Semi-detached House

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 72.5m²Site Reference:Bell Road, BottishamPlot Reference:Plot 38

Address: Plot 38

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.69 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 8.50 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.2 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.19 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 **OK** 

4 Heating efficiency

Main Heating system: Database: (rev 508, product index 016841):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant Model: ecoTEC plus 824

Model qualifier: VUW GB 246/5-5

(Combi)

Efficiency 89.1 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

# **Regulations Compliance Report**

Cylinder insulation			
Hot water Storage:	No cylinder		<del>-</del>
Controls	140 cylinaer		
Controls			
Space heating controls	Programmer, room thermo	ostat and TRVs	OK
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		OK
Low energy lights			
Percentage of fixed lights with lo	ow-energy fittings	100.0%	
Minimum		75.0%	OK
Mechanical ventilation			
Not applicable			
Summertime temperature			
Overheating risk (East Anglia):		Medium	OK
ased on:			
Overshading:		Average or unknown	
Windows facing: East		1.17m²	
Windows facing: East		1.12m²	
Windows facing: North		0.39m²	
Windows facing: West		2.98m²	
Windows facing: North		0.39m²	
Windows facing: West		1.14m²	
Windows facing: West		1.25m²	
Ventilation rate:		3.00	
Blinds/curtains:		Dark-coloured curtain or re	oller blind
		Closed 100% of daylight h	ours

10 Key features

Roofs U-value 0.11 W/m²K
Party Walls U-value 0 W/m²K
Floors U-value 0.11 W/m²K

Photovoltaic array

### **Predicted Energy Assessment**



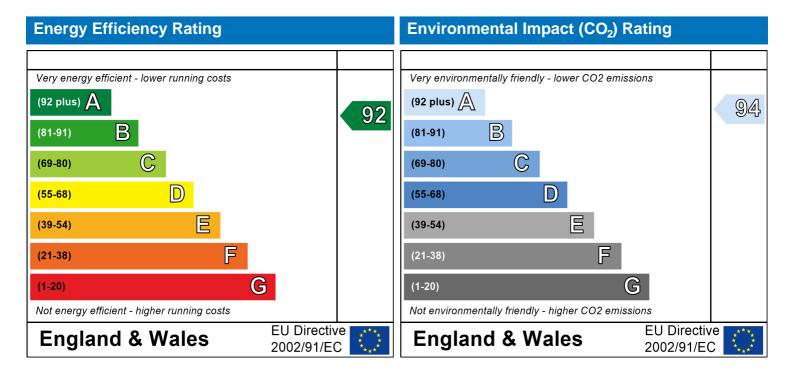
Plot 38

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Semi-detached House 03 November 2022 Liam Mason 72.5 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 38

Address: Plot 38
Located in: England
Region: East Anglia

UPRN:

Date of assessment:

Date of certificate:

Assessment type:

03 November 2022
29 November 2022
New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 508

#### Property description:

Dwelling type: House

Detachment: Semi-detached

Year Completed: 2022

Floor Location: Floor area:

Floor 0  $36.25 \text{ m}^2$  2.4 m Floor 1  $36.25 \text{ m}^2$  2.4 m

Living area: 12.61 m<sup>2</sup> (fraction 0.174)

Front of dwelling faces: East

Openir	

W\_7

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_1	Manufacturer	Solid	S	J	
W_1	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
W_2	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
W_3	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
W_4	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
W_5	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
W_6	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
W_7	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
_			, ,		

Storey height:

1.4

1.25

1

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D_1	mm	0	0	1.2	1.83	1
W_1	16mm or more	0.7	0.63	1.4	1.17	1
W_2	16mm or more	0.7	0.63	1.4	1.12	1
W_3	16mm or more	0.7	0.63	1.4	0.39	1
W_4	16mm or more	0.7	0.63	1.4	2.98	1
W_5	16mm or more	0.7	0.63	1.4	0.39	1
W 6	16mm or more	0.7	0.63	1.4	1.14	1

0.63

0.7

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_1	Doors	Wall 1	East	1.83	1
W_1	Windows	Wall 1	East	1.17	1
W_2	Windows	Wall 1	East	1.12	1
W_3	Windows	Wall 1	North	0.39	1
W_4	Windows	Wall 1	West	2.98	1
W_5	Windows	Wall 1	North	0.39	1
W_6	Windows	Wall 1	West	1.14	1
W_7	Windows	Wall 1	West	1.25	1

16mm or more

### **SAP Input**

Overshading: Average or unknown

Opaque Liement	5.						
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen		10.07	70.75	0.40	•	- I	21/2
Wall 1	84.02	10.27	73.75	0.19	0	False	N/A
Roof 1	36.25	0	36.25	0.11	0		N/A
Floor 1	36.25			0.11			N/A
Internal Element	<u>ts</u>						
INT FLOOR	36.25						N/A
Party Elements							
Party Wall	39.42						N/A

#### Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0885

Lanath	Doi volue	• • • • • • • • • • • • • • • • • • • •	
Length	Psi-value		0 16 ( )
17.06	0.16	E5	Ground floor (normal)
17.06	0.07	E6	Intermediate floor within a dwelling
9.85	0.09	E16	Corner (normal)
8	0.3	E2	Other lintels (including other steel lintels)
7.07	0.04	E3	Sill
17.4	0.05	E4	Jamb
9.06	0.06	E10	Eaves (insulation at ceiling level)
11.29	0.24	E12	Gable (insulation at ceiling level)
9.85	0.06	E18	Party wall between dwellings
0	0.3	E2	
0	0.04	E3	
0	0.05	E4	
0	0.16	E5	
0	0.07	E6	
0	0.06	E10	
0	0.24	E12	
0	0.09	E16	
0	-0.09	E17	
0	0.06	E18	
8	0.16	P1	Ground floor
8	0	P2	Intermediate floor within a dwelling
0	0.16	P1	
0	0	P2	
4.53	0.08	R4	Ridge (vaulted ceiling)
0	0.08	R4	

#### Ventilation:

Pressure test: Yes (As designed)

Ventilation: Natural ventilation (extract fans)

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

#### Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Boiler Database

### **SAP Input**

Database: (rev 508, product index 016841) Efficiency: Winter 87.0 % Summer: 90.0

Brand name: Vaillant Model: ecoTEC plus 824

Model qualifier: VUW GB 246/5-5

(Combi boiler)

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature<=45°C

Unknown

Boiler interlock: Yes Delayed start

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs

Control code: 2106

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

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

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 2 Tilt of collector: 45°

Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: No

		User Details:		
Assessor Name:	Liam Mason	Stroma Nur	mbor: STD	O033679
Software Name:	Stroma FSAP 2012	Software Vo		sion: 1.0.5.58
Continuite Hume.	5.10111a 1 5/11 2012	Property Address: Plot 3		MOTI. 1.0.0.00
Address :	Plot 38			
1. Overall dwelling dime	ensions:			
		Area(m²)	Av. Height(m)	Volume(m³)
Ground floor		36.25 (1a) x	2.4 (2a) =	87 (3a)
First floor		36.25 (1b) x	2.4 (2b) =	87 (3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 72.5 (4)		
Dwelling volume		(3a)+(3	(3c)+(3c)+(3d)+(3e)+(3n) =	174 (5)
2. Ventilation rate:				
	main secor heating heati	ndary other ing	total	m³ per hour
Number of chimneys		0 =	0 x 40 =	0 (6a)
Number of open flues	0 + (	0 + 0 =	0 x 20 =	0 (6b)
Number of intermittent fa	ns		2 x 10 =	20 (7a)
Number of passive vents			0 x 10 =	0 (7b)
Number of flueless gas fi	res		0 x 40 =	0 (7c)
			A:	
Inditantian due to object	us flues and force (60) (6	Sh) (/70) (/7h) (/7o) —		changes per hour
•	ys, flues and fans = (6a)+(6 neen carried out or is intended, pu	roceed to (17), otherwise continue	$from (9) to (16)$ $\div (5) =$	0.11 (8)
Number of storeys in the			(5) 12 (1.5)	0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0	.25 for steel or timber fram	ne or 0.35 for masonry cons	truction	0 (11)
if both types of wall are pa deducting areas of openia		ling to the greater wall area (after		
=		or 0.1 (sealed), else enter (	)	0 (12)
If no draught lobby, en	ter 0.05, else enter 0			0 (13)
Percentage of windows	s and doors draught stripp	ed		0 (14)
Window infiltration		0.25 - [0.2 x (14) ÷	- 100] =	0 (15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0 (16)
•	•	netres per hour per square	metre of envelope area	5 (17)
•	ity value, then $(18) = [(17) \div 2]$			0.36 (18)
Air permeability value applie  Number of sides sheltere		en done or a degree air permeabili	ty is being used	(40)
Shelter factor	eu .	(20) = 1 - [0.075 x	(19)] =	2 (19) 0.85 (20)
Infiltration rate incorporat	ing shelter factor	(21) = (18) x (20) =		0.31 (21)
Infiltration rate modified f	-			0.01
Jan Feb	<del></del>	lun Jul Aug Sep	Oct Nov Dec	
Monthly average wind sp		1 1 3 3 3 5 5 7		
	1 1 1 1			

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (2	22a)m =	(22)m ∸	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjusted infiltr	ation rate	e (allowi	na for sh	nelter an	d wind s	:need) -	(21a) y	(22a)m	!		!	•	
0.4	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36	]	
Calculate effe		_	rate for t	he appli	cable ca	se	<u> </u>	<u> </u>	<u> </u>		<u> </u>	J	
If mechanica			andis N. (O	2h) (22a	.) <b></b> (4	accetion (N	\ F\\	muiaa (22h	·) (22a)			0	(23a)
If exhaust air h									)) = (23a)			0	(23b)
		-	-	_					Oh)m ı (	(22h) [	1 (22a)	0	(23c)
a) If balance (24a)m= 0	o mecha	o o	ntilation	with nea	at recove		$\frac{HR}{0}$ (248	$\frac{a)m = (2a)}{a}$	26)m + (   0	$\frac{(230) \times [}{0}$	1 – (23C) 1 0	1 ÷ 100]	(24a)
b) If balance		_										J	(244)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h		,	,	,	<u> </u>							J	(= :)
,	n < 0.5 x			•	•				.5 × (23k	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural if (22b)n	ventilation								0.5]	•	•	•	
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in bo	x (25)				•	
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat losse	s and he	at loss p	paramete	er:									
ELEMENT	Gros	·	Openin		NIat Au								
	area	_	m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors		_	•	-		m²				K)			
Doors Windows Type	area	_	•	-	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
	area	_	•	-	A ,r	m <sup>2</sup> x x 1.	W/m2	2K =   - 0.04] =	(W/ 2.196	K)			kJ/K (26)
Windows Type	area e 1 e 2	_	•	-	A ,r	m <sup>2</sup> x x10 x10	W/m2 1.2 /[1/( 1.4 )+	2K =   $0.04$ =   $0.04$ =	(W/ 2.196 1.55	K)			kJ/K (26) (27)
Windows Type	area	_	•	-	A ,r 1.83 1.17	x1. x1. x1.	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ccc} 2K & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ \end{array} $	(W/ 2.196 1.55 1.48	K)			kJ/K (26) (27) (27)
Windows Type Windows Type Windows Type	area	_	•	-	A ,r 1.83 1.17 1.12 0.39	x1. x1. x1. x1.	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$\begin{array}{ccc} 2K & & & & \\ \hline & & & & \\ \hline & & & & \\ \hline & & & &$	(W/ 2.196 1.55 1.48 0.52	K)			kJ/K (26) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	area	_	•	-	A ,r  1.83  1.17  1.12  0.39  2.98	x1. x1. x1. x1. x1.	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	EK =   - 0.04] =	(W/ 2.196 1.55 1.48 0.52 3.95	K)			kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	area  1 2 3 4 4 5 6 6	_	•	-	A ,r  1.83  1.17  1.12  0.39  2.98  0.39	x1.	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+	EK =   0.04  =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52	K)			kJ/K (26) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area  1 2 3 4 4 5 6 6	_	•	-	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14	x1. x1. x1. x1. x1. x1. x1.	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+	EK =   0.04  =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51	K) 			kJ/K (26) (27) (27) (27) (27) (27)
Windows Type	area  1 2 3 4 4 5 6 6	(m²)	•	2	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25	x1.	W/m2  1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	EK = 0.04] = 0	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	area  1 2 2 3 4 4 5 5 6 6 7	(m²)	m	2	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25  36.28	x1.	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+	EK =   0.04  =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (28)
Windows Type	area  area  1  2  3  4  5  6  7  84.0  36.2	(m²) 2 5	10.22	2	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25  36.25  73.75  36.25	x1.	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  0.11  0.19	EK =   0.04  =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (28) (29)
Windows Type Roof	area  area  1  2  3  4  5  6  7  84.0  36.2	(m²) 2 5	10.22	2	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25  36.25  73.75  156.5	x1.	W/m2  1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11  0.19  0.11	EK =   0.04  =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31)
Windows Type Floor Walls Roof Total area of e	area  area  1  2  3  4  5  6  7  84.0  36.2	(m²) 2 5	10.22	2	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25  36.25  73.75  36.25  156.5	x1.	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  0.11  0.19	2K =   0.04  =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Tloor Walls Roof Total area of e Party wall	area  2 1 2 2 3 3 4 4 5 5 6 6 7 84.0 36.2 8lements	(m²)  2  5  , m²	10.22	7 7 ndow U-ve	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25  36.25  73.75  36.25  39.42  36.25  alue calcul	x1. x1. x1. x1. x1. x2. x2. x x2. x x2. x x3. x	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  0.11  0.19  0.11	EK =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K)	kJ/m²-l	k 	kJ/K (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Tloor Walls Roof Total area of e Party wall Internal floor * for windows and	area  area	(m²)  2  5  , m²  ows, use e sides of in	10.23 0	7 7 ndow U-ve	A ,r  1.83  1.17  1.12  0.39  2.98  0.39  1.14  1.25  36.25  73.75  36.25  39.42  36.25  alue calcul	x1.	W/m2  1.2  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/( 1.4 )+  0.11  0.19  0.11	2K =   -0.04  =   -0.0	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K)	kJ/m²-l	k 	kJ/K (26) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
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∟ eat trai	nsfer c	oefficier	nt. W/K		ļ.	ļ.	ļ.		(39)m	= (37) + (3	38)m			
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umber	of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.12	(4
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if TFA nnual a educe the transfer to the trans	£ 13.9  average e annua hat 125  Jan usage ir 97.84  ntent of 145.1  neous we 21.77  rorage volume unity hase if no corage nufaction ature factors from the corage of the corage of the corage of the corage nufaction ature factors at the corage of the corage of the corage nufaction at the corage of the corage o	Poor N = 1	Mar day for ea 90.73  used - calc 130.96  including at point 19.64  including at water 19.64  in	ge in litre usage by day (all w Apr ach month 87.17  culated mo 114.17  of use (no 17.13  ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da $5\%$ if the orater use, if the orater us	ay Vd,av livelling is hot and co  Jun ctor from 80.05  190 x Vd,r 94.53  r storage), 14.18  /WHRS enter 110 nstantar wn (kWh	erage = designed Id)  Jul Table 1c x  80.05  87.6  enter 0 in  13.14  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  83.61  07m / 3600  100.52  boxes (46)  15.08  within sa (47) ombi boil	+ 36 a water us  Sep  87.17  0 kWh/mor  101.72  0 to (61)  15.26  ame vess  ers) ente	Oct  90.73  Fotal = Sunth (see Tail 118.55)  Fotal = Sunth 17.78  Seel	Nov  94.29  m(44) <sub>112</sub> = abbles 1b, 1  129.4  m(45) <sub>112</sub> = 19.41	Dec 97.84 = c, 1d) 140.52 = 21.08		(4) (4) (4) (4) (4) (4) (4) (4) (4) (4)
if TFA nnual a educe the of more to  of water  4)m=  instantar  6)m=  /ater st torage commutatorage /ater st ) If ma nergy I ) If ma of water commutatorage of the management	£ 13.9  average annual hat 125  Jan usage ir 97.84  ntent of 145.1  neous water volume unity here if no corage nufaction at ure factors at ure factors with the corage nufaction restoration in the corage nufaction is set from the corage nufaction in the corage nufaction is set from the corage nufaction in the corage number of the corage number	e hot was a verage litres per	Mar day for ea 90.73  used - calconder 130.96  including at point 19.64  including and no talconder the storage eclared of factor free sections.	ge in litre usage by day (all w Apr ach month 87.17  culated mo 114.17  of use (no 17.13  ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da 5% if the of water use, I  May Vd,m = fa  83.61  109.55  hot water  16.43  colar or W welling, e ncludes i  or is known ear loss fact	ay Vd,av livelling is hot and co  Jun ctor from 80.05  190 x Vd,r 94.53  r storage), 14.18  /WHRS enter 110 nstantar wn (kWh	erage = designed Id)  Jul Table 1c x  80.05  87.6  enter 0 in  13.14  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  83.61  07m / 3600  100.52  boxes (46)  15.08  within sa (47) ombi boil	+ 36 a water us  Sep  87.17  0 kWh/mor  101.72  0 to (61)  15.26  ame vess  ers) ente	Oct  90.73  Fotal = Sunth (see Tail 118.55)  Fotal = Sunth 17.78  Seel	Nov  94.29  m(44) <sub>112</sub> = abbles 1b, 1  129.4  m(45) <sub>112</sub> = 19.41	Dec 97.84 = c, 1d) 140.52 = 21.08 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4)
if TFA nnual a educe the transfer to the trans	£ 13.9  average e annua hat 125  Jan usage ir 97.84  ntent of 145.1  neous w. 21.77  orage volume unity here if no corage nufaction of ature factors where the series of the factor is factor if factor if the series of the factor is the series of the serie	Poor N = 1	Mar day for ea 90.73  used - calconder 130.96  including at point 19.64  including and no talconder the storage eclared of factor free sections.	ge in litre usage by day (all w  Apr ach month 87.17  culated mo 114.17  of use (no 17.13  ag any so ank in dw er (this in cuss facto 2b , kWh/ye cylinder I com Tabl on 4.3	es per da 5% if the of water use, I  May Vd,m = fa  83.61  109.55  hot water  16.43  colar or W welling, e ncludes i  or is known ear loss fact	ay Vd,av livelling is hot and co  Jun ctor from 80.05  190 x Vd,r 94.53  r storage), 14.18  /WHRS enter 110 nstantar wn (kWh	erage = designed Id)  Jul Table 1c x  80.05  87.6  enter 0 in  13.14  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  83.61  07m / 3600  100.52  boxes (46)  15.08  within sa (47) ombi boil	+ 36 a water us  Sep  87.17  0 kWh/mor  101.72  0 to (61)  15.26  ame vess  ers) ente	Oct  90.73  Fotal = Sunth (see Tail 118.55)  Fotal = Sunth 17.78  Seel	Nov  94.29  m(44) <sub>112</sub> = abbles 1b, 1  129.4  m(45) <sub>112</sub> = 19.41	Dec 97.84 = c, 1d) 140.52 = 21.08 0 0 0 0 0		(.) (.) (.) (.) (.)

Energy lost from water s	storage, kWh	/year			(47) x (51	) x (52) x (	53) =		0		(54)
Enter (50) or (54) in (55	5)								0		(55)
Water storage loss calc	ulated for ea	ch month			((56)m = (	$(55) \times (41)$ r	m				
(56)m= 0 0	0 0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedicated	solar storage, (	57)m = (56)m	x [(50) – (	(H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0 0	0 0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (ann	nual) from Ta	ble 3							0		(58)
Primary circuit loss calc	ulated for ea	ch month (	(59)m =	(58) ÷ 36	65 × (41)	m					
(modified by factor fro	om Table H5	if there is	solar wa	ter heati	ng and a	cylinde	r thermo	stat)	_		
(59)m= 0 0	0 0	0	0	0	0	0	0	0	0		(59)
Combi loss calculated for	or each mon	h (61)m =	(60) ÷ 3	65 × (41	)m						
(61)m= 25.82 23.29	25.75 24.8	7 25.67	24.8	25.6	25.64	24.84	25.72	24.94	25.8		(61)
Total heat required for v	water heating	calculated	d for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 170.92 150.2	156.7 139.0	4 135.22	119.33	113.2	126.17	126.56	144.26	154.34	166.33		(62)
Solar DHW input calculated u	sing Appendix (	or Appendix	к Н (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines if F	GHRS and/o	r WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0 0	0 0	0	0	0	0	0	0	0	0		(63)
Output from water heate	er	-	-	-	-	-		-	-	•	
(64)m= 170.92 150.2	156.7 139.0	4 135.22	119.33	113.2	126.17	126.56	144.26	154.34	166.33		
	•	•		•	Outp	out from wa	ater heate	r (annual)₁	12	1702.27	(64)
Heat gains from water h	neating, kWh	month 0.2	5 ′ [0.85	× (45)m	+ (61)m	n]	r [(46)m	+ (57)m	+ (59)m	1	
				× (10)11	( <i>0 i j</i> ii	1] 1 0.0 /	· [(+0)111	· (01)	1 (00)111	]	
(65)m= 54.7 48.02	49.98 44.1		37.63	35.53	39.83	40.03	45.85	49.26	53.17	] 	(65)
(65)m= 54.7 48.02 include (57)m in calcu	ļ	3 42.84	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
	ulation of (65	42.84 m only if o	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
include (57)m in calcu 5. Internal gains (see	ulation of (65 Table 5 and	42.84 m only if o	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
include (57)m in calcu	ulation of (65 Table 5 and	42.84 Im only if o	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
include (57)m in calcute.  5. Internal gains (see Metabolic gains (Table)	ulation of (65 Table 5 and 5), Watts	42.84 mm only if contains the same of the	37.63 cylinder i	35.53 s in the o	39.83 dwelling	40.03 or hot w	45.85 ater is fr	49.26 om com	53.17 munity h		(65)
include (57)m in calcutations.  5. Internal gains (see  Metabolic gains (Table of Samuel Samu	ulation of (65 Table 5 and 5), Watts Mar Ap 138.32 138.3	42.84 m only if co.  5a):  May 138.32	37.63 cylinder i Jun 138.32	35.53 s in the (	39.83 dwelling Aug 138.32	40.03 or hot w Sep 138.32	45.85 ater is fr	49.26 om com	53.17 munity h		
include (57)m in calcu  5. Internal gains (see  Metabolic gains (Table  Jan Feb	ulation of (65 Table 5 and 5), Watts Mar Ap 138.32 138.3	42.84 am only if containing the second secon	37.63 cylinder i Jun 138.32	35.53 s in the (	39.83 dwelling Aug 138.32	40.03 or hot w Sep 138.32	45.85 ater is fr	49.26 om com	53.17 munity h		
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table :  Jan Feb  (66)m= 138.32 138.32  Lighting gains (calculate (67)m= 50.57 44.92	ulation of (65  Table 5 and 5), Watts  Mar Ap 138.32 138.3 ed in Append 36.53 27.6	42.84 am only if of 5a):  T May 138.32 ax L, equat 20.67	37.63 cylinder i Jun 138.32 tion L9 o	35.53 s in the o Jul 138.32 r L9a), a	39.83 dwelling Aug 138.32 lso see 24.51	40.03 or hot w Sep 138.32 Table 5 32.9	45.85 ater is fr  Oct 138.32 41.78	49.26 om com Nov 138.32	53.17 munity h		(66)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table :  Jan Feb  (66)m= 138.32 138.32  Lighting gains (calculate (67)m= 50.57 44.92  Appliances gains (calculate gains gains (calculate gains (calculate gains gain	ulation of (65 Table 5 and 5), Watts Mar Ap 138.32 138.3 ed in Append 36.53 27.6 ulated in Append	42.84 m only if contains a second of the conta	Jun 138.32 tion L9 o 17.45 uation L	Jul 138.32 r L9a), a 18.86	39.83 dwelling Aug 138.32 lso see 24.51 3a), also	40.03 or hot w Sep 138.32 Table 5 32.9 o see Tal	45.85  ater is fr  Oct  138.32  41.78  ble 5	49.26 om com Nov 138.32	53.17 munity h		(66)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table and Internal gains (Table and Internal gains (Table and Internal gains (Table and Internal gains (Calculate (66)m= 50.57 44.92  Appliances gains (Calculate (68)m= 303.07 306.22	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3  ed in Append  36.53 27.6  ulated in Append  298.29 281.4	42.84 am only if of 5a):  T May 138.32 ix L, equal 6 20.67 endix L, equal 2 260.13	Jun 138.32 tion L9 o 17.45 uation L 240.11	35.53 s in the o Jul 138.32 r L9a), a 18.86 13 or L1 226.74	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59	40.03 or hot w Sep 138.32 Table 5 32.9 o see Tal 231.52	45.85  ater is fr  Oct 138.32  41.78  ble 5 248.39	49.26 om com Nov 138.32	53.17 munity h		(66) (67)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table of Same of	ulation of (65 Table 5 and 5), Watts Mar Ap 138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append	42.84 m only if one	Jun 138.32 tion L9 o 17.45 uation L 240.11 tion L15	35.53 s in the of Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59	40.03 or hot w  Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table	45.85  ater is fr  Oct  138.32  41.78  ole 5  248.39  5	49.26 om com Nov 138.32 48.76	53.17 munity h		(66) (67) (68)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table :  Jan Feb  (66)m= 138.32 138.32  Lighting gains (calculate (67)m= 50.57 44.92  Appliances gains (calculate (68)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3  ed in Append 36.53 27.6  ulated in Append 298.29 281.4  ed in Append 51.14 51.1	42.84 m only if one	Jun 138.32 tion L9 o 17.45 uation L 240.11	35.53 s in the o Jul 138.32 r L9a), a 18.86 13 or L1 226.74	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59	40.03 or hot w Sep 138.32 Table 5 32.9 o see Tal 231.52	45.85  ater is fr  Oct 138.32  41.78  ble 5 248.39	49.26 om com Nov 138.32	53.17 munity h		(66) (67)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table of Samuel S	ulation of (65  Table 5 and 5), Watts  Mar Ap 138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append 51.14 51.1 (Table 5a)	42.84 am only if one	Jun 138.32 tion L9 o 17.45 uation L 240.11 tion L15 51.14	Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a 51.14	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14	40.03 or hot w Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table 51.14	45.85  ater is fr  Oct 138.32  41.78 ble 5 248.39 5 51.14	49.26 om com Nov 138.32 48.76 269.69	53.17 munity h Dec 138.32 51.98		(66) (67) (68) (69)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table of Samuel 1988)  Jan Feb  (66)m= 138.32 138.32  Lighting gains (calculate (67)m= 50.57 44.92  Appliances gains (calculate (68)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14  Pumps and fans gains (70)m= 3 3	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append 51.14 51.1 (Table 5a) 3 3	42.84 am only if of 5a):  T May 138.32 ax L, equate 5 20.67 ax L, equate 2 260.13 ax L, equate 4 51.14	Jun 138.32 tion L9 o 17.45 tuation L 240.11 tion L15 51.14	35.53 s in the of Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59	40.03 or hot w  Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table	45.85  ater is fr  Oct  138.32  41.78  ole 5  248.39  5	49.26 om com Nov 138.32 48.76	53.17 munity h		(66) (67) (68)
include (57)m in calculate (57)m in calculate (57)m in calculate (58)m    Metabolic gains (Table 19)    Jan Feb (66)m    138.32    138.32    Lighting gains (calculate (67)m    50.57    44.92    Appliances gains (calculate (68)m    303.07    306.22    Cooking gains (calculate (69)m    51.14    51.14    Pumps and fans gains (70)m    3     Losses e.g. evaporation	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append 51.14 51.1 (Table 5a) 3 3 n (negative value)	42.84  Im only if (5a):  T May 138.32  Iix L, equal 20.67  Endix L, equal 21.14  31  Salues) (Tab	Jun 138.32 tion L9 o 17.45 uation L 240.11 tion L15 51.14	35.53 s in the of  Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a 51.14	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14	40.03 or hot w Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table 51.14	45.85  ater is fr  Oct  138.32  41.78  ble 5  248.39  5  51.14	49.26 om com Nov 138.32 48.76 269.69	53.17 munity h  Dec 138.32  51.98  289.7		(66) (67) (68) (69)
include (57)m in calculate  5. Internal gains (see  Metabolic gains (Table and Internal gains)  [66)m= 138.32	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6  ulated in Append 298.29 281.4 ed in Append 51.14 51.1  (Table 5a) 3 3 n (negative value) -92.21 -92.2	42.84  Im only if (5a):  T May 138.32  Ix L, equal 20.67  Endix L, equal 21.14  31  Salues) (Tak	Jun 138.32 tion L9 o 17.45 tuation L 240.11 tion L15 51.14	Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a 51.14	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14	40.03 or hot w Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table 51.14	45.85  ater is fr  Oct 138.32  41.78 ble 5 248.39 5 51.14	49.26 om com Nov 138.32 48.76 269.69	53.17 munity h Dec 138.32 51.98		(66) (67) (68) (69)
include (57)m in calculate (58)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14  Pumps and fans gains (70)m= 3 3  Losses e.g. evaporation (71)m= -92.21 -92.21  Water heating gains (calculate (57)m= -92.21 -92.21  See Metabolic gains (Calculate (68)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14  Pumps and fans gains (70)m= 3 700.000  Water heating gains (Talculate (70)m= 700.21	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append 51.14 51.1 (Table 5a) 3 3 n (negative value) -92.21 -92.2 able 5)	42.84  m only if of only if of only if of only if of only if only if only if only if only if only if only in only if only in only if only in o	Jun 138.32 tion L9 o 17.45 tuation L 240.11 tion L15 51.14 3 ole 5) -92.21	35.53 s in the of  Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a) 51.14  3	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14	40.03 or hot w Sep 138.32 Table 5 32.9 o see Talle 231.52 ee Table 51.14	45.85 ater is fr  Oct 138.32  41.78 ole 5 248.39 5 51.14  3	49.26 om com  Nov  138.32  48.76  269.69  51.14  3	53.17 munity h  Dec 138.32  51.98  289.7  51.14  3		(66) (67) (68) (69) (70) (71)
include (57)m in calculate (58)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14  Pumps and fans gains (70)m= 3 3  Losses e.g. evaporation (71)m= -92.21 -92.21  Water heating gains (Talculate (72)m= 73.52 71.46	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6  ulated in Append 298.29 281.4 ed in Append 51.14 51.1  (Table 5a) 3 3 n (negative value) -92.21 -92.2	42.84  m only if of only if of only if of only if of only if only if only if only if only if only if only in only if only in only if only in o	Jun 138.32 tion L9 o 17.45 uation L 240.11 tion L15 51.14 3 ble 5) -92.21	35.53 s in the of  Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a 51.14  3  -92.21	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14 3	40.03 or hot w  Sep 138.32 Table 5 32.9 see Tal 231.52 ee Table 51.14  3  -92.21	45.85 ater is fr  Oct 138.32  41.78 ble 5 248.39 5 51.14  3  -92.21	49.26 om com  Nov 138.32 48.76 269.69 51.14 3 -92.21	53.17 munity h  Dec 138.32  51.98  289.7  51.14  3  -92.21		(66) (67) (68) (69)
include (57)m in calculate (58)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14  Pumps and fans gains (70)m= 3 3  Losses e.g. evaporation (71)m= -92.21 -92.21  Water heating gains (Talculate (72)m= 73.52 71.46  Total internal gains =	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append 51.14 51.1 (Table 5a) 3 3 n (negative value) -92.21 -92.2 able 5) 67.18 61.3	42.84  Im only if of the control of	Jun 138.32 tion L9 o 17.45 uation L 240.11 tion L15 51.14 3 ole 5) -92.21	35.53 s in the of  Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a) 51.14  3  -92.21  47.75 )m + (67)m	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14  3  -92.21  53.54 1+ (68)m	40.03 or hot w  Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table 51.14  3  -92.21  55.6 + (69)m + (	45.85  ater is fr  Oct 138.32  41.78  ole 5 248.39  5 51.14  3  -92.21  61.62  70)m + (7	49.26 om com  Nov 138.32  48.76  269.69  51.14  3  -92.21  68.42  1)m + (72)	53.17 munity h  Dec 138.32  51.98  289.7  51.14  3  -92.21  71.47		(66) (67) (68) (69) (70) (71)
include (57)m in calculate (58)m= 303.07 306.22  Cooking gains (calculate (69)m= 51.14 51.14  Pumps and fans gains (70)m= 3 3  Losses e.g. evaporation (71)m= -92.21 -92.21  Water heating gains (Talculate (72)m= 73.52 71.46  Total internal gains =	ulation of (65  Table 5 and  5), Watts  Mar Ap  138.32 138.3 ed in Append 36.53 27.6 ulated in Append 298.29 281.4 ed in Append 51.14 51.1 (Table 5a) 3 3 n (negative value) -92.21 -92.2 able 5)	42.84  Im only if of the control of	Jun 138.32 tion L9 o 17.45 uation L 240.11 tion L15 51.14 3 ble 5) -92.21	35.53 s in the of  Jul 138.32 r L9a), a 18.86 13 or L1 226.74 or L15a 51.14  3  -92.21	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 ), also se 51.14 3	40.03 or hot w  Sep 138.32 Table 5 32.9 see Tal 231.52 ee Table 51.14  3  -92.21	45.85 ater is fr  Oct 138.32  41.78 ble 5 248.39 5 51.14  3  -92.21	49.26 om com  Nov 138.32 48.76 269.69 51.14 3 -92.21	53.17 munity h  Dec 138.32  51.98  289.7  51.14  3  -92.21		(66) (67) (68) (69) (70) (71)

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

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.39	x	10.63	x	0.63	x	0.7	] =	1.27	(74)
North	0.9x	0.77	x	0.39	x	10.63	X	0.63	x	0.7	=	1.27	(74)
North	0.9x	0.77	x	0.39	x	20.32	x	0.63	x	0.7	=	2.42	(74)
North	0.9x	0.77	x	0.39	x	20.32	x	0.63	x	0.7	=	2.42	(74)
North	0.9x	0.77	x	0.39	x	34.53	X	0.63	x	0.7	=	4.12	(74)
North	0.9x	0.77	x	0.39	x	34.53	x	0.63	x	0.7	=	4.12	(74)
North	0.9x	0.77	x	0.39	x	55.46	x	0.63	x	0.7	=	6.61	(74)
North	0.9x	0.77	x	0.39	x	55.46	x	0.63	x	0.7	=	6.61	(74)
North	0.9x	0.77	x	0.39	x	74.72	x	0.63	x	0.7	=	8.91	(74)
North	0.9x	0.77	x	0.39	x	74.72	x	0.63	x	0.7	=	8.91	(74)
North	0.9x	0.77	X	0.39	x	79.99	X	0.63	X	0.7	=	9.53	(74)
North	0.9x	0.77	x	0.39	x	79.99	x	0.63	x	0.7	=	9.53	(74)
North	0.9x	0.77	x	0.39	x	74.68	x	0.63	x	0.7	=	8.9	(74)
North	0.9x	0.77	x	0.39	x	74.68	x	0.63	x	0.7	=	8.9	(74)
North	0.9x	0.77	x	0.39	x	59.25	x	0.63	x	0.7	=	7.06	(74)
North	0.9x	0.77	x	0.39	x	59.25	X	0.63	x	0.7	=	7.06	(74)
North	0.9x	0.77	x	0.39	x	41.52	x	0.63	x	0.7	=	4.95	(74)
North	0.9x	0.77	x	0.39	x	41.52	x	0.63	x	0.7	=	4.95	(74)
North	0.9x	0.77	x	0.39	x	24.19	x	0.63	x	0.7	=	2.88	(74)
North	0.9x	0.77	x	0.39	x	24.19	x	0.63	x	0.7	=	2.88	(74)
North	0.9x	0.77	x	0.39	x	13.12	x	0.63	x	0.7	=	1.56	(74)
North	0.9x	0.77	x	0.39	x	13.12	X	0.63	x	0.7	=	1.56	(74)
North	0.9x	0.77	x	0.39	x	8.86	X	0.63	x	0.7	=	1.06	(74)
North	0.9x	0.77	x	0.39	x	8.86	X	0.63	x	0.7	=	1.06	(74)
East	0.9x	0.77	X	1.17	X	19.64	X	0.63	X	0.7	=	7.02	(76)
East	0.9x	0.77	x	1.12	x	19.64	X	0.63	x	0.7	=	6.72	(76)
East	0.9x	0.77	X	1.17	X	38.42	X	0.63	X	0.7	=	13.74	(76)
East	0.9x	0.77	X	1.12	X	38.42	X	0.63	X	0.7	=	13.15	(76)
East	0.9x	0.77	x	1.17	X	63.27	X	0.63	x	0.7	=	22.62	(76)
East	0.9x	0.77	X	1.12	X	63.27	X	0.63	X	0.7	=	21.66	(76)
East	0.9x	0.77	X	1.17	X	92.28	X	0.63	X	0.7	=	33	(76)
East	0.9x	0.77	x	1.12	x	92.28	X	0.63	X	0.7	=	31.59	(76)
East	0.9x	0.77	X	1.17	x	113.09	X	0.63	X	0.7	=	40.44	(76)
East	0.9x	0.77	X	1.12	x	113.09	X	0.63	X	0.7	=	38.71	(76)
East	0.9x	0.77	x	1.17	x	115.77	x	0.63	x	0.7	=	41.4	(76)
East	0.9x	0.77	x	1.12	x	115.77	x	0.63	x	0.7	=	39.63	(76)
East	0.9x	0.77	x	1.17	x	110.22	x	0.63	x	0.7	=	39.41	(76)
East	0.9x	0.77	x	1.12	x	110.22	x	0.63	x	0.7	=	37.73	(76)
East	0.9x	0.77	X	1.17	x	94.68	×	0.63	X	0.7	=	33.85	(76)

	_		,						ī				_
East	0.9x	0.77	X	1.12	X	94.68	X	0.63	X	0.7	=	32.41	(76)
East	0.9x	0.77	X	1.17	X	73.59	X	0.63	X	0.7	=	26.31	(76)
East	0.9x	0.77	X	1.12	X	73.59	X	0.63	X	0.7	=	25.19	(76)
East	0.9x	0.77	X	1.17	X	45.59	X	0.63	X	0.7	=	16.3	(76)
East	0.9x	0.77	X	1.12	X	45.59	X	0.63	X	0.7	=	15.6	(76)
East	0.9x	0.77	X	1.17	X	24.49	X	0.63	X	0.7	=	8.76	(76)
East	0.9x	0.77	X	1.12	X	24.49	X	0.63	X	0.7	=	8.38	(76)
East	0.9x	0.77	X	1.17	X	16.15	x	0.63	x	0.7	=	5.78	(76)
East	0.9x	0.77	X	1.12	X	16.15	X	0.63	x	0.7	=	5.53	(76)
West	0.9x	0.77	X	2.98	X	19.64	X	0.63	x	0.7	=	17.89	(80)
West	0.9x	0.77	X	1.14	X	19.64	x	0.63	x	0.7	=	6.84	(80)
West	0.9x	0.77	X	1.25	X	19.64	x	0.63	x	0.7	=	7.5	(80)
West	0.9x	0.77	X	2.98	x	38.42	X	0.63	x	0.7	=	34.99	(80)
West	0.9x	0.77	X	1.14	x	38.42	X	0.63	x	0.7	=	13.39	(80)
West	0.9x	0.77	X	1.25	x	38.42	x	0.63	x	0.7	=	14.68	(80)
West	0.9x	0.77	x	2.98	x	63.27	x	0.63	x	0.7	=	57.62	(80)
West	0.9x	0.77	X	1.14	x	63.27	X	0.63	X	0.7	=	22.04	(80)
West	0.9x	0.77	X	1.25	x	63.27	x	0.63	x	0.7	=	24.17	(80)
West	0.9x	0.77	X	2.98	x	92.28	X	0.63	x	0.7	=	84.04	(80)
West	0.9x	0.77	X	1.14	X	92.28	x	0.63	x	0.7	=	32.15	(80)
West	0.9x	0.77	X	1.25	X	92.28	X	0.63	x	0.7	=	35.25	(80)
West	0.9x	0.77	X	2.98	x	113.09	X	0.63	x	0.7	=	103	(80)
West	0.9x	0.77	X	1.14	x	113.09	x	0.63	X	0.7	=	39.4	(80)
West	0.9x	0.77	X	1.25	x	113.09	X	0.63	x	0.7	=	43.2	(80)
West	0.9x	0.77	X	2.98	x	115.77	x	0.63	x	0.7	=	105.44	(80)
West	0.9x	0.77	X	1.14	x	115.77	x	0.63	x	0.7	=	40.33	(80)
West	0.9x	0.77	X	1.25	X	115.77	X	0.63	x	0.7	=	44.23	(80)
West	0.9x	0.77	X	2.98	X	110.22	x	0.63	x	0.7	=	100.38	(80)
West	0.9x	0.77	X	1.14	X	110.22	x	0.63	x	0.7	=	38.4	(80)
West	0.9x	0.77	X	1.25	x	110.22	x	0.63	x	0.7	=	42.11	(80)
West	0.9x	0.77	X	2.98	x	94.68	X	0.63	x	0.7	=	86.22	(80)
West	0.9x	0.77	X	1.14	x	94.68	X	0.63	x	0.7	=	32.98	(80)
West	0.9x	0.77	X	1.25	x	94.68	x	0.63	x	0.7	=	36.17	(80)
West	0.9x	0.77	X	2.98	x	73.59	X	0.63	x	0.7	=	67.02	(80)
West	0.9x	0.77	X	1.14	x	73.59	X	0.63	x	0.7	=	25.64	(80)
West	0.9x	0.77	x	1.25	x	73.59	x	0.63	x	0.7	] =	28.11	(80)
West	0.9x	0.77	x	2.98	x	45.59	x	0.63	x	0.7	] =	41.52	(80)
West	0.9x	0.77	X	1.14	x	45.59	x	0.63	x	0.7	] =	15.88	(80)
West	0.9x	0.77	x	1.25	x	45.59	x	0.63	x	0.7	] =	17.42	(80)
West	0.9x	0.77	X	2.98	×	24.49	x	0.63	x	0.7	<b>=</b>	22.3	(80)
West	0.9x	0.77	x	1.14	x	24.49	x	0.63	x	0.7	j =	8.53	(80)
													_

West	0.9x	0.77	X	1.2	25	x [	24	1.49	x		0.63	x	0.7	=	9.36	(80)
West	0.9x	0.77	X	2.9	18	x	16	6.15	x [		0.63	x	0.7	=	14.71	(80)
West	0.9x	0.77	x	1.1	4	x	16	3.15	x		0.63	x	0.7	=	5.63	(80)
West	0.9x	0.77	x	1.2	25	x $\lceil$	16	6.15	×		0.63	_ x _	0.7	=	6.17	(80)
	_					_										
Solar ga	ains in v	watts. ca	alculated	for eacl	n month				(83)m	= Su	um(74)m .	(82)m				
(83)m=	48.51	94.79	156.35	229.25	282.56	290	0.09	275.82	235.	76	182.17	112.49	60.46	39.92	]	(83)
Total ga	ains – ir	nternal a	ınd solar	(84)m =	(73)m -	+ (83	3)m ,	watts		!				I.		
(84)m=	575.92	617.62	658.6	699.93	721.18	700	0.15	669.41	637.	64	602.43	564.52	547.56	553.32		(84)
7. Mea	an inter	nal temp	erature	(heating	season	)	,						•			
				`			rea fr	om Tah	ole 9	Th1	1 (°C)				21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)																
	Jan	Feb	Mar		May	Ò	un	Jul	Αι	<u></u> T	Sep	Oct	Nov	Dec	1	
(96)		0.92	0.89	Apr 0.84	-	-	61		_	<del>-</del>	0.7		0.92	0.94		(86)
(86)m=	0.94	0.92	0.69	0.64	0.74	0.0	61	0.48	0.5	'	0.7	0.85	0.92	0.94	J	(00)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)																
(87)m=	18.93	19.13	19.51	20.01	20.45	20	.78	20.92	20.	9	20.66	20.1	19.44	18.89		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwe	elling f	from Ta	able 9	, Th	n2 (°C)					
(88)m=	19.97	19.97	19.97	19.98	19.99		.99	19.99	19.9	-	19.99	19.99	19.98	19.98	]	(88)
					ا ممالامیا	<u> </u>		Table	0-2	!			<u> </u>		I	
	0.93	0.91	ains for r	0.81			Ť	0.38		<u>. T</u>	0.64	0.82	0.91	0.94	1	(89)
(89)m=	0.93	0.91	0.00	0.61	0.7	0.:	54	0.36	0.42		0.64	0.82	0.91	0.94	J	(09)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)																
(90)m=	18.1	18.3	18.67	19.15	19.57	19	.85	19.95	19.9	94	19.76	19.25	18.61	18.06		(90)
$fLA = Living area \div (4) = 0.17 $ (91)																
Mean i	internal	temper	ature (fo	r the wh	ole dwe	llina`	) = fL	A × T1	+ (1 -	– fL	A) × T2					
(92)m=	18.24	18.44	18.81	19.3	19.72		.02	20.12	20.1	-	19.92	19.4	18.75	18.2	]	(92)
Apply 8	adiustn	nent to th	he mean	internal	temper	ı ature	e fron	n Table	4e. v	whe	re appro	priate	!	<u>[</u>	J	
(93)m=	18.09	18.29	18.66	19.15	19.57		.87	19.97	19.9		19.77	19.25	18.6	18.05	]	(93)
8. Spa	ce hea	ting regu	uirement						<u> </u>							
•		•	ernal ten	nperatui	e obtain	ed a	at ster	p 11 of	Table	e 9b	, so tha	t Ti,m=(	76)m an	d re-cald	culate	
			or gains เ					•				, ,	,		_	
	Jan	Feb	Mar	Apr	May	J	un	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
Utilisat	tion fac	tor for g	ains, hm											-	_	
(94)m=	0.91	0.89	0.85	0.79	0.68	0.	53	0.38	0.42	2	0.62	0.8	0.88	0.92		(94)
Useful	gains,	hmGm ,	W = (94	l)m x (84	4)m										•	
(95)m=	523.98	550.23	562.56	550.17	491.1	371	1.53	256.2	266.	34	374.14	451.49	483.66	507.3		(95)
Monthl	ly avera	age exte	rnal tem	perature	from Ta	able	8						•	•	•	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat Id	oss rate	for mea	an intern	al tempe	erature,	Lm ,	, W =[	[(39)m :	x [(93	B)m-	- (96)m	]	•		•	
(97)m=	1136.94	1101.59	998.33	833.21	638.72	423	3.45	271.2	285.	84	457.31	701.36	936.5	1132.59	]	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m										•						
(98)m=	456.04	370.52	324.21	203.79	109.82	(	0	0	0		0	185.91	326.04	465.22		
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =										2441.55	(98)					
Space	heatin	a require	ement in	kWh/m²	/vear										33.68	(99)
Space	, iodii i	y roquire		411/111	, y oui										00.00	

Space heating:	9a. Energy requirements – Individual heating	svstems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system fs	Space heating:	<del>oyoto</del> mo i	Holdaling	,-/moro	7-11-)——————————————————————————————————					_
Fraction of total heating from main system 1 (204) = (202) × (1 - (203)) = 1 (204) (202) × (1 - (203)) = 1 (204) (202) (205) (	Fraction of space heat from secondary/supp	lementary	system						0	(201)
Secondary supplementary heating system	Fraction of space heat from main system(s)			(202) = 1	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   KWh/year	Fraction of total heating from main system 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   KWhiyear	Efficiency of main space heating system 1								92.4	(206)
Space   heating requirement (calculated above)	Efficiency of secondary/supplementary heati	ng systen	n, %						0	(208)
	Jan Feb Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
211)m = {[(98)m x (204)] } x 100 ÷ (206)	· <del>- · · · · · · · · · · · · · · · · · ·</del>	<del>-i</del>							1	
A33.55		2 0	0	0	0	185.91	326.04	465.22		
Total (kWh/year) = Sum(211), sss_t=" 2642.37 (211) Space heating fuel (secondary), kWh/month  ([(98)m x (201)] \ \cdot x \ (201)] \ \cdot x \ (208)    15)m	`		Ι ο	Ι ,		004.0	050.00	T 500 40	1	(211)
Space heating fuel (secondary), kWh/month {{([98)m x (201)] } x 100 ÷ (208)} {\$15 m } 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	493.55   400.99   350.88   220.55   118.86	9 0	0						2642.27	7(211)
(198)m x (201)    x 100 ÷ (208)	Space heating fuel (secondary) k\M/h/menth			1018	ii (KVVII/ yCc	ar) =Ouri	211/15,1012	2	2642.37	(211)
15 m   0										
Atter heating sutput from water heater (calculated above)    170.92   150.2   156.7   139.04   135.22   119.33   113.2   126.17   126.56   144.26   154.34   166.33     170.92   150.2   156.7   139.04   135.22   119.33   113.2   126.17   126.56   144.26   154.34   166.33     170.92   150.2   156.7   139.04   135.22   119.33   113.2   126.17   126.56   144.26   154.34   166.33     170.92   150.2   150.3   150.3   150.3   150.2   150.3   150.2   150.3   150.12   145.02   145.47   162.71   173.39   186.49     190.2   190.2   190.2   145.42   145.47   162.71   173.39   186.49     190.2   190.2   190.2   190.2   145.47   162.71   173.39   186.49     190.2   190.2   190.2   190.2   145.47   162.71   173.39   186.49     190.2   190.2   190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2   190.2     190.2   190.2		0	0	0	0	0	0	0	]	
Trough the start (calculated above)    170.92		•	•	Tota	l (kWh/yea	ar) =Sum(	215),15,1012		0	(215)
170.92   150.2   156.7   139.04   135.22   119.33   113.2   126.17   126.56   144.26   154.34   166.33     170.92   150.2   156.7   139.04   135.22   119.33   113.2   126.17   126.56   144.26   154.34   166.33     170.91   89.16   89.11   89   88.76   88.32   87   87   87   87   88.66   89.01   89.19     170.91   190.91   190.91   190.91   190.91   190.91     190.91   190.91   190.91   190.91   190.91     190.91   190.91   190.91   190.91     190.91   190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91     190.91   190.91   190.91     190.91   190.91   190.91     190.91   190.91	Water heating									_
fficiency of water heater  17)m= 89.16 89.11 89 88.76 88.32 87 87 87 87 88.66 89.01 89.19  19)m= (64)m x 100 ÷ (217)m  19)m= 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49  Total = Sum(219a), = 1926.42 (219)m  190ms queltor water heating, kWh/year 190ms queltor water heating fuel used, main system 1  190ms queltor water heating fuel used, main system 1  2642.37    190ms queltor water heating fuel used, main system 1  2642.37    2642.3	Output from water heater (calculated above)	140.22	T 442.0	106 17	100 50	144.06	154.24	166.22	1	
17)m= 89.16 89.11 89 88.76 88.32 87 87 87 87 88.66 89.01 89.19  usel for water heating, kWh/month 219)m= (64)m x 100 ÷ (217)m 19)m= 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49  Total = Sum(219a), p = 1926.42 (219)  kWh/year		119.33	113.2	120.17	120.30	144.26	154.34	100.33	97	7(216)
usel for water heating, kWh/month  19)m = (64)m x 100 ÷ (217)m  19)m = 191.7   168.55   176.07   156.65   153.1   137.16   130.12   145.02   145.47   162.71   173.39   186.49  Total = Sum(219a) <sub>1-12</sub> = 1926.42   (219)  mnual totals pace heating fuel used, main system 1  //ater heating fuel used //ater heating pump: //ater heating fuel used //ater heating fuel		87	87	87	87	88.66	89.01	89.19	01	
219)m = (64)m x 100 ÷ (217)m 19)m = 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49  Total = Sum(219a) <sub>19</sub> = 1926.42 (219)  Innual totals pace heating fuel used, main system 1  //ater heating fuel used  lectricity for pumps, fans and electric keep-hot central heating pump:  30 (230c) coller with a fan-assisted flue  otal electricity for the above, kWh/year  lectricity for lighting  lectricity generated by PVs  otal electricity generated by PVs  otal electricity generated by PVs  otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3636.19 (338)  Fuel kWh/year  Fuel Fuel Price					<u> </u>	00.00	1 00.01	1 000	J	,
Innual totals pace heating fuel used, main system 1  Water heating fuel used  Idectricity for pumps, fans and electric keep-hot  Contral heating pump:  Coolier with a fan-assisted flue  Cotal electricity for the above, kWh/year  Idectricity for lighting  Idectricity for lighting  Idectricity generated by PVs  Cotal delivered energy for all uses (211)(221) + (231) + (232)(237b) =  Total = Sum(219a)2 =  1926.42  192	(219)m = (64)m x 100 ÷ (217)m		1	1			1		1	
nnual totals pace heating fuel used, main system 1  //ater heating fuel used //ater heating fuel used //ater heating fuel used //ater heating pumps, fans and electric keep-hot //ater heating pump: //ater heating pump: //ater heating pump: //ater heating pumps, fans and electric keep-hot //ater heating pump: //ater heating pumps, fans and electric keep-hot //ater heating fuel used //ater heating fuel use	219)m= 191.7   168.55   176.07   156.65   153.1	137.16	130.12				173.39	186.49		٦
pace heating fuel used. main system 1  /ater heating fuel used  /ater h	Amount totals			Tota	ii = Sum(2	<u>-</u>	NA/II- /	_		<b>_</b>
lectricity for pumps, fans and electric keep-hot central heating pump:    30						K	wn/yeai	r		
lectricity for pumps, fans and electric keep-hot  central heating pump:  cooller with a fan-assisted flue  cotal electricity for the above, kWh/year  lectricity for lighting  lectricity generated by PVs  cotal delivered energy for all uses (211)(221) + (231) + (232)(237b) =  The sum of (230a)(230g) =  75									1926 42	╡
Coolier with a fan-assisted flue   Coolier with a	· ·	ot							1020.12	
boiler with a fan-assisted flue  otal electricity for the above, kWh/year  sum of (230a)(230g) =  75 (231)  lectricity for lighting  lectricity generated by PVs  otal delivered energy for all uses (211)(221) + (231) + (232)(237b) =  10a. Fuel costs - individual heating systems:  Fuel kWh/year  kWh/year  Fuel Price (Table 12)  fuel Cost								20	1	(2200
otal electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) lectricity for lighting 357.25 (232) lectricity generated by PVs -1364.85 (233) otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3636.19 (338)  10a. Fuel costs - individual heating systems:  Fuel kWh/year (Table 12) pace heating - main system 1 (211) x 3.48 x 0.01 = 91.95 (240)									] 1	
lectricity for lighting    357.25   (232)					-1 (000-)	(000-)		45		_
lectricity generated by PVs  otal delivered energy for all uses (211)(221) + (231) + (232)(237b) =  10a. Fuel costs - individual heating systems:  Fuel Fuel Price (Table 12)  pace heating - main system 1  (211) x  3.48  v 0.01 = 91.95  (240)				sum	of (230a).	(230g) =			75	=
otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3636.19 (338)  10a. Fuel costs - individual heating systems:  Fuel Fuel Price (Table 12) £/year  pace heating - main system 1 (211) x 3.48 x 0.01 = 91.95 (240)	Electricity for lighting								357.25	(232)
Fuel Fuel Price Fuel Cost & KWh/year (Table 12)  pace heating - main system 1  Fuel Fuel Price (Table 12)  £/year  211) x  3.48  x 0.01 = 91.95 (240)	Electricity generated by PVs									(233)
Fuel Fuel Price Fuel Cost kWh/year (Table 12) £/year pace heating - main system 1	Total delivered energy for all uses (211)(22	1) + (231)	+ (232).	(237b)	=				3636.19	(338)
pace heating - main system 1 $\frac{\text{kWh/year}}{\text{(211)}}$ $\frac{\text{E/year}}{\text{(240)}}$	10a. Fuel costs - individual heating systems:									
pace heating - main system 1 $\frac{\text{kWh/year}}{\text{(211)}}$ $\frac{\text{E/year}}{\text{(240)}}$		Fu	el			Fuel P	rice		Fuel Cost	
3.40 S.40 S.40 S.40 S.40 S.40 S.40 S.40 S										
pace heating - main system 2 (213) $\times$ $0.01 = 0.00$	Space heating - main system 1	(21	1) x			3.4	18	x 0.01 =	91.95	(240)
	Space heating - main system 2	(213	3) x					x 0.01 =	0	(241)

Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 =	67.04 (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)	separately as applicable an		
Energy for lighting	(232)	13.19 X 0.01 =	47.12 (200)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-180.02 (252)
Appendix Q items: repeat lines (253) and (254	,		
	(247) + (250)(254) =		155.98 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255)	$\times (256)] \div [(4) + 45.0] =$		0.56 (257)
SAP rating (Section 12)			92.22 (258)
12a. CO2 emissions – Individual heating sys	stems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	570.75 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	416.11 (264)
Space and water heating	(261) + (262) + (263) + (2	64) =	986.86 (265)
Electricity for pumps, fans and electric keep-h	not (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	185.41 (268)
Energy saving/generation technologies Item 1		0.519 =	-708.36 (269)
Total CO2, kg/year		sum of (265)(271) =	502.84 (272)
CO2 emissions per m²		(272) ÷ (4) =	6.94 (273)
EI rating (section 14)			94 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22	3223.69 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22 =	2350.24 (264)
Space and water heating	(261) + (262) + (263) + (2	64) =	5573.93 (265)
Electricity for pumps, fans and electric keep-h	not (231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0 =	1096.75 (268)

### **SAP 2012 Overheating Assessment**

Calculated by Stroma FSAP 2012 program, produced and printed on 29 November 2022

#### Property Details: Plot 38

**Dwelling type:** Semi-detached House

Located in:EnglandRegion:East Anglia

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

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

**Night ventilation:** False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):

Dark-coloured curtain or roller blind
3 (Windows open half the time)

#### Overheating Details:

Summer ventilation heat loss coefficient: 172.26 (P1)

Transmission heat loss coefficient: 49.2

Summer heat loss coefficient: 221.48 (P2)

#### Overhangs:

Orientation:	Ratio:	${\bf Z\_overhangs:}$
East (W_1)	0	1
East (W_2)	0	1
North (W_3)	0	1
West (W_4)	0	1
North (W_5)	0	1
West (W_6)	0	1
West (W_7)	0	1

#### Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
East (W_1)	0.85	0.9	1	0.76	(P8)
East (W_2)	0.85	0.9	1	0.76	(P8)
North (W_3)	0.85	0.9	1	0.76	(P8)
West (W_4)	0.85	0.9	1	0.76	(P8)
North (W_5)	0.85	0.9	1	0.76	(P8)
West (W_6)	0.85	0.9	1	0.76	(P8)
West (W_7)	0.85	0.9	1	0.76	(P8)

#### Solar gains:

Orientation		Area	Flux	<b>g</b> _	FF	Shading	Gains
East (W_1)	0.9 x	1.17	119.47	0.63	0.7	0.76	42.44
East (W_2)	0.9 x	1.12	119.47	0.63	0.7	0.76	40.63
North (W_3)	0.9 x	0.39	82.12	0.63	0.7	0.76	9.72
West (W_4)	0.9 x	2.98	119.47	0.63	0.7	0.76	108.1
North (W_5)	0.9 x	0.39	82.12	0.63	0.7	0.76	9.72
West (W_6)	0.9 x	1.14	119.47	0.63	0.7	0.76	41.35
West (W_7)	0.9 x	1.25	119.47	0.63	0.7	0.76	45.34
						Total	207.32 <b>(P3/P</b>

#### Internal gains:

	June	July	August
Internal gains	407.07	390.59	398.89
Total summer gains	722.74	687.9	655.48 <b>(P5)</b>

# **SAP 2012 Overheating Assessment**

Likelihood of high internal temperature	Not significant	Medium	Sliaht	
Threshold temperature	19.96	22.01	21.86	(P7)
Thermal mass temperature increment	1.3	1.3	1.3	
Mean summer external temperature (East Anglia)	15.4	17.6	17.6	
Summer gain/loss ratio	3.26	3.11	2.96	(P6)

Assessment of likelihood of high internal temperature: <u>Medium</u>