Predicted Energy Assessment

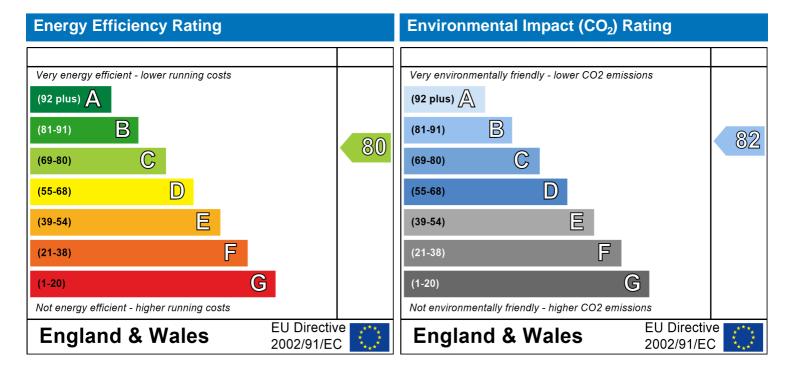


Flat 3 222 Otley Road Leeds LS16 5AB

Dwelling type: Date of assessment: Produced by: Total floor area: Top floor Flat 16 January 2017 Mark Heptonstall 77.78 m²

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

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



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

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

SAP Input

Property Details: Flat 3

Address: Flat 3, 222 Otley Road, Leeds, LS16 5AB

Located in: England Region: East Pennines

UPRN:

Date of assessment: 16 January 2017
Date of certificate: 16 January 2017

Assessment type: New dwelling created by change of use

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling

Owner-occupied

No related party

Indicative Value Medium

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

PCDF Version: 404

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2017

Floor Location: Floor area:

Storey height: 77.78 m^2 1.8 m

7.7.0

Living area: 38.51 m² (fraction 0.495)

Front of dwelling faces: North East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front DW	SAP 2012	Windows	double-glazed	Yes	PVC-U
Front	SAP 2012	Windows	double-glazed	Yes	PVC-U
Pro RLs	Manufacturer	Roof Windows	double-glazed	Yes	PVC-U
Pro RLs	Manufacturer	Roof Windows	double-glazed	Yes	PVC-U
Pro RL	Manufacturer	Roof Windows	double-glazed	Yes	PVC-U

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
Front DW	16mm or more	0.7	0.76	1.6	2.85	1
Front	16mm or more	0.7	0.76	1.6	0.55	1
Pro RLs	16mm or more	0.7	0.76	1.6	2.8	1
Pro RLs	16mm or more	0.7	0.76	1.6	2.1	1
Pro RL	16mm or more	0.7	0.76	1.6	1.4	1

Name: Front DW	Type-Name:	Location: DW	Orient: North East	Width: 0	Height: 0
Front		Existing EW	North East	0	0
Pro RLs		Sloping Roof	North West	0	0
Pro RLs		Sloping Roof	South East	0	0
Pro RL		Sloping Roof	South West	0	0

Overshading: Average or unknown

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>ts</u>						
Existing EW	5.13	0.55	4.58	0.3	0	False	N/A
DW	4	2.85	1.15	0.3	0	False	N/A
SW	36.85	0	36.85	0.3	0	False	N/A
Flat Roof	41.48	0	41.48	0.18	0		N/A
Sloping Roof	67.78	6.3	61.48	0.18	0		N/A
Dormer Roof	1.85	0	1.85	0.18	0		N/A

SAP Input

Internal Elements Party Elements

Thermal bridges:	
Thermal bridges:	No information on thermal bridging $(y=0.15)$ $(y=0.15)$
Ventilation:	No illiornation on thermal bridging (J=0.10) (J=0.10)
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test: Main heating system:	No (Assumed) Natural ventilation (extract fans) 0 0 0 3 0 2 15
Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Boiler Database Database: (rev 404, product index 015166) Efficiency: Winter 80.2 % Summer: 90.3 Brand name: Worcester Model: Greenstar Model qualifier: 42 CDi (Combi boiler) Systems with radiators Central heating pump: 2013 or later Design flow temperature: Design flow temperature<=35°C Boiler interlock: Yes
Main heating Control:	Bollot Illicologic Tes
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: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics: Assess Zero Carbon Home:	Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No None No

			User D	etaile: -						
Assessor Name:	Mark Heptonstall			Strom:	a Nium	her:		STRO	0004925	
Software Name:	Stroma FSAP 20			Softwa					on: 1.0.4.5	
				Address		0.0				
Address :	Flat 3, 222 Otley R									
1. Overall dwelling dime										
			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			7	7.78	(1a) x	1	1.8	(2a) =	140	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 7	7.78	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	140	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hoι	ır
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + [0	Ī = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	3	x ·	10 =	30	(7a)
Number of passive vents	3				F	0	x ·	10 =	0	(7b)
Number of flueless gas f	ïres				F	0	x 4	40 =	0	(7c)
					L					(1.5)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	30		÷ (5) =	0.21	(8)
If a pressurisation test has I		ded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to ((16)			_
Number of storeys in t	he dwelling (ns)							47.04	0	(9)
Additional infiltration	OF for otaal or timber		0.05 to				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (oresent, use the value corre				•	uction			0	(11)
deducting areas of open		openang te	ino grout	or wan are	a (unor					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,	•		•	•	•	etre of e	envelope	area	15	(17)
If based on air permeabi	•					ia haina	000		0.96	(18)
Air permeability value applie Number of sides sheltere		as been don	ie or a deg	gree air pei	пеаышу	is being u	sea		2	(19)
Shelter factor	34			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.82	(21)
Infiltration rate modified	for monthly wind spee	ed								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 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]	
Mind Factor (00.)	100								•	
Wind Factor (22a)m = $(2^{22a})^{m}$	'	0.05	0.05	0.00	4	4.00	4 40	4.40	1	
(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	J	

Adjusted infiltra	ation rate (all	owing for sr	nelter and v	vind spee	d) = (21a) x	(22a)m					
1.05	1.02 1	0.9	0.88	0.78 0.7	78 0.76	0.82	0.88	0.92	0.96		
Calculate effec		ge rate for t	he applicat	ole case	<u>I</u>	ı	!		!		
If mechanica		A	Ola) (OO a)	F ((AUE)) - (Ib a) (OO -)			0	(23a)
If exhaust air he			, , ,			,) = (23a)			0	(23b)
If balanced with	-		_				21.) (4	201) [4 (00.)	0	(23c)
a) If balance					- 	ŕ	É Ì		<u> </u>	÷ 100] I	(24a)
(24a)m= 0	0 0		0		0 0	0	0	0	0		(24a)
b) If balance	o mechanica 0 0		0 o		0 0	$\int_{0}^{\infty} \int_{0}^{\infty} \int_{0$	2b)m + (2 0	23D) 0	0]	(24b)
c) If whole he	ļ			!	Ļ	<u> </u>		0			(= .5)
•	ouse extract n < 0.5 × (23k		-	•			5 × (23b)			
(24c)m= 0	0 0		0	1	0 0	0	0	0	0		(24c)
d) If natural v	ventilation or	whole hous	e positive i	input vent	ilation from I	oft			ı	ı	
	n = 1, then (2						0.5]				
(24d)m= 1.05	1.02 1	0.91	0.89	0.8 0.	8 0.79	0.84	0.89	0.93	0.96		(24d)
Effective air	change rate	- enter (24a) or (24b) c	or (24c) or	(24d) in box	(25)					
(25)m= 1.05	1.02 1	0.91	0.89	0.8 0.	8 0.79	0.84	0.89	0.93	0.96		(25)
3. Heat losses	s and heat lo	ss paramete	er:								
ELEMENT	Gross area (m²)	Openin m	gs N	Net Area A ,m²	U-valı W/m2		A X U (W/ł	۲)	k-value kJ/m²·l		A X k kJ/K
Windows Type	1			2.85	x1/[1/(1.6)+	0.04] =	4.29				(27)
Windows Type	2			0.55	x1/[1/(1.6)+	0.041 =	0.83				(27)
Rooflights Type	۵ 1				7 L ()						
Rooflights Type	5 I			2.8	x1/[1/(1.6) +		4.48				(27b)
				2.8		0.04] =	4.48 3.36				(27b)
Rooflights Type	e 2				x1/[1/(1.6) +	0.04] = 0.04] =					
Rooflights Type Walls Type1	e 2	0.55		2.1	x1/[1/(1.6) + x1/[1/(1.6) +	0.04] = 0.04] =	3.36			-	(27b)
	e 2 e 3	0.55		2.1 1.4 4.58	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3	0.04] = 0.04] = 0.04] =	3.36 2.24 1.37				(27b) (27b) (29)
Walls Type1 Walls Type2	e 2 e 3 5.13	2.85		2.1 1.4 4.58 1.15	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3	0.04] = 0.04] = 0.04] = = = =	3.36 2.24 1.37 0.35				(27b) (27b) (29) (29)
Walls Type1 Walls Type2 Walls Type3	e 2 e 3 5.13 4 36.85	2.85		2.1 1.4 4.58 1.15 36.85	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3	0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3.36 2.24 1.37 0.35 11.05				(27b) (27b) (29) (29) (29)
Walls Type1 Walls Type2 Walls Type3 Roof Type1	5.13 4 36.85 41.48	0		2.1 1.4 4.58 1.15 36.85 41.48	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3 x 0.18	0.04] = 0.04] = 0.04] = = = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47				(27b) (27b) (29) (29) (29) (30)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2	5.13 4 36.85 41.48 67.78	2.85 0 0 6.3		2.1 1.4 4.58 1.15 36.85 41.48 61.48	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3 x 0.18 x 0.18	0.04] = 0.04] =	3.36 2.24 1.37 0.35 11.05 7.47 11.07				(27b) (27b) (29) (29) (29) (30) (30)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3	5.13 4 36.85 41.48 67.78	0		2.1 1.4 4.58 1.15 36.85 41.48 61.48	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3 x 0.18	0.04] = 0.04] = 0.04] = = = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47				(27b) (27b) (29) (29) (29) (30) (30) (30)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el	5.13 4 36.85 41.48 67.78 1.85 Lements, m ²	2.85 0 0 6.3		2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3 x 0.18 x 0.18 x 0.18	0.04] = 0.04] =	3.36 2.24 1.37 0.35 11.05 7.47 11.07	s aiven in	paragraph		(27b) (27b) (29) (29) (29) (30) (30)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3	e 2 e 3 5.13 4 36.85 41.48 67.78 1.85 lements, m² roof windows, u	2.85 0 0 6.3 0	ndow U-value	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated to	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3 x 0.18 x 0.18 x 0.18	0.04] = 0.04] =	3.36 2.24 1.37 0.35 11.05 7.47 11.07	s given in	paragraph]	(27b) (27b) (29) (29) (29) (30) (30) (30)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el	5.13 4 36.85 41.48 67.78 1.85 lements, m² roof windows, u is on both sides	2.85 0 0 6.3 0 see effective will of internal wall	ndow U-value	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated to	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x 0.3 x 0.3 x 0.3 x 0.18 x 0.18 x 0.18	0.04] = 0.04] = 0.04] = = = = = /[(1/U-value)	3.36 2.24 1.37 0.35 11.05 7.47 11.07	s given in	paragraph	1 3.2	(27b) (27b) (29) (29) (29) (30) (30) (30)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el * for windows and ** include the area	5.13 4 36.85 41.48 67.78 1.85 Ilements, m² roof windows, u is on both sides s, W/K = S (A	2.85 0 0 6.3 0 see effective wind of internal walls A x U)	ndow U-value	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated to	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x	0.04] = 0.04] = 0.04] = = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47 11.07	-		Γ	(27b) (27b) (29) (29) (29) (30) (30) (30) (31)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el * for windows and ** include the area Fabric heat los	e 2 e 3 5.13 4 36.85 41.48 67.78 1.85 Ilements, m² roof windows, u is on both sides is, W/K = S (// Cm = S(A x k))	2.85 0 0 6.3 0 see effective win of internal wall A x U)	ndow U-value	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated tons	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x	0.04] = 0.04] = 0.04] = = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47 11.07 0.33	?) + (32a).		46.23	(27b) (27b) (29) (29) (29) (30) (30) (31)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el * for windows and ** include the area Fabric heat los Heat capacity 0 Thermal mass For design assess	5.13 4 36.85 41.48 67.78 1.85 Ilements, m² roof windows, u is on both sides s, W/K = S (A x k parameter (Tements where the	2.85 0 6.3 0 see effective wind of internal walls A x U) (1) TMP = Cm ÷ e details of the	ndow U-value ls and partition	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated to ms	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x	0.04] = 0.04] = 0.04] = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47 11.07 0.33 1e)+0.04] a	?) + (32a). Medium	(32e) =	46.23	(27b) (27b) (29) (29) (29) (30) (30) (31) (33) (34)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el * for windows and ** include the area Fabric heat los Heat capacity 0 Thermal mass For design assess can be used instead	5.13 4 36.85 41.48 67.78 1.85 Ilements, m² roof windows, u is on both sides s, W/K = S (A x k) parameter (Timents where the ad of a detailed of a deta	2.85 0 0 6.3 0 see effective winder of internal walls A x U) C) TMP = Cm ÷ e details of the calculation.	ndow U-value s and partition	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated ones J/m²K are not know	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x	0.04] = 0.04] = 0.04] = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47 11.07 0.33 1e)+0.04] a	?) + (32a). Medium	(32e) =	46.23 0 250	(27b) (27b) (29) (29) (30) (30) (31) (33) (34) (35)
Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Roof Type3 Total area of el * for windows and ** include the area Fabric heat los Heat capacity 0 Thermal mass For design assess	e 2 e 3 5.13 4 36.85 41.48 67.78 1.85 Ilements, m² roof windows, u is on both sides s, W/K = S (A x k parameter (Toments where the ad of a detailed des : S (L x Y)	2.85 0 6.3 0 see effective wind of internal walls (A x U) (C) TMP = Cm ÷ e details of the calculation. calculated to the calculated	ndow U-value s and partition - TFA) in kacconstruction a	2.1 1.4 4.58 1.15 36.85 41.48 61.48 1.85 157.09 e calculated ones J/m²K are not know	x1/[1/(1.6) + x1/[1/(1.6) + x1/[1/(1.6) + x	0.04] = 0.04] = 0.04] = = = = = =	3.36 2.24 1.37 0.35 11.05 7.47 11.07 0.33 1e)+0.04] a	?) + (32a). Medium	(32e) =	46.23	(27b) (27b) (29) (29) (30) (30) (31) (33) (34) (35)

Total fabric hea	t loss							(33) +	(36) =		ſ	69.79	(37)
Ventilation heat		lculated	l monthly	V				, ,	$= 0.33 \times (3)$	25)m x (5)	l	09.79	(07)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 48.28	47.34	46.39	41.88	41.03	37.11	37.11	36.38	38.62	41.03	42.74	44.53		(38)
Heat transfer co	pefficien	t, W/K		l	l	l		(39)m	= (37) + (3	88)m			
	117.13	116.18	111.67	110.82	106.9	106.9	106.17	108.41	110.82	112.53	114.32		
Heat loss paran	neter (H	LP), W/	m²K						Average = = (39)m ÷		12 /12=	111.66	(39)
(40)m= 1.52	1.51	1.49	1.44	1.42	1.37	1.37	1.36	1.39	1.42	1.45	1.47		
Number of days	s in mon	th (Tabl	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	1.44	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
							•						
4. Water heati	ng ener	gy requi	rement:								kWh/ye	ear:	
A I												ı	
Assumed occup if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)1 + 0.0)013 x (1	ΓFA -13.		42		(42)
if TFA £ 13.9		•	[. 0,4	(0.000			/_/]			•,			
Annual average											.48		(43)
Reduce the annual not more that 125 li	_				_	_	to acnieve	a water us	se target o				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in					l .			Sep	Oct	INOV	Dec		
(44)m= 106.13	102.27	98.41	94.56	90.7	86.84	86.84	90.7	94.56	98.41	102.27	106.13		
` /							<u> </u>	_	Γotal = Su	m(44) ₁₁₂ =		1157.82	(44)
Energy content of h	not water ι	ısed - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 157.39	137.66	142.05	123.84	118.83	102.54	95.02	109.04	110.34	128.59	140.36	152.43		
					,				Γotal = Su	m(45) ₁₁₂ =		1518.08	(45)
If instantaneous wa		g at point		not water	r storage),	enter 0 in	boxes (46)) to (61)					
(46)m= 23.61 Water storage	20.65	21.31	18.58	17.82	15.38	14.25	16.36	16.55	19.29	21.05	22.86		(46)
Storage volume		includin	a anv so	olar or W	/WHRS	storage	within sa	me ves	sel		0		(47)
If community he	` ,					_					<u> </u>		()
Otherwise if no	_			•			` '	ers) ente	er '0' in (47)			
Water storage l	oss:												
a) If manufactu	ırer's de	clared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature fa	ctor fron	n Table	2b								0		(49)
Energy lost from		_	-				(48) x (49)	=			0		(50)
b) If manufactureHot water storage			-										(51)
If community he	_			C Z (KVV	11/11116/06	iy <i>)</i>					0		(51)
Volume factor for	•										0		(52)
Temperature fa	ctor fror	n Table	2b								0		(53)
Energy lost from	n water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (5	54) in (5	5)									0		(55)

Water Storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	n = (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	t loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	t loss cal	culated f	or each	month (59)m = ((58) ÷ 36	55 × (41)	m				•	
(modified by	/ factor fi	rom Tab	e H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month (61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 50.96	46.03	50.96	49.32	50.96	49.32	50.96	50.96	49.32	50.96	49.32	50.96		(61)
Total heat req	uired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 208.35	183.68	193.01	173.16	169.79	151.86	145.98	159.99	159.65	179.55	189.68	203.39		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additiona	I lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter										_	
(64)m= 208.35	183.68	193.01	173.16	169.79	151.86	145.98	159.99	159.65	179.55	189.68	203.39		
							Outp	out from wa	ater heate	r (annual) ₁	12	2118.08	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m= 65.07	57.28	59.97	53.51	52.25	46.42	44.33	48.99	49.02	55.5	59	63.42		(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga	oino (000						•		ato. 10 11	0	indinty i	loating	
	ains (see	Table 5	and 5a):					ator 10 11	0111 00111	manity in	leating	
Metabolic gair	·):									
- J	·			: May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	loamig	
Metabolic gair	ns (Table	5), Wat	ts		Jun 145.16	Jul 145.16			•	ı	ı		(66)
Metabolic gair	rs (Table Feb	5), Wat Mar 145.16	ts Apr 145.16	May 145.16	145.16	145.16	Aug 145.16	Sep 145.16	Oct	Nov	Dec		(66)
Metabolic gair Jan (66)m= 145.16	rs (Table Feb	5), Wat Mar 145.16	ts Apr 145.16	May 145.16	145.16	145.16	Aug 145.16	Sep 145.16	Oct	Nov	Dec		(66) (67)
Metabolic gair Jan (66)m= 145.16 Lighting gains	Feb 145.16 (calcula	• 5), Wat Mar 145.16 ted in Ap	Apr 145.16 opendix 28.02	May 145.16 _, equati 20.95	145.16 ion L9 o	145.16 r L9a), a 19.11	Aug 145.16 lso see	Sep 145.16 Table 5 33.34	Oct 145.16	Nov 145.16	Dec 145.16		` ,
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24	Feb 145.16 (calcula	• 5), Wat Mar 145.16 ted in Ap	Apr 145.16 opendix 28.02	May 145.16 _, equati 20.95	145.16 ion L9 o	145.16 r L9a), a 19.11	Aug 145.16 lso see	Sep 145.16 Table 5 33.34	Oct 145.16	Nov 145.16	Dec 145.16		` ,
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga	reb Feb 145.16 (calcula 45.51 dins (calcula 323.83	5), Wat Mar 145.16 ted in Ap 37.01 ulated in 315.45	Apr 145.16 ppendix 28.02 Append 297.61	May 145.16 L, equati 20.95 dix L, eq 275.09	145.16 ion L9 of 17.68 uation L 253.92	145.16 r L9a), a 19.11 13 or L1 239.78	Aug 145.16 lso see 24.84 3a), also 236.45	Sep 145.16 Table 5 33.34 see Ta 244.83	Oct 145.16 42.33 ble 5 262.67	Nov 145.16	Dec 145.16 52.67		(67)
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5	reb Feb 145.16 (calcula 45.51 dins (calcula 323.83	5), Wat Mar 145.16 ted in Ap 37.01 ulated in 315.45	Apr 145.16 ppendix 28.02 Append 297.61	May 145.16 L, equati 20.95 dix L, eq 275.09	145.16 ion L9 of 17.68 uation L 253.92	145.16 r L9a), a 19.11 13 or L1 239.78	Aug 145.16 lso see 24.84 3a), also 236.45	Sep 145.16 Table 5 33.34 see Ta 244.83	Oct 145.16 42.33 ble 5 262.67	Nov 145.16	Dec 145.16 52.67		(67)
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains	reb 145.16 (calcula 45.51 dins (calcula 323.83 s (calcula 51.94	5), Wat Mar 145.16 ted in Ap 37.01 ulated in 315.45 tted in Ap	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94	May 145.16 L, equati 20.95 dix L, eq 275.09 L, equat	145.16 ion L9 of 17.68 uation L 253.92 tion L15	145.16 r L9a), a 19.11 13 or L1 239.78 or L15a)	Aug 145.16 lso see 24.84 3a), also 236.45	Sep 145.16 Table 5 33.34 see Table	Oct 145.16 42.33 ble 5 262.67 5	Nov 145.16 49.4 285.2	Dec 145.16 52.67 306.36		(67) (68)
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94	reb 145.16 (calcula 45.51 dins (calcula 323.83 s (calcula 51.94	5), Wat Mar 145.16 ted in Ap 37.01 ulated in 315.45 tted in Ap	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94	May 145.16 L, equati 20.95 dix L, eq 275.09 L, equat	145.16 ion L9 of 17.68 uation L 253.92 tion L15	145.16 r L9a), a 19.11 13 or L1 239.78 or L15a)	Aug 145.16 Iso see 24.84 3a), also 236.45	Sep 145.16 Table 5 33.34 see Table	Oct 145.16 42.33 ble 5 262.67 5	Nov 145.16 49.4 285.2	Dec 145.16 52.67 306.36		(67) (68)
Metabolic gairs Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94 Pumps and fa (70)m= 3	reb (calcula 45.51 sins (calcula 323.83 s (calcula 51.94 ns gains 3	5), Wat Mar 145.16 ted in Ap 37.01 ulated in 315.45 ted in Ap 51.94 (Table 5	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94 5a)	May 145.16 L, equati 20.95 dix L, equ 275.09 L, equat 51.94	145.16 ion L9 of 17.68 uation L 253.92 tion L15 51.94	145.16 r L9a), a 19.11 13 or L1: 239.78 or L15a) 51.94	Aug 145.16 lso see 24.84 3a), also 236.45 , also se 51.94	Sep 145.16 Table 5 33.34 see Tal 244.83 ee Table 51.94	Oct 145.16 42.33 ble 5 262.67 5 51.94	Nov 145.16 49.4 285.2 51.94	Dec 145.16 52.67 306.36		(67) (68) (69)
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94 Pumps and fa	reb (calcula 45.51 sins (calcula 323.83 s (calcula 51.94 ns gains 3	5), Wat Mar 145.16 ted in Ap 37.01 ulated in 315.45 ted in Ap 51.94 (Table 5	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94 5a)	May 145.16 L, equati 20.95 dix L, equ 275.09 L, equat 51.94	145.16 ion L9 of 17.68 uation L 253.92 tion L15 51.94	145.16 r L9a), a 19.11 13 or L1: 239.78 or L15a) 51.94	Aug 145.16 lso see 24.84 3a), also 236.45 , also se 51.94	Sep 145.16 Table 5 33.34 see Tal 244.83 ee Table 51.94	Oct 145.16 42.33 ble 5 262.67 5 51.94	Nov 145.16 49.4 285.2 51.94	Dec 145.16 52.67 306.36		(67) (68) (69)
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94 Pumps and fa (70)m= 3 Losses e.g. ev	reb (calcula 45.51 sins (calcula 323.83 s (calcula 51.94 ns gains 3 reporatio -96.78	95), Wate Mar 145.16 ted in Ap 37.01 ulated in Ap 51.94 (Table 5 3 on (negative)	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94 oa) 3	May 145.16 L, equati 20.95 dix L, equati 275.09 L, equati 51.94 3 es) (Tab	145.16 ion L9 o 17.68 uation L 253.92 tion L15 51.94 3 ble 5)	145.16 r L9a), a 19.11 13 or L1 239.78 or L15a) 51.94	Aug 145.16 lso see 24.84 3a), also 236.45 , also se 51.94	Sep 145.16 Table 5 33.34 see Tal 244.83 ee Table 51.94	Oct 145.16 42.33 ble 5 262.67 5 51.94	Nov 145.16 49.4 285.2 51.94	Dec 145.16 52.67 306.36 51.94		(67) (68) (69) (70)
Metabolic gair Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -96.78	reb (calcula 45.51 sins (calcula 323.83 s (calcula 51.94 ns gains 3 reporatio -96.78	95), Wate Mar 145.16 ted in Ap 37.01 ulated in Ap 51.94 (Table 5 3 on (negative)	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94 oa) 3	May 145.16 L, equati 20.95 dix L, equati 275.09 L, equati 51.94 3 es) (Tab	145.16 ion L9 o 17.68 uation L 253.92 tion L15 51.94 3 ble 5)	145.16 r L9a), a 19.11 13 or L1 239.78 or L15a) 51.94	Aug 145.16 lso see 24.84 3a), also 236.45 , also se 51.94	Sep 145.16 Table 5 33.34 see Tal 244.83 ee Table 51.94	Oct 145.16 42.33 ble 5 262.67 5 51.94	Nov 145.16 49.4 285.2 51.94	Dec 145.16 52.67 306.36 51.94		(67) (68) (69) (70)
Metabolic gairs Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -96.78 Water heating (72)m= 87.46	reb (Calcula 45.51 sins (Calcula 323.83 s (Calcula 51.94 ns gains 796.78 gains (Table 85.23	145.16 ted in Ap 37.01 ulated in 315.45 tted in Ap 51.94 (Table 5 3 on (negat -96.78 Table 5) 80.61	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94 Ga) 3 cive valu -96.78	May 145.16 L, equati 20.95 dix L, equ 275.09 L, equat 51.94 3 es) (Tab	145.16 ion L9 o 17.68 uation L 253.92 tion L15 51.94 3 ble 5) -96.78	145.16 r L9a), a 19.11 13 or L1: 239.78 or L15a) 51.94	Aug 145.16 Iso see 24.84 3a), also 236.45 , also se 51.94 3	Sep 145.16 Table 5 33.34 see Tale 244.83 ee Table 51.94 3	Oct 145.16 42.33 ble 5 262.67 5 51.94 3 -96.78	Nov 145.16 49.4 285.2 51.94 3 -96.78	Dec 145.16 52.67 306.36 51.94 3		(67) (68) (69) (70) (71)
Metabolic gairs Jan (66)m= 145.16 Lighting gains (67)m= 51.24 Appliances ga (68)m= 320.5 Cooking gains (69)m= 51.94 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -96.78 Water heating	reb (Calcula 45.51 sins (Calcula 323.83 s (Calcula 51.94 ns gains 796.78 gains (Table 85.23	145.16 ted in Ap 37.01 ulated in 315.45 tted in Ap 51.94 (Table 5 3 on (negat -96.78 Table 5) 80.61	Apr 145.16 opendix 28.02 Append 297.61 opendix 51.94 Ga) 3 cive valu -96.78	May 145.16 L, equati 20.95 dix L, equ 275.09 L, equat 51.94 3 es) (Tab	145.16 ion L9 o 17.68 uation L 253.92 tion L15 51.94 3 ble 5) -96.78	145.16 r L9a), a 19.11 13 or L1 239.78 or L15a) 51.94 3 -96.78	Aug 145.16 Iso see 24.84 3a), also 236.45 , also se 51.94 3	Sep 145.16 Table 5 33.34 see Tale 244.83 ee Table 51.94 3	Oct 145.16 42.33 ble 5 262.67 5 51.94 3 -96.78	Nov 145.16 49.4 285.2 51.94 3 -96.78	Dec 145.16 52.67 306.36 51.94 3		(67) (68) (69) (70) (71)

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

Orientation: Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	2.85	x	11.28	x	0.76	x	0.7	=	11.86	(75)
Northeast 0.9x 0.77	x	0.55	x	11.28	x	0.76	x	0.7	=	2.29	(75)
Northeast 0.9x 0.77	x	2.85	x	22.97	x	0.76	x	0.7	=	24.13	(75)
Northeast 0.9x 0.77	x	0.55	x	22.97	x	0.76	x	0.7	=	4.66	(75)
Northeast 0.9x 0.77	x	2.85	x	41.38	X	0.76	X	0.7	=	43.48	(75)
Northeast 0.9x 0.77	x	0.55	x	41.38	x	0.76	x	0.7	=	8.39	(75)
Northeast 0.9x 0.77	x	2.85	x	67.96	x	0.76	x	0.7	=	71.4	(75)
Northeast _{0.9x} 0.77	x	0.55	x	67.96	x	0.76	x	0.7	=	13.78	(75)
Northeast _{0.9x} 0.77	x	2.85	x	91.35	x	0.76	x	0.7	=	95.98	(75)
Northeast _{0.9x} 0.77	x	0.55	x	91.35	x	0.76	x	0.7	=	18.52	(75)
Northeast _{0.9x} 0.77	x	2.85	x	97.38	X	0.76	X	0.7	=	102.32	(75)
Northeast _{0.9x} 0.77	x	0.55	x	97.38	x	0.76	X	0.7	=	19.75	(75)
Northeast _{0.9x} 0.77	x	2.85	x	91.1	X	0.76	X	0.7	=	95.72	(75)
Northeast _{0.9x} 0.77	x	0.55	x	91.1	X	0.76	X	0.7	=	18.47	(75)
Northeast _{0.9x} 0.77	x	2.85	x	72.63	x	0.76	x	0.7	=	76.31	(75)
Northeast _{0.9x} 0.77	x	0.55	x	72.63	x	0.76	x	0.7	=	14.73	(75)
Northeast _{0.9x} 0.77	x	2.85	x	50.42	x	0.76	X	0.7	=	52.98	(75)
Northeast 0.9x 0.77	x	0.55	x	50.42	x	0.76	x	0.7	=	10.22	(75)
Northeast _{0.9x} 0.77	x	2.85	x	28.07	x	0.76	x	0.7	=	29.49	(75)
Northeast _{0.9x} 0.77	x	0.55	x	28.07	x	0.76	x	0.7	=	5.69	(75)
Northeast 0.9x 0.77	x	2.85	x	14.2	x	0.76	x	0.7	=	14.92	(75)
Northeast _{0.9x} 0.77	x	0.55	x	14.2	x	0.76	x	0.7	=	2.88	(75)
Northeast _{0.9x} 0.77	X	2.85	x	9.21	X	0.76	X	0.7	=	9.68	(75)
Northeast _{0.9x} 0.77	x	0.55	x	9.21	x	0.76	X	0.7	=	1.87	(75)
Rooflights _{0.9x} 1	X	2.8	X	26	X	0.76	X	0.7	=	34.86	(82)
Rooflights _{0.9x} 1	X	2.1	x	26	X	0.76	X	0.7	=	26.14	(82)
Rooflights _{0.9x} 1	X	1.4	X	26	X	0.76	X	0.7	=	17.43	(82)
Rooflights 0.9x 1	x	2.8	x	54	x	0.76	X	0.7	=	72.39	(82)
Rooflights 0.9x 1	X	2.1	X	54	x	0.76	x	0.7	=	54.3	(82)
Rooflights 0.9x 1	x	1.4	x	54	x	0.76	X	0.7	=	36.2	(82)
Rooflights 0.9x 1	X	2.8	x	96	x	0.76	X	0.7] =	128.7	(82)
Rooflights 0.9x 1	X	2.1	X	96	x	0.76	x	0.7	=	96.53	(82)
Rooflights 0.9x 1	x	1.4	x	96	x	0.76	X	0.7	=	64.35	(82)
Rooflights 0.9x 1	X	2.8	x	150	x	0.76	x	0.7	=	201.1	(82)
Rooflights 0.9x 1	X	2.1	x	150	X	0.76	X	0.7	=	150.82	(82)
Rooflights 0.9x 1	x	1.4	x	150	x	0.76	x	0.7	=	100.55	(82)
Rooflights 0.9x 1	x	2.8	x	192	x	0.76	x	0.7	=	257.4	(82)
Rooflights 0.9x 1	x	2.1	x	192	x	0.76	x	0.7	=	193.05	(82)
Rooflights _{0.9x} 1	x	1.4	X	192	x	0.76	x	0.7	=	128.7	(82)

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Rooflights 0.9x	1	×	2.8		x [200	X	0.76	×	0.7	=	268.13	(82)
Rooflights 0.9x	1	X	2.1		x	200	X	0.76	X	0.7	=	201.1	(82)
Rooflights 0.9x	1	X	1.4		x [200	X	0.76	X	0.7	=	134.06	(82)
Rooflights 0.9x	1	X	2.8		x [189	X	0.76	X	0.7	=	253.38	(82)
Rooflights 0.9x	1	X	2.1		x [189	X	0.76	X	0.7	=	190.04	(82)
Rooflights 0.9x	1	X	1.4		x	189	X	0.76	X	0.7	=	126.69	(82)
Rooflights 0.9x	1	X	2.8		x [157	X	0.76	X	0.7	=	210.48	(82)
Rooflights 0.9x	1	X	2.1		x [157	X	0.76	X	0.7	=	157.86	(82)
Rooflights 0.9x	1	X	1.4		x	157	x	0.76	x	0.7	=	105.24	(82)
Rooflights 0.9x	1	x	2.8		x [115	x	0.76	x	0.7	=	154.17	(82)
Rooflights 0.9x	1	×	2.1		x [115	x	0.76	×	0.7	=	115.63	(82)
Rooflights 0.9x	1	x	1.4		x [115	x	0.76	×	0.7	=	77.09	(82)
Rooflights 0.9x	1	x	2.8		x į	66	x	0.76	×	0.7	=	88.48	(82)
Rooflights 0.9x	1	x	2.1		x [66	x	0.76	×	0.7	=	66.36	(82)
Rooflights 0.9x	1	x	1.4		x İ	66	x	0.76	×	0.7	=	44.24	(82)
Rooflights 0.9x	1	x	2.8		x į	33	x	0.76	×	0.7	_	44.24	(82)
Rooflights 0.9x	1	x	2.1		x İ	33	x	0.76	×	0.7	=	33.18	(82)
Rooflights 0.9x	1	x	1.4		x İ	33	x	0.76	×	0.7	=	22.12	(82)
Rooflights 0.9x	1	×	2.8		x İ	21	X	0.76	×	0.7	=	28.15	(82)
Rooflights 0.9x	1	×	2.1		x İ	21	X	0.76	×	0.7	=	21.12	(82)
Rooflights 0.9x	1	×	1.4		x [21	X	0.76	×	0.7	=	14.08	(82)
_							,						_
Solar gains in	watts calc	ulated	for each	month			(83)m	ı = Sum(74)m .	(82)m				
(83)m= 92.57		341.45		693.66	72	25.36 684.3	564		234.2	7 117.34	74.9		(83)
Total gains – ii	nternal and	d solar	(84)m =	(73)m -	F (8	33)m , watts				!		l	
(84)m= 655.1	749.58 8	377.84	1040.92	1163.24	11	64.76 1106.1	995	.08 859.66	717.1	637.2	622.49		(84)
7. Mean inter	nal temper	rature (heating s	season')					,			
Temperature			Ĭ			area from Tab	ole 9.	Th1 (°C)				21	(85)
Utilisation fac	•	•			_			(- /					`
Jan	Feb	Mar	Apr	May	Ò	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	 	0.97	0.9	0.76	_	0.56 0.42	0.4	_	0.95	0.99	0.99		(86)
Mean interna	l tomporati	uro in li	ving area	T1 (fc	المال	w stops 2 to 7	l 7 in T	abla ()a)					
(87)m= 19.5		20.05	20.52	20.83		0.97 20.99	20.		20.45	19.93	19.51		(87)
` '	ļļ_		-			!	<u> </u>	!		1			, ,
Temperature (88)m= 19.67	<u>_</u> _	ating pe	19.74	19.74	_	elling from 1 <i>a</i> 9.78 19.78	19.	` 	19.74	19.73	19.71		(88)
(88)111= 19.07	19.00	19.09	19.74	19.74	1	9.76 19.76	19.	19 19.77	19.74	19.73	19.71		(00)
Utilisation fac					_		r –					1	4
(89)m= 0.99	0.98	0.95	0.86	0.69	C	0.31	0.3	0.66	0.92	0.98	0.99		(89)
Mean interna	l temperat	ure in t	he rest o	f dwelli	ng	T2 (follow ste	ps 3	to 7 in Tabl	e 9c)				
(90)m= 18.35	18.55	18.9	19.38	19.64	1	9.77 19.78	19.	79 19.71	19.34	18.82	18.39		(90)
								f	LA = Liv	ving area ÷ (4) =	0.5	(91)
		,,				\					,		

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

Segins 18.92 19.12 19.47 18.94 20.23 20.36 20.38 20.38 20.29 19.89 18.37 18.95 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)	Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me [18,92] 19,12 19,47 19,94 20,23 20,30 20,38 20,39 20,29 19,89 19,87 18,95 (83) Societ heating requirement temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 0.99 0.98 0.98 0.96 0.87 0.72 0.51 0.36 0.42 0.7 0.92 0.98 0.99 0.99 (84) Useful gains, hmGm, W = (94)m x (84)m (84)m (84)m (85)me 84.70 (73), 36 35,12 0.98 0.84 17, 197.39 401.01 416.97 602.19 662.11 623.61 616.17 (95)me 84.702 733.96 353.12 0.98 0.84 17.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (86) Heat loss rate for mean internal temperature, Lm, W = (33)m x (33)m = (96)m (37)me 1726.6 166.64 156.08 31 223.37 95.24 816.94 404.18 422.86 671.16 1020.6 189.08 1895.86 (97) Space heating requirement for each month, kWh/month = 0.024 x (167)m = (95)m x (41)m (95)m x (41)m (95)m x (42)m (95)m x (43)m x (44)m														
18.50 18.5	18.92 19.12 19.47 19.94 20.23 20.36 20.38 20.28 19.89 19.87 18.95 (33)	(92)m= 18.92	19.12	19.47	19.94	20.23	20.36	20.38	20.38	20.29	19.89	19.37	18.95		(92)
September Sept	Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Apply adjustn	nent to tl	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 0.99 0.98 0.95 0.87 0.72 0.51 0.36 0.42 0.7 0.92 0.98 0.99 0.98 0.99 0.98 0.95 0.87 0.72 0.51 0.36 0.42 0.7 0.92 0.98 0.99 0.98 0.99 0.98 0.95 0.87 0.72 0.51 0.36 0.42 0.7 0.92 0.98 0.99 0.99	(93)m= 18.92	19.12	19.47	19.94	20.23	20.36	20.38	20.38	20.29	19.89	19.37	18.95		(93)
The utilisation Factor for Jania Surjing Table 9a. 1	the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Space hea	ting requ	uirement											
Jan	Jan				•		ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)ms	Utilisation factor for gains, hm: (94)ms												1		
(94)	(94) (94) (95) (98) (98) (98) (98) (93) (94) (94) (94) (18) (1		l		•	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hm/Gm W = (94)m x (84)m (95)m S47.02 733.36 335.12 905.98 834.71 597.39 401.01 416.97 602.19 662.11 623.61 616.17 (95)	Useful gains, hmGm, W = (94)m x (84)m (95)me			i i						1		I	I I		(0.4)
(95)me 647.02 733.36 835.12 905.98 834.71 597.39 401.01 416.97 602.19 662.11 623.61 616.17 (95) Monthly average external temperature from Table 8 (96)me 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) Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m – (96)m] (97)me 1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1685.88 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)me 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 0 273.41 544.86 795.86 Space heating requirement in kWh/m²/year 3861.53 (99) 9a. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system (6) (202) = 1 – (201) = 1 (204) Efficiency of main space heating groun main system y beating systems, % 0 (208) Efficiency of secondary/supplementary heating system, % 0 (208) Efficiency of secondary/supplementary heating system, % 0 (208) (211)m = {(96)m} x (204)} x 100 + (206)	(95) Sar, 202 733,36 835,12 905,98 834,71 597,39 401,01 416,97 602,19 662,11 623,61 616,17 (95) Monthly average external temperature from Table 8 (96) 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) Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m - (96)m] (97)m (1726.6 1665.64 150.683 1233,37 945,24 615.94 404.18 422.69 671.16 1029.6 1380.36 1665.88 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m 803.21 626.49 499,75 235.72 82.23 0 0 0 0 273,41 544.86 795.86 (99) Space heating requirement in kWh/m²/year Sum(98)3	` '					0.51	0.36	0.42	0.7	0.92	0.98	0.99		(94)
Monthly average external temperature from Table 8 (96)	Monthly average external temperature from Table 8 (96)m= 4.3			<u>`</u>	<u> </u>		507.00	404.04	140.07	000.40	000.44		040.47		(05)
(96)	96 me	` ′					l	401.01	416.97	602.19	662.11	623.61	616.17		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m = (1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1885.88 (97) (98)m = (1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1885.88 (97) (98)m = (1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1885.88 (97) (98)m = (1726.6 1665.64 1506.83 1233.37 945.24 82.23 0 0 0 0 273.41 544.86 795.86 (98) (99) (99) (99) (94)	Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m = (1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1685.88 (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x ((41)m (98)m = 803.21 626.49 499.75 235.72 82.23 0 0 0 0 273.41 544.86 795.86 Space heating requirement in kWh/m²/year Sum(98)s. v = 3861.53 (98) Space heating requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202 + (203)) = 1 (204 + (203)) = (204 + (203)) = (204 + (204)) =			· · · · · ·				40.0	10.4		40.0		4.0		(00)
1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1685.88 (97)	(97) (97)m= 1726.6 1665.64 1506.83 1233.37 945.24 615.94 404.18 422.69 671.16 1029.6 1380.36 1685.88 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (411)m Total per year (kWh/year) = Sum(95)s = 3861.53 (98) Space heating requirement in kWh/m²/year = 3861.53 (98) Space heating requirement in kWh/m²/year = 3861.53 (98) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system								l			7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	Space Heating requirement for each month, kWh/month = 0.024 × ((97)m - (95)m) x (41)m		1								Ī				(07)
Same 803.21 626.49 499.75 235.72 82.23 0 0 0 0 273.41 544.86 795.86	Space heating requirements Space heating from main systems Space heating from main systems Space heating from main systems Space heating from main systems Space heating from main systems Space heating from main systems Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating system Space heating from main system Space heating from main system Space heating from main system Space heating from main system Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating from from (calculated above) Space heating from from (calculated above) Space heating from from (calculated above) Space heating from from from from from from from from	` '					<u> </u>		<u> </u>			<u> </u>	1685.88		(97)
Space heating requirement in kWh/m²/year Sum(98)s 0 3861.53 (98)	Space heating requirement in kWh/m²/year Sum(88)ss 3861.53 (98)		` 							<u> </u>	- `	ŕ	l		
Space heating requirement in kWh/m²/year Space heating: Fraction of space heat from secondary/supplementary system C202 = 1 - (201) = 1 (202) Fraction of space heat from main system(s) C202 = 1 - (201) = 1 (202) Fraction of total heating from main system(s) C204 = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 C204 = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 93.3 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan	Space heating requirement in kWh/m²/year Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202) Fraction of total heating from main system(s) (202) = 1 - (201) = 1 (204) Fraction of total heating from main system (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 273.41 544.86 795.86 (211)m = [[(98)m x (204)]] × x 100 ÷ (206) (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	(98)m= 803.21	626.49	499.75	235.72	82.23	0	0				<u> </u>			–
Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202)	Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202)								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	3861.53	(98)
Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202)	Space heating: Country Space heat from secondary/supplementary system Country Space heat from main system Country Space heat from main system Country Space heat from main system Country Space heating from main system Country Space heating system Space heating system Space heating system Space heating system Space heating system Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating fuel (secondary), kWh/month Space heating fuel (secondar	Space heatin	g require	ement in	kWh/m²	/year								49.65	(99)
Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202)	Space heating: Country Space heat from secondary/supplementary system Country Space heat from main system Country Space heat from main system Country Space heat from main system Country Space heating from main system Country Space heating system Space heating system Space heating system Space heating system Space heating system Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating requirement (calculated above) Space heating fuel (secondary), kWh/month Space heating fuel (secondar	9a. Energy red	quiremer	nts – Indi	vidual h	eating sv	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from secondary/supplementary system	Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)]} x 100 ÷ (206) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		•					J		<i>'</i>					
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Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =	Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) = (202) × [1 - (203)] = 1 (204) = (202) × [1 - (203)] = 1 (204) = (202) × [1 - (203)] = 1 (204) = (202) × [1 - (203)] = 1 (204) = (204) = (202) × [1 - (203)] = 1 (204) = (204) = (202) × [1 - (203)] = 1 (204) = (Fraction of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)]} x 100 ÷ (206) Total (kWh/year) = Sum(211),x = 4138.83 (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 0 0 0 0 0	Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)]} x 100 ÷ (206) 860.89 671.48 535.64 252.65 88.14 0 0 0 0 293.04 583.99 853.02 Total (kWh/year) = Sum(211),xq, = 4138.83 (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 0 0 0 0 0	·			-	. ,			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 273.41 544.86 795.86 (211) m = {[(98)m x (204)] } x 100 ÷ (206) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)] } x 100 ÷ (206) Total (kWh/year) = Sum(211) ₁₈₀₁₂ 4138.83 (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 0 0 0 0 0 0			_	•										╡`
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	•	-				a avatam	. 0/							╡```
Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)] } x 100 ÷ (206)	Space heating requirement (calculated above) 803.21 626.49 499.75 235.72 82.23 0 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 860.89 671.48 535.64 252.65 88.14 0 0 0 0 293.04 583.99 853.02 Total (kWh/year) = Sum(211) _{1.4.9012} 4138.83 (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 0 0 0 Total (kWh/year) = Sum(215) _{1.4.9012} 0 (215) Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater (217)m = 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m												1		」 `
803.21 626.49 499.75 235.72 82.23 0 0 0 0 273.41 544.86 795.86 (211)m = {[(98)m x (204)] } x 100 ÷ (206)	803.21 626.49 499.75 235.72 82.23 0 0 0 0 273.41 544.86 795.86	L						Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
(211) m = {[[(98)m x (204)]]} x 100 ÷ (206)	(211) m = {[(98)m x (204)] } x 100 ÷ (206)			· `			·						ı -		
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Total (kWh/year) =Sum(211) _{1.5.1012} 4138.83 (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) _{1.5.1012} 0 (215) Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater (217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month	Total (kWh/year) =Sum(211) _{1_6,10_12} = 4138.83 (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 Total (kWh/year) =Sum(215) _{1_6,10_12} = 0 (215) Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater (217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	$(211)m = \{[(98)$)m x (20	4)] } x 1	00 ÷ (20	6)									(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) _{15,1012} 0 (215) Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater (217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month	Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(215) _{16,1012} 0 (215) Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater (217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	860.89	671.48	535.64	252.65	88.14	0	0							
= {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	= {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	4138.83	(211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space heatin	g fuel (s	econdary	y), kWh/	month							·		
Total (kWh/year) =Sum(215) _{15,1012} 0 (215) Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater	Total (kWh/year) =Sum(215) _{15,1012} = 0 (215) Water heating Output from water heater (calculated above) 208.35	$= \{[(98)m \times (20)]\}$)1)]}x1	00 ÷ (20	8)										
Water heating Output from water heater (calculated above) 208.35	Water heating Output from water heater (calculated above) 208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater	(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
Output from water heater (calculated above) 208.35	Output from water heater (calculated above) 208.35			-	-				Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(215)
208.35 183.68 193.01 173.16 169.79 151.86 145.98 159.99 159.65 179.55 189.68 203.39 Efficiency of water heater 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month	208.35	Water heating	3										'		_
Efficiency of water heater 80.2 (216) (217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month	Efficiency of water heater 80.2 (217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	Output from w	ater hea	ter (calcı	ulated al	oove)						_			
(217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month	(217)m= 88.02 87.79 87.24 85.73 83.24 80.2 80.2 80.2 80.2 86.01 87.46 88.04 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	208.35	183.68	193.01	173.16	169.79	151.86	145.98	159.99	159.65	179.55	189.68	203.39		
Fuel for water heating, kWh/month	Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$	Efficiency of w	ater hea	ter										80.2	(216)
o r	(219) m = (64) m x $100 \div (217)$ m	(217)m= 88.02	87.79	87.24	85.73	83.24	80.2	80.2	80.2	80.2	86.01	87.46	88.04		(217)
o r	(219) m = (64) m x $100 \div (217)$ m	Fuel for water	heating,	kWh/mc	nth							•			
	(219)m ≥ 236.72 209.22 221.24 201.98 203.98 189.35 182.02 199.49 199.07 208.76 216.89 231.01	i doi ioi watoi													
(219)m= 236.72 209.22 221.24 201.98 203.98 189.35 182.02 199.49 199.07 208.76 216.89 231.01		(219)m = (64)													
	Total = $Sum(219a)_{112}$ = 2499.72 (219)	(219)m = (64)				203.98	189.35	182.02	199.49		208.76	216.89	231.01		_

Annual totals		kWh/year	, ,	kWh/year	1	
Space heating fuel used, main system 1				4138.83]	
Water heating fuel used				2499.72		
Electricity for pumps, fans and electric kee	p-hot					
central heating pump:			30		(230c)	
boiler with a fan-assisted flue			45		(230e)	
Total electricity for the above, kWh/year		sum of (230a)(230g) =		75	(231)	
Electricity for lighting				361.98	(232)	
10a. Fuel costs - individual heating system	ms:					
	Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost £/year		
Space heating - main system 1	(211) x	3.48	x 0.01 =	144.03	(240)	
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)	
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)	
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	86.99	(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 (230 Energy for lighting	g) separately as applical (232)	· · · · <u>— · · — · — </u>	ding to T × 0.01 = [able 12a	(250)	
Additional standing charges (Table 12)			[120	(251)	
Appendix Q items: repeat lines (253) and (254) as needed		•		-	
	45)(247) + (250)(254) =			408.66	(255)	
11a. SAP rating - individual heating syste	ms					
Energy cost deflator (Table 12)			[0.42	(256)	
Energy cost factor (ECF)	255) x (256)] ÷ [(4) + 45.0] =			1.4	(257)	
SAP rating (Section 12)				80.5	(258)	
12a. CO2 emissions – Individual heating systems including micro-CHP						
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	r	
Space heating (main system 1)	(211) x	0.216	= [893.99	(261)	
Space heating (secondary)	(215) x	0.519	= [0	(263)	
Water heating	(219) x	0.216	=	539.94	(264)	
Space and water heating	(261) + (262) + (26	63) + (264) =	[1433.93	(265)	
Electricity for pumps, fans and electric kee	p-hot (231) x	0.519	= [38.93	(267)	
Electricity for lighting	(232) x	0.519	= [187.87	(268)	
Total CO2, kg/year		sum of (265)(271) =	[1660.72	(272)	
CO2 emissions per m²		(272) ÷ (4) =	[21.35	(273)	

El rating (section 14) (274)82 13a. Primary Energy **Primary** P. Energy **Energy** kWh/year factor kWh/year (211) x Space heating (main system 1) (261) 1.22 5049.38 (215) x Space heating (secondary) 3.07 0 (263)Energy for water heating (219) x 1.22 3049.66 (264) (261) + (262) + (263) + (264) =Space and water heating (265)8099.04 Electricity for pumps, fans and electric keep-hot (231) x (267)3.07 230.25 Electricity for lighting (232) x (268)0 1111.28 'Total Primary Energy sum of (265)...(271) =(272)9440.57 $(272) \div (4) =$ Primary energy kWh/m²/year (273)121.38

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 16 January 2017

Property Details: Flat 3

Dwelling type:FlatLocated in:EnglandRegion:East Pennines

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Medium

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):6 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient: 277.21 (P1)

Transmission heat loss coefficient: 69.8

Summer heat loss coefficient: 347 (P2)

Overhangs:

Overhangs:

Orientation:	Ratio:	Z_overhangs:
North East (Front DW)	0	1
North East (Front)	0	1
North West (Pro RLs)	0	1
South East (Pro RLs)	0	1
South West (Pro RL)	0	1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North East (Front DW)	1	0.9	1	0.9	(P8)
North East (Front)	1	0.9	1	0.9	(P8)
North West (Pro RLs)	1	1	1	1	(P8)
South East (Pro RLs)	1	1	1	1	(P8)
South West (Pro RL)	1	1	1	1	(P8)

Solar gains

Orientation		Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
North East (Front DW)	0.9 x	2.85	91.1	0.76	0.7	0.9	111.88
North East (Front)	0.9 x	0.55	91.1	0.76	0.7	0.9	21.59
	1 x	2.8	189	0.76	0.7	1	253.38
	1 x	2.1	189	0.76	0.7	1	190.04
	1 x	1.4	189	0.76	0.7	1	126.69
						Total	703.58 (P3/P4)

Internal gains:

	June	July	August
Internal gains	436.4	418.8	427.46
Total summer gains	1182.37	1122.38	1007.45 (P5)
Summer gain/loss ratio	3.41	3.23	2.9 (P6)
Mean summer external temperature (East Pennines)	14.6	16.6	16.4

SAP 2012 Overheating Assessment

Thermal mass temperature increment 0.25 0.25

Threshold temperature 18.26 20.08 19.55 (P7)

Likelihood of high internal temperature Not significant Not significant

Assessment of likelihood of high internal temperature: Not significant