

Energy Statement

For

Heath House London

produced for

Consero London





Multidisciplinary Consulting

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Project Revision Sheet

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1 Introduction

MLM were commissioned to undertake an energy assessment to support the Planning Application for the conversion of the Heath House property, London.

The development is refurbishment of the existing listed Grade II property into six apartments. The proposed development is located within the London Borough of Camden.

The Greater London Authority and the London Borough of Camden are the regional and local bodies that set the Planning Policy context, referencing to National Standards and Regulations.

The proposed development is required by the London Borough of Camden to make carbon emission reductions in accordance with the Camden Core Strategy Policy CS13.

The aim of this report is to assess feasible carbon emissions reductions through the implementation of efficient energy measures, the use of local district system or alternatively the use of an onsite Combine Heat and Power system, and finally the use of zero carbon technologies.

This report demonstrates how the site has followed the London Plan's Energy Hierarchy by reducing energy demand through passive design, energy efficiency measures, generating heat in a clean and efficient system and by using on-site renewable energy systems to further reduce the overall carbon emissions of the development.

The methodology followed in this report follows the guidance set out by the Camden council for developing energy strategies as detailed in the Core Strategy and Policies for Management of Development.

The energy consumption figures for the proposed development are based on SAP modeling data produced under Building Regulations Part L1B 2013 software compliant.

The proposed Sustainability Principles and engineering concepts will also incorporate the Requirements and Guidelines of the relevant British Standards, CIBSE Guides and DfE Building Bulletins.

2 Executive Summary

The proposed development will implement significant energy efficiency measures where feasible, a new heating and hot water service and new lighting system to achieve the required carbon emission reductions by the Local Authority and the London Plan.

The strategy detailed within this report follows the Greater London Authority's Energy Hierarchy and achieves a 45.71% improvement in CO₂ emissions over the baseline.

The carbon emissions baseline for the scheme has been identified at 64,756 kg CO₂/yr for space heating, domestic hot water, lighting and auxiliary (regulated emissions). To ensure Compliance with the Planning Requirements, the scheme needs to reduce its carbon emission by 29.602kgCO₂/yr.

The following strategy has been implemented site wide:

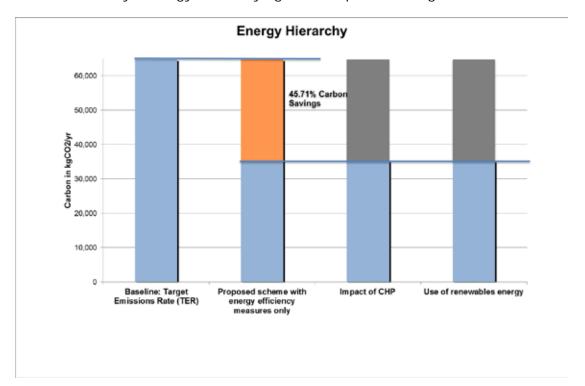
- 'Be Lean': Energy efficiency measures to improve the building fabric and services: high performance U-Values (0.17 for the basement floor, 0.15 for basement walls, 0.20 for the new walls, 0.15 for roofs, 0.20 for the exposed flor, 0.00 for partition walls and 1.5 for new windows (double glazed) in W/m²K).
- 'Be Clean': a CHP has not been deemed feasible for the scheme.
- 'Be Green': The proposed development is a Grade II listed property located within the conservation area of Hampstead, sub area 7 Whitestone Pond. All zero carbon technologies have been assessed within this report, and due to site constraints the use of zero carbon technologies has not been deemed feasible for the scheme.

The energy efficiency measures included within this report represent current best practice and the use of a low and zero carbon technology.

The conclusions of the assessment can be summarised by the following table:

	Carbon Dioxide Emissions (Tonnes/ Annum)	CO ₂ Emissions Reduction (%)	
Baseline	64.77	-	
Savings from Energy Demand Reduction	29.60	45.71%	
Savings from CHP	-	-	
Savings from Renewable Energy	-	-	
Total Target Savings	22.67	35%	

The following graph illustrates the carbon savings for each stage of the Greater London Authority's Energy Hierarchy against the previous stage.



3 Planning Requirement

This energy strategy has been designed to adhere to the national, Regional and Local Policies. The proposed development is located within the Greater London area and is therefore requested to implement the London Plan Energy Hierarchy from GLA Energy Team Guidance on Planning Energy Assessments, Version 1, 2011, with further alterations to the London Plan April 2015.

Baseline Model Section 5.1

The proposed development is a refurbishment; therefore, a baseline has been created using the SAP Appendix S data. The baseline then was taken from the created Dwelling Emission Rate (DER) worksheet of the SAP Models.

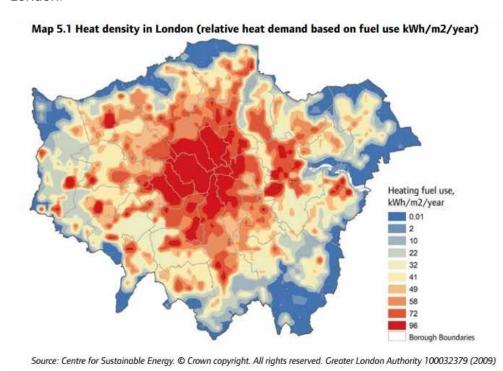
'Be Lean' Section 5.2:

Implementation of energy efficient ('Be Lean') measures specific to the scheme is encouraged at the earliest design stage of a development and aims to reduce the energy demand. Measures typically include passive design: both Architectural and building fabric measures, and active design: energy efficient services. It is possible to exceed Building Regulations Requirements (Part L 2013) through reduced energy demand ('Be Lean') measures alone.

'Be Clean' Section 5.5 and 5.6

Decentralised Energy Networks Section 5.5

The GLA require developers to prioritise connection to existing or planned decentralised energy networks where feasible. The London heat map below has been developed to help developers identify decentralised energy opportunities in London.



Decentralised Energy in Development Proposals Section 5.6

The use of the 'clean' energy supply refers to the energy efficiency of heating, cooling and power systems. Planning applications should demonstrate how the heating, cooling and power systems have been selected to minimise carbon emissions in accordance with the following hierarchy (Policy 5.6):

- A. The proposed development should evaluate the feasibility of the use of combined heat and power (CHP) systems. Where a new CHP system is appropriate, opportunities to extend the system beyond the site boundary to adjacent sites should be examined.
- B. Major developments should select energy systems in accordance with the following hierarchy:
 - a. Connection to existing heating or cooling networks
 - b. Site wide CHP network
 - c. Communal heating and cooling
- C. Potential opportunities to meet the first priority in this hierarchy are outlined in the above London heat map. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Cooling

Where design measures and the use of natural and/or mechanical ventilation will not guarantee occupant comfort, a cooling strategy should be specified.

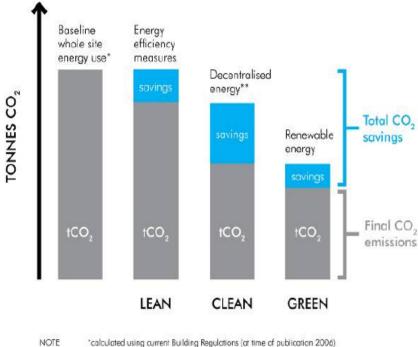
Where appropriate, the cooling strategy should investigate opportunities to improve efficiency through the use of locally available sources such as ground cooling, river/dock water cooling.

'Be Green' Section

The use of renewable energy in developments is encouraged at the 'Be Green' stage. Each renewable energy technology in Policy 5.7 of the London Plan are technically feasible in London and each should be considered in the Energy Statement.

All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets.

Figure 2 provides a graphical representation of the London Plan Energy Hierarchy.



NOTE

*calculated using current Building Regulations (at time of publication 2006)
plus the CO₂ emissions associated with other energy uses not covered by
Building Regulations.

** including district heating and cooling.

SOURCE

GLA, adapted from the London Climate Change Agency

DIAGRAM: GLA, The London Plan - consolidated with alterations since 2004 (2008) www.london.gov.uk/thelondonplan

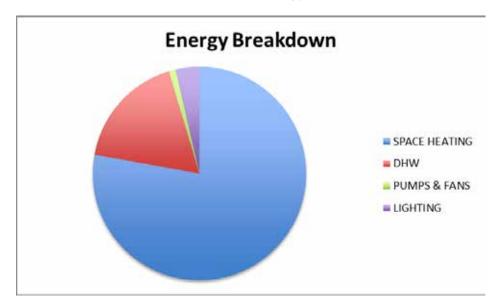
Figure 2 - Energy Hierarchy Diagram, London Plan Figure 2 - Energy hierarchy calculation of energy/carbon dioxide savings

4 Baseline Energy Consumption and CO₂ Emissions Figures

Energy modelling has been undertaken to allow the Design Team to explore the performance of the proposed development in terms of the likely energy usage and related carbon emissions. Through this analysis it is possible to identify how to reduce energy use, increase renewable energy capacity, were feasible, and supply energy efficiently. The modelling of the proposed scheme has been undertaken with compliant software to estimate the likely energy demands and carbon emissions of the proposed scheme.

Energy Use Associated CO ₂ Emissions (Tonnes CO ₂ /Annum) Heating 50.39 Hot Water 11.37 Auxiliary 0.66		Baseline (KgCO₂/m². Annum)
Heating	50.39	
Hot Water	11.37	(4.75
Auxiliary	0.66	64.75
Lighting	2.34	

The sample Output Documents and Energy Reports can be found in Appendix A.



5 'Be Lean' Stage – Reduction by Energy Efficiency Measures

Specific energy efficient measures have been identified, reviewed and appraised for the proposed scheme.

The measures outlined in this section result in an annual carbon emission saving of 45.71% which equate to 29,602 kgCO₂/yr saved over the baseline.

5.1 Proposed Measures

The following measures are applicable to the dwelling and allow the proposed development to comply with Building Regulation Part L1B 2013.

The energy efficiency measures include:

Passive

The development is predominantly of south/North facing orientation.

Enhanced Building Fabric U-Values

Enhancements of the building fabric will be used.

The table below demonstrates the limiting U-Value set by Approved Document Part L and the proposed U-Value for the development.

Elements	Building Regulations Part	Proposed U-Value
	L 1B 2013 minimum	(W/m ² K)
	U-Value (W/m²K)	Indicative build-up
External Walls New	0.28	0.20
Basement Wall	0.28	0.15
Basement Floor	0.25	0.17
Party Walls	0.50	0.00
Roof	0.18	0.15
Ground Floor	0.22	0.20
New Windows (Double Glazing)	1.60	1.50

Ventilation

The dwelling will be fitted with mechanical ventilation within the wet room; all other room will use natural ventilation (trickle vent).

Heating

Space heating is to be supplied from a communal gas fired boiler; each dwellings will be fitted with a hot water cylinder.

Cooling

Cooling will be provided for the proposed development. Each dwelling will be fitted with air conditioning unit with an EEr of no less than 3.5.

Domestic Hot Water

The domestic hot water will be provided by the main system.

Lighting

All lighting will be dedicated low energy fittings.

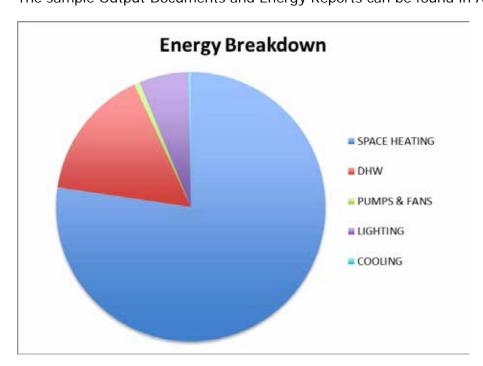
Lighting systems to a number of spaces may include LED technology where viable and subject to the performance of each product being able to deliver to the performance requirements of the space served.

5.2 'Be Lean' Energy Consumption and CO₂ Emission Figures

Based on the aforementioned 'Be Lean' measures, the calculation process has identified the following CO₂ emission figures:

Energy Use	Associated CO ₂ Emissions (Tonnes CO ₂ /Annum)	BER/DER (KgCO ₂ /m². Annum)
Heating	27.18	
Hot Water	5.55	
Auxiliary	0.24	35.15
Lighting	2.08	
Cooling	0.10	

The sample Output Documents and Energy Reports can be found in Appendix B.



6 'Be Clean' – Selection of Low Carbon Energy Supply Strategy

6.1 Connection to Existing Low Carbon Heating Infrastructure

The site is not located near an existing communal heating network.

6.2 Feasibility of CHP Scheme

It is not possible to incorporate a CHP (energy centre) into the scheme to meet the London Plan Hierarchy of providing 'clean' energy as the proposed development heat demand is not suitable for such technology.

Combined Heat and Power (CHP)

Combined heat and power generation (CHP) is an important technology for efficient fuel use and can use biomass or gas as the fuel source.

A gas-fired CHP is regarded as a low carbon technology, not a true renewable. Should the supply of fuel to the CHP be biomass then the system can be considered as a true renewable system.

CHP primarily offers carbon emission reductions by reducing the amount of electricity imported from the national grid – a 'carbon heavy' source of electricity.

The system produces electricity that can be used in the building or exported to the grid, and heat for space, water and even process heating. Systems must be heat led for high efficiency, which best suits applications to situations where there is a significant demand for heat for long periods of time (particularly through the summer period). This will also apply to residential developments, hospitals, hotels and leisure centres (swimming pools being ideal).

The split of heat to power and losses in both types of CHP systems are slightly different, but in principal each unit of gas supplied would generate approx 35% electricity, 50% heat and 15% in losses.

CHP units operate most efficiently when supplying the base load of the building. Given the nature of the building (predominantly domestic) the base load will be on the lower side and with peaks and troughs throughout the occupied period therefore the use of this technology has been deemed unsuitable for the site.

7 'Be Green' - Renewable Technologies

7.1 Green Technologies

Due to the site constraint it has been identified that none of the available renewable technology are deemed feasible for the site.

The energy strategy for the site instead focuses on maximising the efficiency of energy use.

Renewable technology options were investigated and discounted.

These alternative technologies included:

- Solar Thermal;
- Photovoltaic;
- Air Source Heat Pump;
- Wind Turbines:
- Biomass Boiler;
- · Ground Source Heat Pump.

The justification for discounting these technologies can be found in Appendix C.

8 Conclusion

This report has followed the London Plan 2011 Strategy and Philosophy and in doing so has identified measures to improve energy efficiency and mitigate CO₂ emissions of the proposed development.

The following table provides a summary of the improvements recognised by each step of the energy hierarchy approach:

	Carbon Dioxide Emissions (Tonnes/ Annum)	CO ₂ Emissions Reduction (%)
Baseline	64.77	-
Savings from energy demand reduction	29.60	45.71%
Savings from CHP	-	-
Savings from renewable energy	-	-
Total Target Savings	29.60	35%

This report has concluded that the proposed Heath House development incorporating the proposed enhanced building envelope and efficient building services systems is predicted to achieve a 45.71% improvement over the baseline via 'Be Lean' measures. Additionally the proposed scheme will comply with Building Regulations Part L1B 2013 and comply with the Greater London Authority and the London Borough of Camden's Planning requirements.

Appendix A - Step One - Baseline Output Document and Energy Report Figures

SAP Input

Property Details: Flat 6

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015 Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

Basement floor 103.39 m^2 3.1 m Floor 1 110.92 m^2 2.6 m

Living area: 50.2 m² (fraction 0.234)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
D1		Manufacturer	Solid			Wood
W1		Manufacturer	Windows	low-E, En = 0.2, hard coat	No	
W2		SAP 2012	Windows	Single-glazed	No	
W3		SAP 2012	Windows	Single-glazed	No	
W4		SAP 2012	Windows	Single-glazed	No	
RF1		Manufacturer	Roof Windows	low-F Fn = 0.2 hard coat	No	PVC-II

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
W1	16mm or more	0.7	0.65	1.5	1.43	2
W2		0.7	0.65	4.5	3.13	2
W3		0.7	0.85	4.5	2.5	1
W4		0.7	0.65	4.5	3.13	2
RF1	16mm or more	0.7	0.65	1.5	3.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D1		corridor		1	2.1
W1		Basement wall	North	0.95	1.5
W2		External wall	North	1.25	2.5
W3		External wall	West	1	2.5
W4		External wall	North	1.25	2.5
RF1		flat roof	Horizontal	4.5	0.8

Overshading: More than average

Opaque Flements

Type: External Element	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
Basement wall	64.17	2.86	61.31	0.25	0	False	N/A
External wall	62.4	15.02	47.38	0.45	0	False	N/A
corridor	33.67	2.1	31.57	0.25	0.9	False	N/A

Stroma FSAP 2012 Version: 1.0.1.24 (SAP 9.92) - http://www.stroma.com

SAP Input

 flat roof
 7.68
 3.6
 4.08
 0.25
 0
 N/A

 Basement floor
 103.39
 0.25
 N/A

 Internal Elements
 0.25
 N/A

Party Elements

party wall Basement 53.32 N/A party ff 39.78 N/A

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: No (Assumed)

Ventilation: Natural ventilation (extract fans)

Number of chimneys: 0
Number of open flues: 0
Number of fans: 3
Number of passive stacks: 0
Number of sides sheltered: 4
Pressure test: 15

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: SAP Tables

SAP Table: 115 Wall mounted

Systems with radiators

Design flow temperature: Unknown

Open

Boiler interlock: Yes

Main heating Control: No time or thermostatic control of room temperature

Control code: 2101

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 250 litres

Cylinder insulation: Factory 15 mm Primary pipework insulation: False

Cultinal protects. Follow

Cylinderstat: False

Cylinder in heated space: False

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 0%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No Photovoltaics: None

No

Assess Zero Carbon Home:

		Hear Bataile				
		User Details:				
Assessor Name:	Ctroma FCAD 2040	Stroma N		\/avaia	4 0 4 04	
Software Name:	Stroma FSAP 2012	roperty Address: Fla	Version:	versio	n: 1.0.1.24	
Address :	г	Toperty Address. Fi	at 0			
1. Overall dwelling dimer	nsions:					
5		Area(m²)	Av. Height(ı	n)	Volume(m³))
Basement		103.39 (1a)) x 3.1	(2a) =	320.51	(3a)
Ground floor		110.92 (1b)) x 2.6	(2b) =	288.39	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1ı	1) 214.31 (4)				
Dwelling volume		(3a	a)+(3b)+(3c)+(3d)+(3e)	+(3n) =	608.9	(5)
2. Ventilation rate:						
	main secondar heating heating	ry other	total		m³ per hour	r
Number of chimneys		+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent fan	us		3	x 10 =	30	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fire	es		0	x 40 =	0	(7c)
				Air ch	anges per ho	ur
	s, flues and fans = $(6a)+(6b)+(7a)$		30	÷ (5) =	0.05	(8)
Number of storeys in the	en carried out or is intended, procee e dwelling (ns)	d to (17), otherwise conti	nue from (9) to (16)		0	(9)
Additional infiltration	c awelling (113)			[(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame or	0.35 for masonry c		[(0) 1]x0.1 =	0	(11)
	esent, use the value corresponding to	•			0	
deducting areas of opening		4 (analad) alaa ant	a. 0			٦
•	oor, enter 0.2 (unsealed) or 0	.1 (sealed), else ent	er u		0	(12)
If no draught lobby, enter	and doors draught stripped				0	(13)
Window infiltration	and doors draught stripped	0.25 - [0.2 x (1	4) ÷ 1001 =		0	(14)
Infiltration rate			1) + (12) + (13) + (15) :	=	0	(15)
	q50, expressed in cubic metre				0	(17)
•	Ty value, then $(18) = [(17) \div 20] + (18)$		ino mono or enver	po area	0.8	(18)
·	if a pressurisation test has been do		ability is being used		0.0	(10)
Number of sides sheltered		ŭ ,	, 0		4	(19)
Shelter factor		(20) = 1 - [0.0]	75 x (19)] =		0.7	(20)
Infiltration rate incorporation	ng shelter factor	$(21) = (18) \times (21)$	20) =		0.56	(21)
Infiltration rate modified fo	r monthly wind speed			'	•	_
Jan Feb I	Mar Apr May Jun	Jul Aug	Sep Oct No	ov Dec		
	·					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.71	0.7	0.69	0.62	0.6	0.53	0.53	0.52	0.56	0.6	0.63	0.66]	
Calculate effe		•	rate for t	he appli	cable ca	ise	!	!	!	!		,	(co.).
If mechanica			andiv N (2	3h) - (23s	a) v Emy (4	aguation (N5)) othe	rwisa (23h	n) – (23a)			0	(23a)
If balanced with		0		, ,	,	. `	,, .	,) = (23a)			0	(23b)
a) If balance		•	•	_		,		,	2h)m + (23h) 🗴 [1 – (23c)	0 - 1001	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	coverv (ľ	л ИV) (24b)m = (22	2b)m + (1 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	ouse ex	tract ven	tilation o	or positiv	re input	ventilatio	on from o	outside				J	
,		(23b), t		•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r		on or whe			•				0.5]				
(24d)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(24d)
Effective air	change	rate - en	iter (24a) or (2 <mark>4</mark> b	o) or (24	c) or (24	ld) in box	(25)					
(25)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(25)
3. Heat losse	es and he	eat loss r	paramet	er:								_	
ELEMENT	Gros		Openin		Net Ar	-03	Haral		A >< 1.1		ر برامید با	_	ΑΧk
					14007	Ca	U-valı	ue	A X U		k-value	-	/ \ / \ \ \
	area	(m²)	m	-	A ,r		W/m2		(W/I		kJ/m ² ·		kJ/K
Doors		(m²)		-		m² x	W/m2	= =					
Windows Type	e 1	(m²)		-	A ,r	m ² x	W/m2	= =	(W/I				kJ/K
Windows Type	e 1 e 2	(m²)		-	A ,r	m ² x	W/m2	0.04] =	4.2				kJ/K (26)
Windows Type	e 1 e 2	(m²)		-	A ,r	m ² x x1 x1	W/m2 2 /[1/(1.5)+	0.04] = 0.04] =	4.2 2.02				kJ/K (26) (27)
Windows Type	e 1 e 2 e 3	(m²)		-	A ,r 2.1 1.43 3.13	x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	4.2 2.02 11.94				kJ/K (26) (27) (27)
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Windows Type Windows Type Windows Type Windows Type	e 1 e 2 e 3	(m²)		-	A ,r 2.1 1.43 3.13 2.5 3.13	x1 x1 x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 2.02 11.94 9.53 11.94	k)			kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Rooflights	e 1 e 2 e 3			, Ž	A ,r 2.1 1.43 3.13 2.5 3.13 3.6	x1 x1 x1 x1 9 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 2.02 11.94 9.53 11.94 5.4	k)			kJ/K (26) (27) (27) (27) (27) (27b)
Windows Type Windows Type Windows Type Windows Type Rooflights	e 1 e 2 e 3 e 4	17	m	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 y1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/l 4.2 2.02 11.94 9.53 11.94 5.4 25.8475	k)			(26) (27) (27) (27) (27) (27b) (28)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	e 1 e 2 e 3 e 4	17 4	2.86	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 y2 x x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.25 0.25	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	9.53 11.94 9.53 11.94 5.4 25.8475	k)			(26) (27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	e 1 e 2 e 3 e 4	17 4 37	2.86 15.00	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.25 0.45	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/l 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32	k)			kJ/K (26) (27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3	64. 62. 33.6 7.6	17 4 37 8	2.86 15.00 2.1	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.5	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44	k)			(26) (27) (27) (27) (27) (27b) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof	64. 62. 33.6 7.6	17 4 37 8	2.86 15.00 2.1	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.57 4.08	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44	k)			(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	64. 62. 33.6 7.6	17 4 37 8	2.86 15.00 2.1	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 47.38 271.3	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.25 0.25	0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	k)			(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall	64.7 62. 33.6 7.6 elements	17 4 37 8 8 4, m ²	2.86 15.0 2.1 3.6	indow U-ve	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 47.38 4.08 271.3 53.32 39.78 alue calculus	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.25 0.25 0.00 0	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = 0.04	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K)	kJ/m²-	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and	64.7 62. 33.6 7.6 81 roof wind as on both	4 37 8 8, m ² ows, use e	2.86 15.0 2.1 3.6 ffective with ternal wall	indow U-ve	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 47.38 4.08 271.3 53.32 39.78 alue calculus	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.25 0.25 0.00 0	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K)	kJ/m²-	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and ** include the area	64.76 62. 33.6 7.6 8 roof wind as on both	00000000000000000000000000000000000000	2.86 15.0 2.1 3.6 ffective with ternal wall	indow U-ve	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 47.38 4.08 271.3 53.32 39.78 alue calculus	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45 0.25 0.25 0.9 formula 1	0.04] = 0.04]	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K)	kJ/m²•	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall *for windows and ** include the area Fabric heat los	64.76 62. 33.6 7.6 8 elements	0ws, use e sides of in = S (A x k)	2.86 15.0; 2.1 3.6 ffective winternal wall	indow U-vals and pan	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.5 4.08 271.3 53.32 39.78 alue calculatitions	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45 0.25 0.25 0.9 formula 1	0.04] = 0.04]	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K) 5 [] as given in	kJ/m²•	n 3.2	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32) (32)

can be used inste	ad of a de	tailed calc	ulation										
Thermal bridge				usina Ap	pendix l	<						40.7	(36)
if details of therma	,	•			•							10.7	(,
Total fabric he	at loss							(33) +	(36) =			181.28	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 151.59	149.61	147.66	138.52	136.81	128.85	128.85	127.38	131.92	136.81	140.27	143.89		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 332.87	330.88	328.94	319.8	318.09	310.13	310.13	308.65	313.19	318.09	321.55	325.17		
Heat loss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷		12 /12=	319.79	(39)
(40)m= 1.55	1.54	1.53	1.49	1.48	1.45	1.45	1.44	1.46	1.48	1.5	1.52		
Number of day	/s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.49	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					•		•	•					
4. Water heat	ting enei	gy requi	rement:								kWh/ye	ear:	
Assumed occu											.02		(42)
if TFA > 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
if TFA £ 13.9 Annual average		ater usac	ae in litre	es per da	v Vd.av	erage =	(25 x N)	+ 36		10	5.94		(43)
Redu <mark>ce the</mark> annua	al average	hot water	usage by	5% if the a	welling is	designed i			se target o	f	0.01		(10)
not more that 125											1		
Jan Hot water usage is	Feb	Mar day for e	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	112.29	108.06	103.82	99.58	95.34	95.34	99.58	103.82	108.06	112.29	116.53		
(44)m= 116.53	112.29	100.00	103.02	99.56	95.54	95.54	99.56	<u> </u>	Total = Su		110.55	1271.25	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			. ,	c, 1d)	1271.25	(/
(45)m= 172.81	151.14	155.97	135.98	130.47	112.59	104.33	119.72	121.15	141.19	154.12	167.36		
						l .			Total = Su	m(45) ₁₁₂ =	=	1666.81	(45)
If instantaneous w	ater heatii		of use (no		storage),	enter 0 in	boxes (46) to (61)				•	
(46)m= 25.92 Water storage	22.67	23.39	20.4	19.57	16.89	15.65	17.96	18.17	21.18	23.12	25.1		(46)
Storage volum		includin	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		250		(47)
If community h	, ,					•							()
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)) =		2	50		(50)
Hot water stor			-							0.	.03		(51)
If community h	•			`									` '
Volume factor			0.1							-	78		(52)
Temperature f	actor fro	m Table	2b							0.	78		(53)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	5.18	(54)
Enter (50) or (54) in (55) Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	5.18	(55)
		455 40 400 00	(56)
(56)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷		155.49 160.68	(56) lix H
(57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68		155.49 160.68	(57)
Drimary circuit loss (annual) from Table 2	<u> </u>	0	(58)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 3	365 × (41)m	Ŭ	(00)
(modified by factor from Table H5 if there is solar water hea	` '	stat)	
(59)m= 128.38 115.95 128.38 124.24 128.38 41.92 43.31	43.31 41.92 128.38	124.24 128.38	(59)
Combi loss calculated for each month (61)m = (60) \div 365 x (4	1)m		
(61)m= 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mont	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 461.87 412.22 445.02 415.7 419.52 310 308.32	2 323.71 318.56 430.24	433.84 456.41	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant	ity) (enter '0' if no solar contribut	ion to water heating)	•
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater			
(64)m= 461.87 412.22 445.02 415.7 419.52 310 308.32	323.71 318.56 430.24	433.84 456.41	
	Output from water heate	(annual) ₁₁₂	4735.41 (64)
Heat gains from water heating, kWh/month 0.25 [0.85 x (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m]
(65)m= 160.16 143.02 154.56 144.6 146.08 70.97 69.34	74.46 73.81 149.65	150.63 158.35	(65)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is fr	om community h	eating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts			
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	
(66)m= 181.23 181.23 181.23 181.23 181.23 181.23 181.23 181.23	181.23 181.23 181.23	181.23 181.23	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	•	•
(67)m= 190.9 169.56 137.89 104.39 78.04 65.88 71.19	92.53 124.2 157.7	184.05 196.21	(67)
Appliances gains (calculated in Appendix L, equation L13 or L			
	13a), also see Table 5	-	
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27		510.59 548.49	(68)
	423.32 438.33 470.27	510.59 548.49	(68)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27	423.32 438.33 470.27	510.59 548.49 56.14 56.14	(68) (69)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15	423.32 438.33 470.27 a), also see Table 5	<u> </u>	
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14 56.14 56.14 56.14 56.14 56.14 56.14 56.14	423.32 438.33 470.27 a), also see Table 5	<u> </u>	
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14	423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14	56.14 56.14	(69)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14 56.14 56.14 56.14 56.14 56.14 56.14 Pumps and fans gains (Table 5a)	423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0	56.14 56.14	(69)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14	423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0	56.14 56.14	(69)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14	423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0	56.14 56.14	(69)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14	423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0 2 -120.82 -120.82 -120.82	56.14 56.14 0 0 -120.82 -120.82 209.21 212.83	(69) (70) (71)
(68)m= 573.81 579.76 564.76 532.81 492.49 454.59 429.27 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 56.14	423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0 2 -120.82 -120.82 -120.82 100.08 102.52 201.14 m + (68)m + (69)m + (70)m + (7	56.14 56.14 0 0 -120.82 -120.82 209.21 212.83	(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	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.	9x 0.3	X	1.43	x	10.63	x	0.65	x	0.7	=	3.74	(74)
North 0	9x 1	X	3.13	x	10.63	x	0.65	x	0.7] =	27.26	(74)
North 0.	9x 1	X	3.13	х	10.63	x	0.65	x	0.7	=	27.26	(74)
North 0.	9x 0.3	X	1.43	х	20.32	x	0.65	x	0.7	=	7.14	(74)
North 0	9x 1	X	3.13	x	20.32	x	0.65	x	0.7	=	52.09	(74)
North 0.	9x 1	X	3.13	x	20.32	x	0.65	x	0.7	=	52.09	(74)
North 0.	9x 0.3	X	1.43	x	34.53	x	0.65	x	0.7	=	12.13	(74)
North 0.	9x 1	X	3.13	x	34.53	X	0.65	x	0.7	=	88.52	(74)
North 0.	9x 1	X	3.13	x	34.53	x	0.65	x	0.7	=	88.52	(74)
North 0.	9x 0.3	X	1.43	x	55.46	x	0.65	x	0.7	=	19.49	(74)
North 0.	9x 1	X	3.13	x	55.46	X	0.65	x	0.7	=	142.18	(74)
North 0.	9x 1	X	3.13	x	55.46	x	0.65	x	0.7	=	142.18	(74)
North 0.	9x 0.3	X	1.43	x	74.72	X	0.65	x	0.7	=	26.25	(74)
North 0.	9x 1	X	3.13	x	74.72	X	0.65	x	0.7	=	191.53	(74)
North 0.	9x 1	X	3.13	x	74.72	x	0.65	x	0.7	=	191.53	(74)
North 0.	9x 0.3	X	1.43	X	79.99	Х	0.65	X	0.7	=	28.1	(74)
North 0	9x 1	X	3.13	х	79.99	х	0.65	x	0.7	=	205.04	(74)
North 0.	9x 1	X	3.13	х	79.99	x	0.65	x	0.7	=	205.04	(74)
North 0.	9x 0.3	X	1.43	X	74.68	x	0.65	x	0.7	=	26.24	(74)
North 0.	9x 1	X	3.13	x	74.68	Х	0.65	x	0.7	=	191.43	(74)
North 0.	9x 1	X	3.13	x	74.68	х	0.65	x	0.7	=	191.43	(74)
North 0.	9x 0.3	X	1.43	х	59.25	X	0.65	x	0.7	=	20.82	(74)
North 0	9x 1	X	3.13	X	59.25	x	0.65	X	0.7	=	151.88	(74)
North 0.	9x 1	X	3.13	x	59.25	x	0.65	x	0.7	=	151.88	(74)
North 0.	9x 0.3	X	1.43	X	41.52	x	0.65	X	0.7	=	14.59	(74)
North 0.	9x 1	X	3.13	x	41.52	x	0.65	x	0.7	=	106.43	(74)
North 0.	9x 1	X	3.13	x	41.52	x	0.65	x	0.7	=	106.43	(74)
North 0.	9x 0.3	X	1.43	x	24.19	X	0.65	x	0.7] =	8.5	(74)
North 0.	9x 1	X	3.13	X	24.19	X	0.65	X	0.7] =	62.01	(74)
North 0.	9x 1	X	3.13	X	24.19	x	0.65	X	0.7	=	62.01	(74)
North 0.	9x 0.3	X	1.43	X	13.12	x	0.65	x	0.7	=	4.61	(74)
North 0.	9x 1	X	3.13	x	13.12	X	0.65	x	0.7	=	33.63	(74)
North 0	9x 1	X	3.13	x	13.12	X	0.65	X	0.7	=	33.63	(74)
North 0	9x 0.3	X	1.43	x	8.86	X	0.65	X	0.7	=	3.11	(74)
North 0	9x 1	X	3.13	x	8.86	X	0.65	X	0.7	=	22.72	(74)
North 0.	9x 1	X	3.13	x	8.86	x	0.65	x	0.7	=	22.72	(74)
West 0	9x 0.54	X	2.5	x	19.64	x	0.85	x	0.7] =	14.2	(80)
West 0	9x 0.54	X	2.5	x	38.42	x	0.85	x	0.7] =	27.78	(80)
West 0	9x 0.54	X	2.5	X	63.27	×	0.85	X	0.7	=	45.74	(80)

		_				,		_				_
West 0.9x	0.54	×	2.5	X	92.28	X	0.85	X	0.7	=	66.71	(80)
West 0.9x	0.54	X	2.5	X	113.09	X	0.85	X	0.7	=	81.76	(80)
West 0.9x	0.54	X	2.5	X	115.77	X	0.85	X	0.7	=	83.69	(80)
West 0.9x	0.54	X	2.5	X	110.22	X	0.85	X	0.7	=	79.68	(80)
West 0.9x	0.54	X	2.5	X	94.68	x	0.85	X	0.7	=	68.44	(80)
West 0.9x	0.54	X	2.5	X	73.59	x	0.85	X	0.7	=	53.2	(80)
West 0.9x	0.54	X	2.5	X	45.59	X	0.85	X	0.7	=	32.96	(80)
West 0.9x	0.54	x	2.5	X	24.49	x	0.85	x	0.7	=	17.7	(80)
West 0.9x	0.54	X	2.5	x	16.15	x	0.85	X	0.7	=	11.68	(80)
Rooflights 0.9x	1	X	3.6	x	26	x	0.65	X	0.7	=	38.33	(82)
Rooflights 0.9x	1	X	3.6	X	54	х	0.65	X	0.7	=	79.61	(82)
Rooflights 0.9x	1	x	3.6	x	96	x	0.65	X	0.7	=	141.52	(82)
Rooflights 0.9x	1	x	3.6	x	150	x	0.65	x	0.7	=	221.13	(82)
Rooflights 0.9x	1	x	3.6	x	192	x	0.65	X	0.7	=	283.05	(82)
Rooflights 0.9x	1	x	3.6	x	200	x	0.65	X	0.7	=	294.84	(82)
Rooflights 0.9x	1	x	3.6	x	189	x	0.65	x	0.7	=	278.62	(82)
Rooflights 0.9x	1	X	3.6	x	157	x	0.65	x	0.7	<u> </u>	231.45	(82)
Rooflights 0.9x	1	x	3.6	X	115	Х	0.65	Х	0.7		169.53	(82)
Rooflights 0.9x	1	X	3.6	x	66	х	0.65	x	0.7	_	97.3	(82)
Rooflights 0.9x	1	×	3.6	х	33	x	0.65	x	0.7	<u> </u>	48.65	(82)
Rooflights _{0.9x}	1	X	3.6	x	21	x	0.65	х	0.7	=	30.96	(82)
												_
Solar gains in	watts, calcu	ılated	for each mon	th		(83)m	n = Sum(74)m.	(82)m				
(83)m= 110.78	218.71 37	6.43	591 .69 774.1	2 8	16.72 767,4	624	.46 450.17	262.7	138.21	91.2		(83)
Total gains –	internal and	solar	(84)m = (73) r	n + (83)m , watts							
(84)m= 1207.32	1297.4 14	03.38	1546.29 1657.5	55 1	552.31 1477.62	1356	5.94 1231.77	1208.4	3 1158.63	1165.28		(84)
7. Mean inte	rnal tempera	ature ((heating seaso	on)								
Temperature	during heat	ing p	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation fa	ctor for gains	s for l	iving area, h1,	m (s	ee Table 9a)							
Jan	Feb I	Mar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 0	.99	0.99 0.96		0.89 0.77	0.8	33 0.96	0.99	1	1		(86)
Mean interna	al temperatu	re in I	iving area T1	(follo	w steps 3 to 7	7 in T	able 9c)					
(87)m= 19.22	19.35	9.62	20.03 20.43	1	20.75 20.91	20.	88 20.59	20.13	19.63	19.23		(87)
Temperature	during heat	ina p	eriods in rest	of dv	elling from Ta	able 9). Th2 (°C)		•		'	
(88)m= 20.22	 	0.23	20.25 20.26	$\overline{}$	20.28 20.28	20.		20.26	20.25	20.24		(88)
Litilization for	eter for gains	for r	est of dwelling	<u> </u>	m (soo Tablo	02/						
(89)m= 1	 	.99	0.98 0.94		0.85 0.69	0.7	75 0.94	0.99	1	1		(89)
	 	!	<u> </u>	!					1 .			` '
	 	re in t	the rest of dwe	Ť	12 (follow ste 20.1 20.23	20.		e 9c) 19.48	18.98	18.58		(90)
(90)m= 18.55	10.06	ა.ჟა	19.30 19.78	<u> </u>	20.1 20.23				ing area ÷ (4	L	0.22	(90)
								_, ,,	ig aroa - (•	., –	0.23	(31)
Moan interna	d tomporatu	ra (fa	r the whole dw	االمر	α) = fl Λ \sim T1	1 1	_ fl Λ\ ∨ T2					

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

Apply adjustment to the mean internal temperature from Table 4e, where appropriate (30)me 19.31 19.44 19.71 20.13 20.53 20.85 20.99 20.96 20.7 20.23 19.74 19.33 (93) S. Space heating: Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the fullisation factor for gains. suring Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 1 1 0.99 0.98 0.95 0.89 0.77 0.82 0.95 0.99 1 1 (94) Useful gains, hmGm, W e/94/m x (84)m (95)me 1204.1 1292.38 1393.19 1518.19 1574.08 1374.62 1142.08 1116.84 1159.33 1192.44 1153.7 1162.68 (95) Monthly average external temperature from Table 8 (96)me 1204.1 1292.38 1393.19 1518.19 1574.08 1374.62 1142.08 1116.84 1159.33 1192.44 1153.7 1162.68 (95) Monthly average external temperature, Lm , W = ((39)m x ((39)m - (96)m) (96)m (97)m (98)m (98)m (98)m (99)m (196)m (196)m	` '													
Same 19.31 19.44 19.71 20.13 20.53 20.95 20.96 20.77 20.23 19.74 19.33 (83)		18.84	19.11	19.53	19.93	20.25	20.39	20.36	20.1	19.63	19.14	18.73		(92)
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, sun; gains, lam; which utilisation factor for gains, hms. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Apply adjust	ment to the	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
Set Till to to the mean internal temperature obtained Set Till Set Set Till Set Se	(93)m= 19.31	19.44	19.71	20.13	20.53	20.85	20.99	20.96	20.7	20.23	19.74	19.33		(93)
the utilisation factor for gains using Table 9a Mar	8. Space hea	ating requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Set Ti to the	mean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Unit Column Col	the utilisation	n factor fo	or gains u	using Ta	ble 9a									
(94)m			LI		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m (95)m = 1204.1 1 292.38 1393.39 1818.19 1574.69 1374.62 1142.08 1116.84 1168.93 1192.44 1153.7 1162.68 (96) Monthly average external temperature from Table 8 (96)m 43 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, Lrn , W = ((39)m x ((33)m - (96)m) (97)m 4995.91 4810.89 4345.11 3592.94 2808.81 1938.16 1360.48 1408.74 2066.6 3064.11 4063.11 4919.96 (97) Space heating requirement for each month, kWh/month = 0.024 x ((37)m - (95)m) x ((41)m) (75)m (41)m (75)m (201)m (20		ctor for ga	ains, hm			ı								
(96)m=						0.89	0.77	0.82	0.95	0.99	1	1		(94)
Monthly average external temperature from Table 8 (96)ms				<u> </u>		1						-		(0.7)
(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 Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m) (97)me 4995.91 4810.89 4345.11 3592.94 2093.1 1938.16 1380.46 1408.74 2066.8 3064.11 4063.11 4919.96 Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x ((41)m (98)m = 2821.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 0 1392.52 2094.78 2795.41 Total per year (kWh/year) = Sum((98)s	` '						1142.08	1116.84	1169.93	1192.44	1153.7	1162.68		(95)
Heat loss rate for mean intermal temperature, Lm., W = (39)m x (93)m (96)m (97)m (495.91 4810.89 4345.11 582.94 2809.81 1988.16 1360.46 1408.74 266.6 3664.11 4063.11 4919.96 (97)		1 	1											
(97)									<u> </u>		7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m Total per year (kWh/year) = Sum(98).ssz = 16077.22 (98)		1 1							<u> </u>					
Space heating requirement in kWh/m²/year Space heating Space heat from secondary/supplementary system Space heating	` '											4919.96		(97)
Total per year (kWh/year) = Sum(98)s: = 16077.22 (98)														
Space heating requirement in kWh/m²/year 75.02 (99)	(98)m= 2821.1	2364.44	2196.23	1493.82	918.93	0	0	0	0	1392.52	2094.78	2795.41		_
Salar Sala								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	16077.22	(98)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Space heatir	ng require	ement in	kWh/m²	/year								75.02	(99)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	9a. Energy re	guiremen	its – Indi	vidual h	eating s	vstems i	ncluding	micro-C	CHP)	_				
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) Ze21.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 1392.52 2094.78 2795.41 (211)m = {{(98)m x (204)}} } x 100 ÷ (206) Total (kWh/year) = Sum(211), 1.518y = 26356.1 (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														
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) 2821.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 1392.52 2094.78 2795.41 (211)m = {{(98)m x (204)}} } x 100 ÷ (206) Total (kWh/year) = Sum(211) _{1.8.90-17} = 26356.1 (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	•	_	t from se	econdar	y/supple	mentary	system					_ [0	(201)
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) 2821.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 1392.52 2094.78 2795.41 (211)m = {{(98)m x (204)}} } x 100 ÷ (206) Total (kWh/year) = Sum(211) _{1.8.90-17} = 26356.1 (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	Fraction of s	pace hea	t from m	ain svst	em(s)			(202) = 1 -	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec										(203)] =		l		╡ `
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) 2821.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 1392.52 2094.78 2795.41 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 4624.76 3876.13 3600.37 2448.88 1506.44 0 0 0 0 0 2282.81 3434.06 4582.64 Total (kWh/year) =Sum(211) _{1.840.12} 2 26356.1 (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 Total (kWh/year) =Sum(215) _{1.840.12} 0 (215) Water heating Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m = 59.36 59.27 59.05 58.5 57.47 51 51 51 51 51 58.3 59.01 59.37 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81			7					(- / ((- 7,1		l	'	(=0.)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				ng syste	em i									الرومور)
Space heating requirement (calculated above) 2821.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 1392.52 2094.78 2795.41 (211)m = {[[(98)m x (204)]]} x 100 ÷ (206) 4624.76 3876.13 3600.37 2448.88 1506.44 0 0 0 0 2282.81 3434.06 4582.64 Total (kWh/year) = Sum(211) _{1.8.10-12} 26356.1 (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 Total (kWh/year) = Sum(215) _{1.8.10-12} 0 (215) Water heating Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m = 59.36 59.27 59.05 58.5 57.47 51 51 51 51 51 58.3 59.01 59.37 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Efficiency of	seconda										ļ	61	╡ `
2821.1 2364.44 2196.23 1493.82 918.93 0 0 0 0 1392.52 2094.78 2795.41 (211)m = {[(98)m x (204)] } x 100 ÷ (206)			ry/supple	ementar	y heatin	g system	ո, %							╡ `
(211) m = {[(98)m x (204)] } x 100 ÷ (206) (211) 4624.76 3876.13 3600.37 2448.88 1506.44 0 0 0 0 2282.81 3434.06 4582.64	Jan	Feb						Aug	Sep	Oct	Nov	Dec	0	(208)
4624.76 3876.13 3600.37 2448.88 1506.44 0 0 0 0 2282.81 3434.06 4582.64			Mar	Apr	May	Jun		Aug	Sep	Oct	Nov	Dec	0	(208)
Total (kWh/year) =Sum(211) _{15,1012} = 26356.1 (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) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 51 58.3 59.01 59.37 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatir	ng require	Mar ement (c	Apr alculated	May d above	Jun	Jul						0	(208)
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) _{16,1012} 0 (215) Water heating Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 51 58.3 59.01 59.37 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin	ng require 2364.44	Mar ement (c	Apr alculated 1493.82	May d above) 918.93	Jun	Jul						0	(208) ar
= {[(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	Space heatin 2821.1 (211)m = {[(98	2364.44 2364.44 3)m x (20	Mar ement (con 2196.23	Apr alculated 1493.82 00 ÷ (20	May d above) 918.93	Jun) 0	Jul 0	0	0	1392.52	2094.78	2795.41	0	(208)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space heatin 2821.1 (211)m = {[(98	2364.44 2364.44 3)m x (20	Mar ement (con 2196.23	Apr alculated 1493.82 00 ÷ (20	May d above) 918.93	Jun) 0	Jul 0	0	0	1392.52	2094.78	2795.41 4582.64	0 kWh/ye	(208) ar
Water heating Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 51 58.3 59.01 59.37 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin 2821.1 (211)m = {[(98 4624.76	2364.44 8)m x (20 6 3876.13	Mar ement (c 2196.23 4)] } x 1 3600.37	Apr alculated 1493.82 00 ÷ (20 2448.88	May d above 918.93 96)	Jun) 0	Jul 0	0	0	1392.52	2094.78	2795.41 4582.64	0 kWh/ye	(208) ar
Water heating Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 58.3 59.01 59.37 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin 2821.1 (211)m = {[(98) 4624.76} Space heatin	ng require 2364.44 3)m x (20 3876.13	Mar ement (ca 2196.23 (4)] } x 1 3600.37	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/	May d above 918.93 96)	Jun) 0	Jul 0	0	0	1392.52	2094.78	2795.41 4582.64	0 kWh/ye	(208) ar
Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 58.3 59.01 59.37 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin 2821.1 (211)m = {[(98] 4624.76] Space heatin = {[(98) m x (2821.16] 4624.76]	ng require 2364.44 8)m x (20 3876.13 ng fuel (se 01)] } x 1	Mar ement (c. 2196.23 4)] } x 1 3600.37 econdary 00 ÷ (20	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8)	May d above 918.93 96) 1506.44	Jun) 0	Jul 0	0 0 Tota	0 0 Il (kWh/yea	1392.52 2282.81 ar) =Sum(2	2094.78 3434.06 211) _{15,1012}	2795.41 4582.64	0 kWh/ye	(208) ar
Output from water heater (calculated above) 461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 58.3 59.01 59.37 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin 2821.1 (211)m = {[(98] 4624.76] Space heatin = {[(98) m x (2821.16] 4624.76]	ng require 2364.44 8)m x (20 3876.13 ng fuel (se 01)] } x 1	Mar ement (c. 2196.23 4)] } x 1 3600.37 econdary 00 ÷ (20	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8)	May d above 918.93 96) 1506.44	Jun) 0	Jul 0	0 Tota	0 0 (kWh/yea	1392.52 2282.81 ar) =Sum(2	2094.78 3434.06 211) _{15,1012}	2795.41 4582.64	0 kWh/ye 26356.1	(208) ar
461.87 412.22 445.02 415.7 419.52 310 308.32 323.71 318.56 430.24 433.84 456.41 Efficiency of water heater (217)m= 59.36 59.27 59.05 58.5 57.47 51 51 51 51 58.3 59.01 59.37 (217) Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin 2821.1 (211)m = {[(98) 4624.76]} Space heatin = {[(98)m x (2) (215)m= 0]}	ng require 2364.44 B)m x (20 3876.13 ng fuel (se 01)] } x 10 0	Mar ement (c. 2196.23 4)] } x 1 3600.37 econdary 00 ÷ (20	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8)	May d above 918.93 96) 1506.44	Jun) 0	Jul 0	0 Tota	0 0 (kWh/yea	1392.52 2282.81 ar) =Sum(2	2094.78 3434.06 211) _{15,1012}	2795.41 4582.64	0 kWh/ye 26356.1	(208) ar (211)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Space heatin 2821.1 (211)m = {[(98) 4624.76] Space heatin = {[(98)m x (2) (215)m= 0] Water heatin	ng require 2364.44 3)m x (20 6 3876.13 ng fuel (se 01)] } x 10 0	Mar ement (ca 2196.23 [4)] } x 1 3600.37 econdary 00 ÷ (20 0	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8)	May d above 918.93 06) 1506.44 month 0	Jun) 0	Jul 0	0 Tota	0 0 (kWh/yea	1392.52 2282.81 ar) =Sum(2	2094.78 3434.06 211) _{15,1012}	2795.41 4582.64	0 kWh/ye 26356.1	(208) ar (211)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81	Space heatin (211)m = {[(98) 4624.76] Space heatin = {[(98)m x (2) (215)m= 0] Water heatin Output from v	ng require 2364.44 8)m x (20 3876.13 ng fuel (se 01)] } x 1 0	Mar ement (calculate Mar 2196.23 4)] } x 1 3600.37 econdary 00 ÷ (20 0 0) ter (calculate Calculate Ca	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8) 0	May d above 918.93 96) 1506.44 month 0	Jun 0 0	0 0	0 Tota	0 0 (kWh/yea	1392.52 2282.81 ar) =Sum(2 0 ar) =Sum(2	2094.78 3434.06 211) _{15,1012} 0 215) _{15,1012}	2795.41 4582.64 = 0	0 kWh/ye 26356.1	(208) ar (211)
$ (219) m = (64) m \times 100 \div (217) m $ $ (219) m = 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81 $	Space heatin 2821.1 (211)m = {[(98) 4624.76] Space heatin = {[(98)m x (2) (215)m= 0 Water heatin Output from v 461.87	ng require 2364.44 3)m x (20 6 3876.13 ng fuel (se 01)] } x 10 0	Mar ement (ca 2196.23 3600.37 econdary 00 ÷ (20 0) ter (calculate)	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8) 0	May d above 918.93 96) 1506.44 month 0	Jun 0 0	0 0	0 Tota	0 0 (kWh/yea	1392.52 2282.81 ar) =Sum(2 0 ar) =Sum(2	2094.78 3434.06 211) _{15,1012} 0 215) _{15,1012}	2795.41 4582.64 = 0	0 kWh/ye 26356.1	(208) ar (211)
$ (219) m = (64) m \times 100 \div (217) m $ $ (219) m = 778.04 695.45 753.64 710.57 730.01 607.83 604.54 634.72 624.62 737.95 735.15 768.81 $	Space heatin 2821.1 (211)m = {[(98) 4624.76] Space heatin = {[(98)m x (2) (215)m= 0 Water heatin Output from w 461.87 Efficiency of w	ng require 2364.44 8)m x (20 6 3876.13 ng fuel (se 01)] } x 10 g vater head 412.22 vater head	Mar ement (calculater (calcula	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8) 0	May d above; 918.93 (6) 1506.44 (7) (7) (7) (7) (7) (7) (7) (7) (7) (7)	Jun 0 0 0 310	Jul 0 0 0 308.32	0 Tota 0 Tota 323.71	0 0 (kWh/yea 0 I (kWh/yea 318.56	1392.52 2282.81 ar) =Sum(2 0 ar) =Sum(2 430.24	2094.78 3434.06 211) _{15,1012} 0 215) _{15,1012}	2795.41 4582.64 = 0 =	0 kWh/ye 26356.1	(208) ar (211) (211)
	Space heatin 2821.1 (211)m = {[(98) 4624.76] Space heatin = {[(98)m x (2) (215)m= 0 Water heatin Output from w 461.87 Efficiency of w (217)m= 59.36	g require 2364.44 B)m x (20 3876.13 ng fuel (se 01)] } x 10 g vater hear 412.22 vater hear 59.27	Mar ement (calculater (calculater (calculater 59.05)	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8) 0	May d above; 918.93 (6) 1506.44 (7) (7) (7) (7) (7) (7) (7) (7) (7) (7)	Jun 0 0 0 310	Jul 0 0 0 308.32	0 Tota 0 Tota 323.71	0 0 (kWh/yea 0 I (kWh/yea 318.56	1392.52 2282.81 ar) =Sum(2 0 ar) =Sum(2 430.24	2094.78 3434.06 211) _{15,1012} 0 215) _{15,1012}	2795.41 4582.64 = 0 =	0 kWh/ye 26356.1	(208) ar (211) (215)
Total = $Sum(219a)_{112}$ = 8381.34 (219)	Space heatin 2821.1 (211)m = {[(98)	g require 2364.44 B)m x (20 3876.13 ng fuel (se 01)] } x 10 g vater head 412.22 vater head 59.27 r heating,)m x 100	Mar ement (calculater (calculater (calculater 59.05) kWh/mc	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8) 0 ulated al 415.7 58.5 onth	May d above; 918.93 (6) 1506.44 (7) (7) (7) (7) (7) (7) (7) (7) (7) (7)	Jun 0 0 0 310	Jul 0 0 0 308.32	0 Tota 0 Tota 323.71	0 0 (kWh/yea 0 I (kWh/yea 318.56	1392.52 2282.81 ar) =Sum(2 0 ar) =Sum(2 430.24	2094.78 3434.06 211) _{15,1012} 0 215) _{15,1012}	2795.41 4582.64 = 0 =	0 kWh/ye 26356.1	(208) ar (211) (215)
	Space heatin 2821.1 (211)m = {[(98)	g require 2364.44 B)m x (20 3876.13 ng fuel (se 01)] } x 10 g vater head 412.22 vater head 59.27 r heating,)m x 100	Mar ement (ca 2196.23 (4)] } x 1 3600.37 econdary 00 ÷ (200 ter (calculater 445.02 ter 59.05 kWh/mc 0 ÷ (217)	Apr alculated 1493.82 00 ÷ (20 2448.88 y), kWh/ 8) 0 ulated al 415.7 58.5 onth m	May d above 918.93 96) 1506.44 month 0 200ve) 419.52	Jun 0 0 0 310 51	Jul 0 0 0 308.32 51	0 Tota 0 Tota 323.71 51	0 0 ll (kWh/yea 318.56 51 624.62	1392.52 2282.81 ar) =Sum(2 0 ar) =Sum(2 430.24 58.3	2094.78 3434.06 211) _{15,1012} 0 215) _{15,1012} 433.84	2795.41 4582.64 = 0 = 456.41 59.37	0 kWh/ye 26356.1	(208) ar (211) (215)

Annual totals Space heating fuel used, main system 1			kWh/ye	ar	kWh/year 26356.1	1
Water heating fuel used					8381.34	J 1
Electricity for pumps, fans and electric keep-hot					0001.01	J
central heating pump:				156	1	(230c)
boiler with a fan-assisted flue				45]]	(230e)
Total electricity for the above, kWh/year		sum of (230a).	(230g) =	40	201	(231)
Electricity for lighting		,	(0)		1348.56	(232)
10a. Fuel costs - individual heating systems:					10 10.00]` '
roal raci cocto marriada noating cyclomor	F		Faral Datas		F1 01	
	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		3.48	x 0.01 =	917.19	(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 =	291.67] (247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	26.51	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa	rately as applical	ole and apply	fuel price acc	ording to	Table 12a	_
Energy for lighting	(232)		13.19	x 0.01 =	177.88	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as	needed					_
3, 11) + (250)(254) =				1533.25	(255)
11a. SAP rating - individual heating systems						
Energy cost deflator (Table 12)					0.42	(256)
,	6)] ÷ [(4) + 45.0] =				2.48	(257)
SAP rating (Section 12)		OLID.			65.36	(258)
12a. CO2 emissions – Individual heating systems	including micro-	CHP				
	Energy kWh/year		Emission fa		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x		0.216	=	5692.92	(261)
Space heating (secondary)	(215) x		0.519	=	0](263)
Water heating	(219) x		0.216	=	1810.37](264)
Space and water heating	(261) + (262) + (26	63) + (264) =	0.216			(265)
Electricity for pumps, fans and electric keep-hot	(231) x	, ()	0.519	=	7503.29 104.32	(267)
Electricity for lighting	(232) x		0.519	=	699.9	$\begin{bmatrix} (267) \\ (268) \end{bmatrix}$
Total CO2, kg/year	,	sum o	of (265)(271) =](200)](272)
CO2 emissions per m ²			÷ (4) =		8307.51	$\begin{bmatrix} (272) \\ (273) \end{bmatrix}$
OOL CHIIOSICHO PEL III		(=, =)	- (-/		38.76	J ⁽²¹³⁾

El rating (section 14) (274) 13a. Primary Energy P. Energy **Energy Primary** kWh/year factor kWh/year (211) x Space heating (main system 1) (261) 1.22 32154.44 (215) x Space heating (secondary) 3.07 0 (263)Energy for water heating (219) x 1.22 10225.23 (264) (261) + (262) + (263) + (264) =Space and water heating (265)42379.67 Electricity for pumps, fans and electric keep-hot (231) x (267)3.07 617.07

0

sum of (265)...(271) =

 $(272) \div (4) =$

(232) x

Electricity for lighting

'Total Primary Energy

Primary energy kWh/m²/year

(268)

(272)

(273)

4140.09

47136.84

219.95

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.1.24 Property Address: Flat 6 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) **Basement** 103.39 (1a) x (2a) =320.51 (3a) 3.1 Ground floor (2b) (1b) x (3b) 110.92 2.6 288.39 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)214.31 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 608.9 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)3 30 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c) 0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.05 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)15 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.8 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.7 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.56 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4

4.3

4.5

4.7

4.9

4.4

4.3

3.8

3.8

3.7

5

(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 rat	e (allowi	na for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.71	0.7	0.69	0.62	0.6	0.53	0.53	0.52	0.56	0.6	0.63	0.66]	
Calculate effe		•	rate for t	he appli	cable ca	ise	!	!	!	!		,	(co.).
If mechanica			andiv N (2	3h) - (23s	a) v Emy (4	aguation (N5N othe	rwisa (23h	n) – (23a)			0	(23a)
If balanced with		0		, ,	,	. `	,, .	,) = (23a)			0	(23b)
a) If balance		•	•	_		,		,	2h)m + (23h) 🗴 [1 – (23c)	0 - 1001	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	coverv (ľ	л ИV) (24b)m = (22	2b)m + (1 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	ouse ex	tract ven	tilation o	or positiv	re input	ventilatio	on from o	outside				J	
,		(23b), t		•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r		on or whe			•				0.5]				
(24d)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(24d)
Effective air	change	rate - en	iter (24a) or (2 <mark>4</mark> b	o) or (24	c) or (24	ld) in box	(25)					
(25)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(25)
3. Heat losse	es and he	eat loss r	paramet	er:								_	
ELEMENT	Gros		Openin		Net Ar	-03	Haral		A >< 1.1		ر برامید با	_	ΑΧk
					14007	Ca	U-valı	ue	A X U		k-value	-	/ \ / \ \ \
	area	(m²)	m	-	A ,r		W/m2		(W/I		kJ/m ² ·		kJ/K
Doors		(m²)		-		m² x	W/m2	= =					
Windows Type	e 1	(m²)		-	A ,r	m ² x	W/m2	= =	(W/I				kJ/K
Windows Type	e 1 e 2	(m²)		-	A ,r	m ² x	W/m2	0.04] =	4.2				kJ/K (26)
Windows Type	e 1 e 2	(m²)		-	A ,r	m ² x x1 x1	W/m2 2 /[1/(1.5)+	0.04] = 0.04] =	4.2 2.02				kJ/K (26) (27)
Windows Type	e 1 e 2 e 3	(m²)		-	A ,r 2.1 1.43 3.13	x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	4.2 2.02 11.94				kJ/K (26) (27) (27)
Windows Type Windows Type Windows Type	e 1 e 2 e 3	(m²)		-	A ,r 2.1 1.43 3.13 2.5	x1 x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 2.02 11.94 9.53				kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	e 1 e 2 e 3	(m²)		-	A ,r 2.1 1.43 3.13 2.5 3.13	x1 x1 x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 2.02 11.94 9.53 11.94	k)			kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Rooflights	e 1 e 2 e 3			, Ž	A ,r 2.1 1.43 3.13 2.5 3.13 3.6	x1 x1 x1 x1 9 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 2.02 11.94 9.53 11.94 5.4	k)			kJ/K (26) (27) (27) (27) (27) (27b)
Windows Type Windows Type Windows Type Windows Type Rooflights	e 1 e 2 e 3 e 4	17	m	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 y1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/l 4.2 2.02 11.94 9.53 11.94 5.4 25.8475	k)			(26) (27) (27) (27) (27) (27b) (28)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	e 1 e 2 e 3 e 4	17 4	2.86	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 y2 x x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.25 0.25	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	9.53 11.94 9.53 11.94 5.4 25.8475	k)			(26) (27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	e 1 e 2 e 3 e 4	17 4 37	2.86 15.00	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.25 0.45	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/l 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32	k)			kJ/K (26) (27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3	64. 62. 33.6 7.6	17 4 37 8	2.86 15.00 2.1	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.5	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44	k)			(26) (27) (27) (27) (27) (27b) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof	64. 62. 33.6 7.6	17 4 37 8	2.86 15.00 2.1	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.57 4.08	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44	k)			(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	64. 62. 33.6 7.6	17 4 37 8	2.86 15.00 2.1	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 4.08 271.3	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.25 0.25	0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	k)			(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall	64.7 62. 33.6 7.6 elements	17 4 37 8 8 4, m ²	2.86 15.0 2.1 3.6	indow U-ve	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 47.38 4.08 271.3 53.32 39.78 alue calculus	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.25 0.25 0.00 0	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = 0.04	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K)	kJ/m²-	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and	64.7 62. 33.6 7.6 81 roof wind as on both	4 37 8 8, m ² ows, use e	2.86 15.0 2.1 3.6 ffective with ternal wall	indow U-ve	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 47.38 4.08 271.3 53.32 39.78 alue calculus	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.25 0.25 0.00 0	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K)	kJ/m²-	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and ** include the area	64.76 62. 33.6 7.6 8 roof wind as on both	00000000000000000000000000000000000000	2.86 15.0 2.1 3.6 ffective with ternal wall	indow U-ve	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 47.38 4.08 271.3 53.32 39.78 alue calculus	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45 0.25 0.25 0.9 formula 1	0.04] = 0.04]	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02	K)	kJ/m²•	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall *for windows and ** include the area Fabric heat los	64.76 62. 33.6 7.6 8 elements	0ws, use e sides of in = S (A x k)	2.86 15.0; 2.1 3.6 ffective winternal wall	indow U-vals and pan	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.5 4.08 271.3 53.32 39.78 alue calculatitions	x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.25 0.45 0.25 0.25 0.9 formula 1	0.04] = 0.04]	(W// 4.2 2.02 11.94 9.53 11.94 5.4 25.8479 15.33 21.32 6.44 1.02 0 0	K) 5 [] as given in	kJ/m²•	n 3.2	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32) (32)

an be used inste	0 (1												
hermal bridg details of therm	•	,			•	\						40.7	(3
otal fabric he		are not kir	OWII (30) -	- <i>0.10 x</i> (3	')			(33) +	(36) =			181.28	(3
entilation he	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
8)m= 151.59	149.61	147.66	138.52	136.81	128.85	128.85	127.38	131.92	136.81	140.27	143.89		(:
eat transfer	coefficier	nt, W/K		-	-	-	-	(39)m	= (37) + (3	38)m	-		
9)m= 332.87	330.88	328.94	319.8	318.09	310.13	310.13	308.65	313.19	318.09	321.55	325.17		
eat loss para	ameter (H	HLP), W/	′m²K				-		Average = = (39)m ÷	Sum(39) ₁ . · (4)	12 /12=	319.79	(
0)m= 1.55	1.54	1.53	1.49	1.48	1.45	1.45	1.44	1.46	1.48	1.5	1.52		
umber of da	ys in moi	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.49	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(
sumed occ	inanció											1	
1. Water hea	ting ener	gy requi	rement:								kWh/y	ear:	
sumed occ	inancv											1	
											.02		(
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		02		(
if <mark>TFA > 13.</mark> if TFA £ 13.	9, N = 1 9, N = 1	+ 1.76 x							ΓFA -13.	9)			· ·
if <mark>TFA > 13.</mark> if TFA £ 13. nnual averaç	9, N = 1 9, N = 1 ge hot wa	+ 1.76 x	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		9)	5.94		(
if TFA > 13. if TFA £ 13. nnual averag educe the annu	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre usage by	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)			
if TFA > 13. if TFA £ 13. nnual averageduce the annu t more that 125	9, N = 1 9, N = 1 ge hot wa al average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, l	y Vd,av welling is hot and co	erage = designed i	(25 x N) to achieve	+ 36 a water us	se target o	9) 109	5.94		
if TFA > 13. if TFA £ 13. nnual averagoduce the annual t more that 125	9, N = 1 9, N = 1 ge hot wa al average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed ((25 x N) to achieve	+ 36		9)			
if TFA > 13. if TFA £ 13. nual average duce the annul t more that 125 Jan t water usage	9, N = 1 9, N = 1 ge hot wa al average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed ((25 x N) to achieve	+ 36 a water us	se target o	9) 109	5.94		
if TFA > 13. if TFA £ 13. nnual average duce the annu t more that 125 Jan t water usage 116.53	9, N = 1 9, N = 1 ge hot waal average is litres per per litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the dater use, I May Vd,m = fa 99.58	y Vd,av Iwelling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 95.34	(25 x N) to achieve Aug (43) 99.58	+ 36 a water us Sep	Oct 108.06 Total = Su	Nov 112.29 m(44) ₁₁₂ =	Dec 116.53	1271.25	
if TFA > 13. if TFA £ 13. nnual average duce the annual transcript that 125 Jan of water usage 116.53 eergy content o	9, N = 1 9, N = 1 ge hot was all average is litres per	+ 1.76 x ater usage hot water person per Mar day for each 108.06	ge in litre usage by day (all w Apr ach month 103.82	es per da 5% if the orater use, N May $Vd, m = fa$ 99.58	y Vd,av Iwelling is not and co Jun ctor from 1 95.34	erage = designed of ld) Jul Table 1c x 95.34	(25 x N) to achieve Aug (43) 99.58	+ 36 a water us Sep 103.82	Oct 108.06 Total = Sunth (see Tail	Nov 112.29 m(44) ₁₁₂ = ables 1b, 1	Dec 116.53 = c, 1d)	1271.25	· ·
if TFA > 13. if TFA £ 13. nnual averageduce the annual transfer that 125 Jan it water usage L)m= 116.53 ergy content o	9, N = 1 9, N = 1 ge hot waal average is litres per per litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the dater use, I May Vd,m = fa 99.58	y Vd,av Iwelling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 95.34	(25 x N) to achieve Aug (43) 99.58	+ 36 a water us Sep 103.82 0 kWh/mor 121.15	Oct 108.06 Total = Sunth (see Tail 141.19	Nov 112.29 m(44) ₁₁₂ = ables 1b, 1 154.12	5.94 Dec 116.53 c, 1d) 167.36		
if TFA > 13. if TFA £ 13. innual averageduce the annual at more that 125 Jan it water usage 116.53 ergy content of 172.81	9, N = 1 9, N = 1 ge hot waal average is litres per lit	+ 1.76 x ater usag hot water person per Mar day for ea 108.06 used - calc 155.97	ge in litre usage by day (all w Apr ach month 103.82 culated me 135.98	es per da 5% if the contact use, I May Vd,m = fa 99.58	y Vd,av welling is not and co Jun ctor from 7 95.34 190 x Vd,r	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72	+ 36 a water us Sep 103.82 0 kWh/mor 121.15	Oct 108.06 Total = Sunth (see Tail 141.19	Nov 112.29 m(44) ₁₁₂ = ables 1b, 1	5.94 Dec 116.53 c, 1d) 167.36	1271.25	
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if TFA > 13. if TFA £ 13. if TFA £ 13. innual average duce the annual t more that 125 Jan t water usage 116.53 ergy content of i)m= 172.81 instantaneous v 25.92 atter storage	9, N = 1 9, N = 1 ge hot was all average is litres per	ter usage hot water person per Mar day for ear 108.06 used - calcused - specific person per 23.39	ge in litre usage by day (all w Apr ach month 103.82 culated mo 135.98 of use (no	Pes per da 5% if the da 5% if t	y Vd,av welling is not and co Jun 95.34 190 x Vd,r 112.59 r storage),	erage = designed ald) Jul Table 1c x 95.34 n x nm x E 104.33 enter 0 in 15.65	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46) 17.96	+ 36 a water us Sep 103.82 121.15 10 to (61) 18.17	Oct 108.06 Total = Su 141.19 Total = Su 21.18	Nov 112.29 m(44) ₁₁₂ = ables 1b, 1 154.12 m(45) ₁₁₂ =	Dec 116.53		
if TFA > 13. if TFA £ 13. innual average duce the annual average that 125 Jan t water usage 116.53 ergy content of 172.81 instantaneous volume 25.92 ater storage orage volume	9, N = 1 9, N = 1 ge hot was all average is litres per	ter usage hot water person per Mar day for each 108.06 155.97 ing at point 23.39	ge in litre usage by day (all w Apr ach month 103.82 culated me 135.98 of use (no	May Vd,m = fa 99.58 onthly = 4. 130.47 o hot water 19.57	y Vd,av welling is not and co Jun 95.34 190 x Vd,r 112.59 r storage),	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 7m / 3600 119.72 boxes (46) 17.96 within sa	+ 36 a water us Sep 103.82 121.15 10 to (61) 18.17	Oct 108.06 Total = Su 141.19 Total = Su 21.18	Nov 112.29 m(44) 112 = ables 1b, 1 154.12 m(45) 112 = 23.12	Dec 116.53		
if TFA > 13. if TFA £ 13. if TFA £ 13. innual average duce the annual average that 125 Jan it water usage i)m= 116.53 ergy content of the stantaneous water storage atterns to the storage orage volume community is the stantaneous water storage orage volume.	9, N = 1 9, N = 1 ge hot was all average is litres per	ter usage hot water person per Mar day for ear 108.06 155.97 ng at point 23.39 includin nd no ta	ge in litre usage by day (all w Apr ach month 103.82 culated mo 135.98 of use (no 20.4 ag any so ank in dw	es per da 5% if the de tater use, I May Vd,m = fa 99.58 onthly = 4. 130.47 o hot water 19.57 colar or Waterling, e	y Vd,av welling is not and co Jun 95.34 190 x Vd,r 112.59 r storage), 16.89	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46) 17.96 within sa (47)	+ 36 a water us Sep 103.82 121.15 10 to (61) 18.17 18.17	Oct 108.06 Total = Su 141.19 Total = Su 21.18 sel	Nov 112.29 m(44) ₁₁₂ = 23.12	5.94 Dec 116.53 c, 1d) 167.36 25.1		
if TFA > 13. if TFA £ 13. innual average duce the annual average that 125 Jan it water usage lym= 116.53 ergy content of the stantaneous water storage average volunt community in therwise if n	9, N = 1 9, N = 1 ge hot was all average is litres per	ter usage hot water person per Mar day for ear 108.06 155.97 ng at point 23.39 includin nd no ta	ge in litre usage by day (all w Apr ach month 103.82 culated mo 135.98 of use (no 20.4 ag any so ank in dw	es per da 5% if the de tater use, I May Vd,m = fa 99.58 onthly = 4. 130.47 o hot water 19.57 olar or Waterling, e	y Vd,av welling is not and co Jun 95.34 190 x Vd,r 112.59 r storage), 16.89	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46) 17.96 within sa (47)	+ 36 a water us Sep 103.82 121.15 10 to (61) 18.17 18.17	Oct 108.06 Total = Su 141.19 Total = Su 21.18 sel	Nov 112.29 m(44) ₁₁₂ = 23.12	5.94 Dec 116.53 c, 1d) 167.36 25.1		
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if TFA > 13. if TFA £ 13. innual average duce the annual average duce the annual average lime 116.53 ergy content of the standard standar	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per	ter usage hot water person per Mar day for ear 108.06 used - calcused - calcused - calcused - calcused including at point 23.39 including and no talcused eclared levels and the calcused including the calcus	Apr Apr 103.82 culated mo 135.98 of use (no 20.4 ag any so ank in dw er (this in	es per da 5% if the de tater use, I May Vd,m = fa 99.58 130.47 hot water 19.57 plar or W velling, e acludes i	y Vd,av welling is not and co Jun ctor from 7 95.34 190 x Vd,r 112.59 r storage), 16.89 /WHRS nter 110	erage = designed of ld) Jul Table 1c x 95.34 104.33 enter 0 in 15.65 storage litres in neous co	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46) 17.96 within sa (47)	+ 36 a water us Sep 103.82 121.15 10 to (61) 18.17 18.17	Oct 108.06 Total = Su 141.19 Total = Su 21.18 sel	Nov 112.29 m(44) ₁₁₂ = ables 1b, 1 154.12 m(45) ₁₁₂ = 23.12	Dec 116.53		
if TFA > 13. if TFA £ 13. if TFA £ 13. innual average duce the annual average duce the annual average water usage it more that 125 Jan it more that 125 it more t	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per	ter usage hot water person per Mar day for ear 108.06 155.97 ag at point 23.39 including and no tall hot water eclared lam Table	ge in litre usage by day (all w Apr 103.82 culated mo 135.98 of use (no 20.4 ag any so ank in dw er (this in oss facto 2b	es per da 5% if the de tater use, I May Vd,m = fa 99.58 130.47 19.57 Dar or W Welling, each or is known is known is known is the control of the control o	y Vd,av welling is not and co Jun ctor from 7 95.34 190 x Vd,r 112.59 r storage), 16.89 /WHRS nter 110	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46) 17.96 within sa (47)	+ 36 a water us Sep 103.82 121.15 16 (61) 18.17 ame vess ers) enter	Oct 108.06 Total = Su 141.19 Total = Su 21.18 sel	9) Nov 112.29 m(44) 112 = ables 1b, 1 154.12 m(45) 112 = 23.12	5.94 Dec 116.53 c, 1d) 167.36 25.1		
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if TFA > 13. if TFA £ 13. if TFA £ 13. if TFA £ 13. innual average duce the annual average aduce the annual average average average content of the standard average average volunt community later storage average volunt average ave	9, N = 1 9, N = 1 19, N = 1 112.29	ter usage hot water person per Mar day for each 108.06 155.97 including at point 23.39 including and no tale hot water eclared less storage eclared of factor fr	ge in litre usage by day (all w Apr ach month 103.82 culated mo 135.98 of use (no 20.4 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	May Vd,m = fa 99.58 onthly = 4. 130.47 o hot water 19.57 olar or W velling, e ncludes i or is known are oss fact	y Vd,av Welling is that and co	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46 17.96 within sa (47) ombi boil	+ 36 a water us Sep 103.82 121.15 16 (61) 18.17 ame vess ers) enter	Oct 108.06 Total = Su 141.19 Total = Su 21.18 sel	9) Nov 112.29 m(44) ₁₁₂ = ables 1b, 1 154.12 m(45) ₁₁₂ = 23.12	5.94 Dec 116.53 = c, 1d) 167.36 = 25.1 250		
if TFA > 13. if TFA £ 13. innual averageduce the annual average that 125 Jan of water usage 4)m= 116.53 nergy content of the standard transfer that 125 instantaneous versions are standard transfer to the standard transfer tr	9, N = 1 9, N = 1 19, N = 1 112.29 112	ter usage hot water person per Mar day for ear 108.06 155.97 including at point 23.39 including hot water person per day for ear point 23.39 including at point person per day for ear point 23.39 including the person per day for ear per day for ear per day for ear person per day for ear person per day for ear per day for ea	ge in litre usage by day (all w Apr ach month 103.82 culated mo 135.98 of use (no 20.4 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	May Vd,m = fa 99.58 onthly = 4. 130.47 o hot water 19.57 olar or W velling, e ncludes i or is known are oss fact	y Vd,av Welling is that and co	erage = designed and designed a	(25 x N) to achieve Aug (43) 99.58 07m / 3600 119.72 boxes (46 17.96 within sa (47) ombi boil	+ 36 a water us Sep 103.82 121.15 16 (61) 18.17 ame vess ers) enter	Oct 108.06 Total = Su 141.19 Total = Su 21.18 sel	9) Nov 112.29 m(44) ₁₁₂ = ables 1b, 1 154.12 m(45) ₁₁₂ = 23.12 47)	5.94 Dec 116.53 c, 1d) 167.36 25.1 250 0 0		

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	5.18	(54)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	5.18	(55)
(56)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.6		155.49 160.68	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m where	I I (H11) is from Append	l lix H
(57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.6	3 160.68 155.49 160.68	155.49 160.68	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) \div	` '		
(modified by factor from Table H5 if there is solar water hea	, , , , , , , , , , , , , , , , , , , 	' ' 	
(59)m= 128.38 115.95 128.38 124.24 128.38 41.92 43.31	43.31 41.92 128.38	124.24 128.38	(59)
Combi loss calculated for each month (61)m = (60) \div 365 × (4	1)m		•
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 461.87 412.22 445.02 415.7 419.52 310 308.3	2 323.71 318.56 430.24	433.84 456.41	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan		tion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	' 		(62)
(63)m= 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater	000 74 040 50 400 04	400.04 450.44	
(64)m= 461.87 412.22 445.02 415.7 419.52 310 308.33		433.84 456.41	4705 44 (64)
	Output from water heate		4735.41 (64)
Heat gains from water heating, kWh/month 0.25 / [0.85 x (45)	m + (61)m] + 0.8 x [(46)m	+ (5/)m + (59)m	
(97)	I I I	1 1 2 2 2 1 1 2 2 2 2	1
(65)m= 160.16 143.02 154.56 144.6 146.08 70.97 69.34		150.63 158.35	(65)
include (57)m in calculation of (65)m only if cylinder is in the			(65)
			(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	dwelling or hot water is f	rom community h	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	rom community h	(65) neating
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 151.03 151.03 151.03 151.03 151.03 151.03	Aug Sep Oct 151.03 151.03	rom community h	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5	Nov Dec	(65) neating (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05	rom community h	(65) neating
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5	Nov Dec 151.03 151.03 64.25 68.49	(65) neating (66) (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08	Nov Dec	(65) neating (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49	(65) neating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08	Nov Dec 151.03 151.03 64.25 68.49	(65) neating (66) (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49	(65) neating (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49	(65) neating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49 0 0	(65) neating (66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49	(65) neating (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the standard forms (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 151.0	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1 0 0 0 0 0	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49 38.1 38.1 0 0	(65) leating (66) (67) (68) (69) (70) (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1 0 0 0 0 2 -120.82 -120.82 -120.82	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49 0 0 -120.82 -120.82 209.21 212.83	(65) neating (66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1 0 0 0 0 0 2 -120.82 -120.82 -120.82 100.08 102.52 201.14 am + (68)m + (69)m + (70)m + (70	Nov Dec 151.03 1	(65) heating (66) (67) (68) (69) (70) (71) (72)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 151.03 15	Aug Sep Oct 3 151.03 151.03 151.03 also see Table 5 32.3 43.36 55.05 13a), also see Table 5 283.62 293.68 315.08 a), also see Table 5 38.1 38.1 38.1 0 0 0 0 0 2 -120.82 -120.82 -120.82 100.08 102.52 201.14 am + (68)m + (69)m + (70)m + (70	Nov Dec 151.03 151.03 64.25 68.49 342.1 367.49 0 0 -120.82 -120.82 209.21 212.83	(65) leating (66) (67) (68) (69) (70) (71)

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

Orientatio		ccess Factorable 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North ().9x	0.3	x	1.43	x	10.63	x	0.65	x	0.7	=	3.74	(74)
North ().9x	0.77	X	3.13	x	10.63	x	0.65	x	0.7	=	20.99	(74)
North ().9x	0.77	X	3.13	x	10.63	x	0.65	x	0.7	=	20.99	(74)
North ().9x	0.3	x	1.43	x	20.32	х	0.65	x	0.7	=	7.14	(74)
North ().9x	0.77	X	3.13	x	20.32	x	0.65	x	0.7	=	40.11	(74)
North ().9x	0.77	X	3.13	x	20.32	X	0.65	X	0.7	=	40.11	(74)
North ().9x	0.3	X	1.43	X	34.53	x	0.65	X	0.7	=	12.13	(74)
North ().9x	0.77	x	3.13	x	34.53	x	0.65	x	0.7	=	68.16	(74)
North ().9x	0.77	x	3.13	x	34.53	x	0.65	x	0.7	=	68.16	(74)
North ().9x	0.3	x	1.43	x	55.46	x	0.65	x	0.7	=	19.49	(74)
North ().9x	0.77	x	3.13	x	55.46	x	0.65	x	0.7	=	109.48	(74)
North ().9x	0.77	x	3.13	x	55.46	x	0.65	x	0.7	=	109.48	(74)
North ().9x	0.3	x	1.43	x	74.72	x	0.65	x	0.7	=	26.25	(74)
North ().9x	0.77	x	3.13	x	74.72	x	0.65	x	0.7	=	147.48	(74)
North ().9x	0.77	x	3.13	x	74.72	x	0.65	x	0.7	=	147.48	(74)
North ().9x	0.3	X	1.43	X	79.99	X	0.65	X	0.7	=	28.1	(74)
North ().9x	0.77	X	3.13	х	79.99	x	0.65	x	0.7	=	157.88	(74)
North ().9x	0.77	X	3.13	х	79.99	×	0.65	X	0.7	=	157.88	(74)
North ().9x	0.3	X	1.43	X	74.68	X	0.65	X	0.7	=	26.24	(74)
North ().9x	0.77	X	3.13	X	74.68	Х	0.65	x	0.7	=	147.4	(74)
North ().9x	0.77	X	3.13	x	74.68	X	0.65	x	0.7	=	147.4	(74)
North ().9x	0.3	x	1.43	х	59.25	x	0.65	x	0.7	=	20.82	(74)
North ().9x	0.77	X	3.13	X	59.25	X	0.65	X	0.7	=	116.94	(74)
North ().9x	0.77	X	3.13	X	59.25	X	0.65	X	0.7	=	116.94	(74)
).9x	0.3	X	1.43	X	41.52	X	0.65	X	0.7	=	14.59	(74)
North ().9x	0.77	X	3.13	X	41.52	X	0.65	X	0.7	=	81.95	(74)
).9x	0.77	X	3.13	X	41.52	X	0.65	X	0.7	=	81.95	(74)
).9x	0.3	X	1.43	X	24.19	x	0.65	X	0.7	=	8.5	(74)
).9x	0.77	X	3.13	X	24.19	x	0.65	X	0.7	=	47.75	(74)
).9x	0.77	X	3.13	X	24.19	x	0.65	X	0.7	=	47.75	(74)
).9x	0.3	X	1.43	X	13.12	x	0.65	X	0.7	=	4.61	(74)
).9x	0.77	X	3.13	X	13.12	X	0.65	X	0.7	=	25.89	(74)
).9x	0.77	X	3.13	X	13.12	x	0.65	X	0.7	=	25.89	(74)
).9x	0.3	X	1.43	X	8.86	x	0.65	X	0.7	=	3.11	(74)
).9x	0.77	X	3.13	X	8.86	X	0.65	X	0.7	=	17.5	(74)
).9x	0.77	X	3.13	X	8.86	x	0.65	X	0.7	=	17.5	(74)
).9x	0.54	X	2.5	X	19.64	x	0.85	X	0.7	=	14.2	(80)
).9x	0.54	X	2.5	X	38.42	x	0.85	X	0.7	=	27.78	(80)
West ().9x	0.54	X	2.5	X	63.27	X	0.85	X	0.7	=	45.74	(80)

West			_		,		,		_				_
West	West 0.9x	0.54	X	2.5	X	92.28	X	0.85	X	0.7	=	66.71	(80)
Vest	West 0.9x	0.54	X	2.5	X	113.09	X	0.85	X	0.7	=	81.76	(80)
Vest 0.0x	West 0.9x	0.54	X	2.5	X	115.77	X	0.85	X	0.7	=	83.69	(80)
Vest	West 0.9x	0.54	X	2.5	X	110.22	X	0.85	X	0.7	=	79.68	(80)
Vest	West 0.9x	0.54	X	2.5	X	94.68	x	0.85	X	0.7	=	68.44	(80)
Vest	West 0.9x	0.54	X	2.5	X	73.59	X	0.85	X	0.7	=	53.2	(80)
Vest	West 0.9x	0.54	X	2.5	X	45.59	X	0.85	X	0.7	=	32.96	(80)
Rooflights 0.9x	West 0.9x	0.54	X	2.5	x	24.49	x	0.85	X	0.7	=	17.7	(80)
Rooflights 0.9x	West 0.9x	0.54	X	2.5	x	16.15	X	0.85	X	0.7	=	11.68	(80)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	x	26	x	0.65	X	0.7	=	38.33	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	x	54	х	0.65	X	0.7	=	79.61	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	x	96	x	0.65	x	0.7	=	141.52	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	x	150	x	0.65	x	0.7	=	221.13	(82)
Rooflights 0,9x	Rooflights 0.9x	1	X	3.6	x	192	x	0.65	X	0.7	=	283.05	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	x	200	x	0.65	x	0.7	=	294.84	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	x	189	x	0.65	×	0.7	=	278.62	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	×	157	x	0.65	×	0.7	=	231.45	(82)
Rooflights 0.9x	Rooflights 0.9x	1	X	3.6	X	115	Х	0.65	X	0.7	=	169.53	(82)
Solar gains in watts, calculated for each month (83)m = \$\sum (74)m \cdots (82)m = \$\sum (74)m \cdots (83)m = \$\sum (74)m \cdots (84)m = \$\sum (74)m \cdots (83)m = \$\sum (74)m \cdots (83)m = \$\sum (74)m \cdots (84)m = \$\sum (74)m \cdots (83)m = \$\sum (74)m \cdots (84)m = \$\sum (74)m \cdots (83)m = \$\sum (74)m \cdots (84)m = \$\sum (74)m \cdots (83)m = \$\sum (74)m \cdots (84)m = \$\sum (74)m \cd	Rooflights 0.9x	1	Īx	3.6	х	66	х	0.65	х	0.7	-	97.3	(82)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 99.24	Rooflights _{0.9x}	1	x	3.6	х	33	×	0.65	x	0.7	=	48.65	(82)
(83)m= 98.24 194.74 335.71 526.29 686.01 722.4 679.34 554.6 401.22 234.25 122.75 80.74 Total gains – Internal and solar (84)m = (73)m + (83)m , watts (84)m= 832.91 923.51 1038.29 1188.86 1307.88 1216.85 1153.32 1038.91 909.08 873.82 806.61 797.87 (84) 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 Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 1 0.99 0.98 0.95 0.87 0.91 0.98 1 1 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 Utilisation factor for gains for rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.27 20.26 20.25 20.24 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89)m= 1 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (1 1 (89)) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90)	Rooflights 0.9x	1	X	3.6	x	21	x	0.65	х	0.7	=	30.96	(82)
(83)m= 98.24 194.74 335.71 526.29 686.01 722.4 679.34 554.6 401.22 234.25 122.75 80.74 Total gains – Internal and solar (84)m = (73)m + (83)m , watts (84)m= 832.91 923.51 1038.29 1188.86 1307.88 1216.85 1153.32 1038.91 909.08 873.82 806.61 797.87 (84) 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 Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 1 0.99 0.98 0.95 0.87 0.91 0.98 1 1 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 Utilisation factor for gains for rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.27 20.26 20.25 20.24 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89)m= 1 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (1 1 (89)) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90)													
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 832.91 923.51 1038.29 1188.86 1307.88 1216.85 1153.32 1038.91 909.08 873.82 806.61 797.87 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 1 0.99 0.98 0.95 0.87 0.91 0.98 1 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) (1A = Living area ÷ (4) = 0.23 (91)	Solar gains in	watts, calcu	lated	for each mon	th		(83)m	n = Sum(74)m .	(82)m				
(84)m= 832.91 923.51 1038.29 1188.86 1307.88 1216.85 1153.32 1038.91 909.08 873.82 806.61 797.87 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(83)m= 98.24	194.74 33	5.71	526 .29 686.0	1 7	722.4 679.34	554	401.22	234.2	122.75	80.74		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 1 1 0.99 0.98 0.95 0.87 0.91 0.98 1 1 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	Total gains –	internal and	solar	(84)m = (73) r	n + (83)m , watts							
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(84)m= 832.91	923.51 103	38.29	1188.86 1307.8	38 12	216.85 1153.32	1038	3.91 909.08	873.82	2 806.61	797.87		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean inte	rnal tempera	iture	(heating sease	on)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during heat	ing p	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
(86)m= 1 1 1 0.99 0.98 0.95 0.87 0.91 0.98 1 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	Utilisation fa	ctor for gains	for l	iving area, h1	,m (s	ee Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	Jan	Feb I	Mar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(87)m= 19.07 19.2 19.47 19.89 20.31 20.65 20.85 20.8 20.47 19.99 19.49 19.08 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	(86)m= 1	1	1	0.99 0.98		0.95 0.87	0.9	0.98	1	1	1		(86)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1	Mean interna	al temperatui	re in I	iving area T1	(follo	w steps 3 to 7	7 in T	able 9c)					
(88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	(87)m= 19.07	19.2	9.47	19.89 20.3	1 2	20.65 20.85	20	.8 20.47	19.99	19.49	19.08		(87)
(88)m= 20.22 20.23 20.23 20.25 20.26 20.28 20.28 20.28 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	Temperature	during heat	ina p	eriods in rest	of dv	velling from Ta	able 9	9. Th2 (°C)				'	
(89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)					_	_		` 	20.26	20.25	20.24		(88)
(89)m= 1 1 1 0.99 0.97 0.92 0.8 0.86 0.98 1 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)	Litilication fo	eter for gains	forr	act of dwalling	- L	m (soo Tablo	02/				l .		
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) ### FLA = Living area ÷ (4) = 0.23 (91)					_	<u>`</u>	ΓĖ	36 0.98	1	1 1	1		(89)
(90)m= 18.4 18.53 18.81 19.24 19.66 20.01 20.19 20.15 19.84 19.35 18.84 18.43 (90) fLA = Living area ÷ (4) = 0.23 (91)			!	!		!	L			1 -	<u> </u>	l	` ,
$fLA = Living area \div (4) = 0.23 $ (91)				-	-		ī			10 04	10 //2		(90)
	(30)111= 10.4	10.53	0.01	19.24	<u>, </u>	20.01 20.19						0.22	
									_, ,,	ig aioa ∓ (•	., –	0.23	(31)

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

(92)m=	18.56	18.69	18.96	19.39	19.81	20.16	20.34	20.31	19.99	19.5	18.99	18.58		(92)
Apply a	ıdjustm	ent to th	ne mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.16	19.29	19.56	19.99	20.41	20.76	20.94	20.91	20.59	20.1	19.59	19.18		(93)
8. Spac	e heati	ng requ	iirement											
				•		ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilis	sation f	actor fo	r gains	using Ta	ble 9a								ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	on fact	or for ga	ains, hm					г				ı	I	
(94)m=	1	1	1	0.99	0.98	0.94	0.86	0.91	0.98	1	1	1		(94)
			W = (94)	<u> </u>								1	I	
` '		922.45	1035.66			1143.41	997.23	940.53	891.2	870.07	805.7	797.43		(95)
		ge exte	rnal tem	perature				1					ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los	ss rate	for mea	an intern						– (96)m				•	
` ′ _	945.31		4296.8						2031.32		4016.93	4871.11		(97)
				r each n	nonth, k\	/Vh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m		•	
(98)m= 3	060.05	2579.33	2426.28	1705.14	1112.39	0	0	0	0	1600.79	2312.08	3030.82		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	17826.88	(98)
Space I	heating	require	ement in	kWh/m²	/year								83.18	(99)
9a. Ener	av real	uiromon	te – Indi	vidual b	pating ex	vetome i	ncluding	micro-C	'HDI	_				
Space			is – IIIdi	viduai ii	camy s	y Sterris II	ricidaling	THICIO-C)	_				
•		_	t from se	econdar	v/supple	mentary	system					_	0	(201)
						orricary		(202) = 1	_ (201) _					(202)
			t from m							(000)1			1	╡``
Fraction	of tota	al heatir	ng from I	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficien	cy of m	ain spa	ice heati	ng syste	em 1								61	(206)
Efficien	cy of s	econda	ry/supple	ementar	y heatin	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ar
Space h			ement (c					<u> </u>					,	
	Ť		2426.28			0	0	0	0	1600.79	2312.08	3030.82		
(211)m =	- {[(98)	m x (20		00 ± (20	16)			l.					l	(211)
· / —		4228.4	3977.51		1823.6	0	0	0	0	2624.25	3790.3	4968.55		(=)
									l (kWh/yea				29224.4	(211)
Chanal	booting	fuel (e		.) IAMb/	manth					, ,	/15,1012		20224.4	(=,
= {[(98)m		`	econdar	, , .	month									
(215)m=	0	0	00 + (20	0	0	0	0	0	0	0	0	0		
(213)111=	<u> </u>			Ū			U	_	l (kWh/yea	,		-	0	(215)
187 4 1								1010	(100011) 900) — 5	15,1012		0	(213)
Water he	_	40 4 6004	han (aala	ام ام معمار										
Output fr		ter near 412.22	445.02	415.7	419.52	310	308.32	323.71	318.56	430.24	433.84	456.41		
Efficienc				. 10.1		1 3.0	550.02	1 0-0.7	1 0.000	.50.27	.50.04	.50.71	E 1	(216)
_	-			E0 74	E7 00	E4	EA	E4	E4	E0 E7	E0 47	EO 47	51	
	59.47	59.4	59.2	58.74	57.89	51	51	51	51	58.57	59.17	59.47		(217)
Fuel for (219)m =		-												
(219)m= 7		694.03	- (∠17) 751.71	707.67	724.67	607.83	604.54	634.72	624.62	734.61	733.25	767.42		
, -			• •			L			I = Sum(2			<u> </u>	8361.71	(219)
										7112			0001.71	(213)

Annual totals		kWh/year	kWh/year		
Space heating fuel used, main system 1				29224.4	
Water heating fuel used				8361.71	
Electricity for pumps, fans and electric keep-hot					
central heating pump:		[156		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		201	(231)
Electricity for lighting				1176.93	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				_
	Energy	Emission fact	or	Emissions	;
	kWh/year	kg CO2/kWh		kg CO2/ye	
Space heating (main system 1)	.	kg CO2/kWh	=	kg CO2/ye	
Space heating (main system 1) Space heating (secondary)	kWh/year		=		ar ¬
	kWh/year (211) x	0.216		6312.47	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216	=	6312.47	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	0.216	=	6312.47 0 1806.13	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	6312.47 0 1806.13 8118.6	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	=	6312.47 0 1806.13 8118.6 104.32	(261) (263) (264) (265) (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216 0.519 0.519	=	6312.47 0 1806.13 8118.6 104.32 610.83	(261) (263) (264) (265) (267) (268)

Property Details: Flat 4

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015 Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

 Basement floor
 55.52 m²
 3.1 m

 Floor 1
 83.55 m²
 2.6 m

 Floor 2
 85.82 m²
 3.28 m

Living area: 41.96 m² (fraction 0.187)

Front of dwelling faces: Unspecified

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			Wood
W1	SAP 2012	Windows	Single-glazed	No	
W2	Manufacturer	Windows	Single-glazed	No	
W3	SAP 2012	Windows	Single-glazed	No	
W3	Manufacturer	Windows	low-E, $En = 0.2$, hard coat	No	
RF1	Manufacturer	Roof Windows	low-E, $En = 0.2$, hard coat	No	PVC-U

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
W1		0.7	0.85	4.5	1.5	3
W2		0.7	0.85	1.5	5	2
W3		0.7	0.85	4.5	1.8	2
W3	16mm or more	0.7	0.85	1.5	6.25	1

W3 RF1	16mm or more 16mm or more	0.7 0.7	0.85 0.65	1.5 1.5	6.25 3.45	1 1
Name:	Type-Name:	Location:	Orient:		Width:	Height:
D1	Type Name.	corridor	Orient.		1	2.1
W1		External wall GF	South		1	1.5
1440		E	N		•	0.5

W2 External wall GF 2 2.5 North W3 External wall North 1 1.8 W3 External wall GF West 2.5 2.5 RF1 flat roof Horizontal 2.3 1.5

Overshading: More than average

Opaque Elements

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa:

External Elements							
Basement wall	76.26	0	76.26	0.25	0	False	N/A
External wall GF	80.4	20.75	59.65	0.45	0	False	N/A
corridor GF	13.266	0	13.27	0.25	0.9	False	N/A
Coprridor FF	9.84	0	9.84	0.25	0.9	False	N/A
External FF	69.864	0	69.86	0.45	0	False	N/A
flat roof 1	6	0	6	0.2	0		N/A
Flat roof 2	28.23	0	28.23	0.2	0		N/A
flat roof 3	12.9	0	12.9	0.2	0		N/A
Basement floor	55.52			0.25			N/A
ground floor	28.03			0.25			N/A
Internal Elements							
Party Elements							
party wall Basement	24.18						N/A
party GF	43.684						N/A
Party wall FF	67.24						N/A

Т	hermal	brio	aes:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: No (Assumed)

Ventilation:Natural ventilation (extract fans)Number of chimneys:1 (main: 0, secondary: 0, other: 1)

Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 4

Pressure test:

Main heating system:

Main heating system:

Boiler systems with radiators or underfloor heating

15

Gas boilers and oil boilers Fuel: mains gas Info Source: SAP Tables SAP Table: 115 Wall mounted

Systems with radiators

Design flow temperature: Unknown

Open

Boiler interlock: Yes

Main heating Control:

Main heating Control: No time or thermostatic control of room temperature

Control code: 2101

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas Hot water cylinder

Cylinder volume: 250 litres Cylinder insulation: Factory 15 mm

Primary pipework insulation: False

Cylinderstat: False

Cylinder in heated space: False

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

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



			User Details:					
Assessor Name:			Stro	na Num	ber:			
Software Name:	Stroma FSAP 2	2012	Soft	vare Ve	rsion:	Versio	n: 1.0.1.24	
		Pro	perty Addres	s: Flat 4				
Address :								
1. Overall dwelling dimens	ions:							
Basement			Area(m²) 55.52	(1a) x	Av. Height(r	m) (2a) =	Volume(m ³	(3a)
Ground floor				_		_		=
			83.55	(1b) x	2.6	(2b) =	217.23	(3b)
First floor	(41.) (4.) (4.1)	<i>(4.)</i>	85.82	(1c) x	3.28	(2c) =	281.49	(3c)
Total floor area TFA = (1a)+	-(1b)+(1c)+(1d)+	·(1e)+(1n)	224.89	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)	+(3n) =	670.83	(5)
2. Ventilation rate:			- 41		4-4-1		2	
	main heating	secondary heating	other		total		m³ per hou	ır
Number of chimneys	0 +	0	+ 1	=	1	x 40 =	40	(6a)
Number of open flues	0 +	0	+ 0	= [0	x 20 =	0	(6b)
Number of intermittent fans					4	x 10 =	40	(7a)
Number of passive vents					0	x 10 =	0	(7b)
Number of flueless gas fires	5				0	x 40 =	0	(7c)
						Air ch	anges per ho	our
In filtration along to a bigg a second	fl	(60) (6b) (70)) (7b) (7o) -			,	_	_
Infiltration due to chimneys, If a pressurisation test has been				e continue fi	80 rom (9) to (16)	÷ (5) =	0.12	(8)
Number of storeys in the		.,	(//		() ()		0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timb	oer frame or 0	.35 for masc	nry const	ruction		0	(11)
if both types of wall are prese		erresponding to the	he greater wall a	rea (after		•		
deducting areas of openings, If suspended wooden floo		sealed) or 0.1	(sealed) els	e enter 0			0	(12)
If no draught lobby, enter	•	ŕ	(ocalou), old	0 011101 0			0	(13)
Percentage of windows a							0	(14)
Window infiltration	3		0.25 - [0.2 x (14) ÷	100] =		0	(15)
Infiltration rate			(8) + (1	0) + (11) + (12) + (13) + (15) =	=	0	(16)
Air permeability value, q5	0. expressed in	cubic metres	per hour per	square m	netre of envelo	ppe area	15	(17)
If based on air permeability	•			•			0.87	(18)
Air permeability value applies if	a pressurisation tes	t has been done	or a degree air	permeability	is being used			`
Number of sides sheltered							4	(19)
Shelter factor			(20) = 1	- [0.075 x (19)] =		0.7	(20)
Infiltration rate incorporating	shelter factor		(21) = (18) x (20) =			0.61	(21)
Infiltration rate modified for	monthly wind sp	eed						
Jan Feb Ma	ar Apr M	ay Jun	Jul Aug	g Sep	Oct No	ov Dec		
Monthly average wind spee	d from Table 7							

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (22a)m = (22)m -	- 4									
(22a)m= 1.27 1.25 1.23	T T	08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltration rate (allow	ing for shelte	ar and wind s	need) –	(21a) v i	(22a)m	•		•	•	
0.78 0.76 0.75		65 0.58	0.58	0.56	0.61	0.65	0.68	0.71]	
Calculate effective air change		applicable ca	ise	<u> </u>		!		ļ	J 	
If mechanical ventilation:	" 1 (22)	(00.) = (.=	. (22)	\ (22.)				0 (23a)
If exhaust air heat pump using App						o) = (23a)				0 (23b)
If balanced with heat recovery: effi	-	_				Ob.\ma . (00h) [/	1 (00.5)	. 4001	0 (23c)
a) If balanced mechanical v	 	n neat recov	ery (MVF	1R) (24a 0	0 = (2.0)	2b)m + (. 0	23b) x [*	1 – (23c) 0	i ÷ 100]]	(24a)
b) If balanced mechanical v	<u> </u>								J	(244)
$\frac{\text{(24b)m}}{\text{(24b)m}} = 0 \qquad 0 \qquad 0$			0	0	0	0	0	0	1	(24b)
c) If whole house extract ve					utside				J	` ,
if $(22b)m < 0.5 \times (23b)$,	•	•				.5 × (23b)			
(24c)m= 0 0 0	0	0 0	0	0	0	0	0	0		(24c)
d) If natural ventilation or w	•	•						•		
if (22b)m = 1, then (24d	<u>, , , , , , , , , , , , , , , , , , , </u>	· ·	<u> </u>		•	_			1	(2.4.0)
(24d)m= 0.8 0.79 0.78		71 0.67	0.67	0.66	0.69	0.71	0.73	0.76		(24d)
Effective air change rate - e		· ·	· `		, ,	1 0 74	0.70		1	(05)
(25)m= 0.8 0.79 0.78	0.72 0.	71 0.67	0.67	0.66	0.69	0.71	0.73	0.76	l	(25)
3. Heat losses and heat loss						_				
3. Heat losses and Heat loss	parameter:						_			
ELEMENT Gross area (m²)	Openings m ²	Net Ar A ,ı		U-valu W/m2		A X U (W/I	〈)	k-value kJ/m²-l		A X k kJ/K
ELEMENT Gross	Openings						<) 			
ELEMENT Gross area (m²)	Openings	Α ,ι	m ² x	W/m2	K =	(W/I	<) 			kJ/K
ELEMENT Gross area (m²) Doors	Openings	A ,ı	m² x x x1/	W/m2 2	0.04] =	4.2	<) 			kJ/K (26)
ELEMENT Gross area (m²) Doors Windows Type 1	Openings	2.1 ₂	m ² x x 1/1 x 1/1	W/m2 2 /[1/(4.5)+	0.04] = 0.04] =	4.2 5.72	<) 			kJ/K (26) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2	Openings	A ,1 2.1 1.5 5	x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] =	(W/I 4.2 5.72 7.08	<) 			(26) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3	Openings	A ,1 2.1 1.5 5	x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 5.72 7.08 6.86	<)			kJ/K (26) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Openings	A ,1 2.1 1.5 5 1.8 6.25	x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 5.72 7.08 6.86 8.84	\$) 			kJ/K (26) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights	Openings	A ,1 2.1 1.5 5 1.8 6.25 3.45	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175				kJ/K (26) (27) (27) (27) (27) (27b)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1	Openings	A ,1 2.1 1.5 5 1.8 6.25 3.45	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88				(26) (27) (27) (27) (27) (27b) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2	Openings m ²	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03	x1/ x1/ x1/ x1/ x1/ 2 x 3 x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.25 0.25	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075				kJ/K (26) (27) (27) (27) (27) (27b) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type 1 76.26	Openings m ²	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075				kJ/K (26) (27) (27) (27) (27) (27b) (28) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 80.4	Openings m² 0 20.75	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26	x1/x1/x1/x2/x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25 0.45	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 13.27	0 20.75	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 13.27	x1/x1/x1/x1/x2/x x1/x2/x x1/x2	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.25 0.25 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71				kJ/K (26) (27) (27) (27) (27) (27b) (28) (28) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type4 9.84	0 20.75 0	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.00 76.26 13.27	x1/x1/x1/x1/x2/x x1/x2/x x1/x2	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.25 0.25 0.25 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type4 Walls Type4 Walls Type5 69.86	0 20.75 0 0	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 59.66 13.27 9.84	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25 0.45 0.2 0.45	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01 31.44				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 Walls Type4 G9.86 Roof Type1 6	0 20.75 0 0	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 13.27 9.84 69.86	x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[0.25 0.25 0.25 0.45 0.2 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01 31.44 1.2				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 Walls Type4 G9.86 Roof Type1 G 6 Roof Type2 Roof Type3 Roof Type2 Roof Type2 Roof Type3 Roof Type2 Roof Type3 Roof Type2 Roof Type3 Roof Type4 Roof Type2 Roof Type4 R	0 20.75 0 0 0	A , r 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 13.27 9.84 69.86 28.23	x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25 0.25 0.45 0.2 0.2 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01 31.44 1.2 5.65				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (30) (30)

Party wall													
Party wall	Party wall				24.18	3 x	0	=	0	\neg \vdash			(32)
*for vivindows and roof windows, use effective window U-value calculated using formula 1/(1/U-value)+0.0/fj as given in paragraph 3.2 ** include the areas on both sides of internal valls and partitions Fabric heat Ioss, W/K = S (A x k) Heat capacity Cm = S(A x k) ** (28)(30) + (32) = \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Party wall				43.68	3 x	0	<u> </u>	0	Ħ Ē		1 =	(32)
Fabric heat loss, W/K = S (A x U) (28)(30) + (32) =	Party wall				67.24	x x	0	<u> </u>	0	Ħ Ē		1 =	(32)
Heat capacity Cm = S(A x k)						ated using	formula 1	/[(1/U-valu	e)+0.04] a	s given in	paragraph	3.2	_
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Fabric heat loss, W/K =	S (A x	U)				(26)(30)	+ (32) =				175.34	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 17 can be used instead of a detailed calculation. Thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly Ventilation heat loss calculated monthly Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= (37) Heat transfer coefficient, W/K (38)m= (37) (38) (38) (38) (38) (38) (38) (38) (38	Heat capacity Cm = S(A	Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0	(34)
Thermal bridgings: S (1 x Y) calculated using Appendix K (39) it details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly (38) m = 0.33 x (25) m x (6) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Nov Dec Nov Nov	Thermal mass paramete	er (TMF	P = Cm ÷	-TFA) ir	n kJ/m²K			Indica	tive Value:	Medium	ĺ	250	(35)
Total fabric heat loss calculated monthly (38) = 0.15 x(31) (33) + (36) = (233.76 (37) (37) (38) (ŭ			constructi	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	ible 1f		
Ventilation heat loss calculated monthly (38)	Thermal bridges : S (L)	x Y) cal	culated i	using Ap	pendix l	<						58.42	(36)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 177.31 174.72 172.19 160.27 158.05 147.67 145.75 151.67 158.05 162.55 167.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (411.07 408.48 405.95 394.04 391.81 381.43 381.43 379.51 385.43 391.81 396.32 401.03 Average = Sum(39) - v/12 394.03 394.04 391.81 381.43 381.43 379.51 385.43 391.81 396.32 401.03 Heat loss parameter (HLP), W/m²K (40)m = (38)m + (40) 40.00		are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)		ı		–
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		ام مامده	را ملامر م مص					` '	` '	OF) ·- (F)	l	233.76	(37)
177.31 174.72 172.19 160.27 158.05 147.67 147.67 145.75 151.67 158.05 162.55 167.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m 411.07 408.48 405.95 394.04 391.81 381.43 381.43 379.51 385.43 391.81 396.32 401.03 Average = Sum(39) /12=		1			1	11	۸				Daa		
Heat transfer coefficient, W/K (39)m = (411.07	 			,	-	-	Ť	<u> </u>					(38)
Heat loss parameter (HLP), W/m²K Separameter	` '		100.27	100.00	147.07	147.07	140.70	l .			107.27		(00)
Average = Sum(39)y/12\(\) 394.03 (39)			304.04	301.81	381 //3	381 //3	370 51				401.03		
Heat loss parameter (HLP), W/m²K (40)m= 1.83	(33)1112 411.07 400.40	403.93	334.04	391.01	301.43	301.43	379.51					394.03	(39)
Average Sum(40) /12 /12 /14 /	Heat loss parameter (H	LP), W/	m²K						_			00.000	
Manual average hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	(40)m= 1.83 1.82	1.81	1.75	1.74	1.7	1.7	1.69	1.71	1.74	1.76	1.78		
4. Water heating energy requirement: KWh/year:	Number of days in mon	th (Tabl	e 1a)					•	Average =	Sum(40) _{1.}	.12 /12=	1.75	(40)
4. Water heating energy requirement: Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₋₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₋₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₋₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₋₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) _{1.12} = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) _{1.12} = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	4. Water heating energ	gy requi	rement:								kWh/ye	ear:	
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) _{1.12} = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) _{1.12} = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Assumed occupancy, N	I								3.	03		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	if TFA > 13.9 , N = $1 +$		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.				` ,
not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	•	ter usag	je in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		106	6.26		(43)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	•		0 ,		•	•	to achieve	a water us	se target o	,			
(44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 \text{ kWh/month}$ (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Hot water usage in litres per o	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35	(44)m= 116.89 112.64	108.39	104.14	99.89	95.64	95.64	99.89	104.14	108.39	112.64	116.89		
Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Energy content of hot water u	ısed - cald	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600					1275.17	(44)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)			136 30	130.87	112.93	104.65	120.09	121.52	141.62	154.59	167.88		
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	(45)m= 173.35 151.61	156.45	130.33										
Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	` ' L L			hot water	r storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	:	1671.95	(45)
	If instantaneous water heating	g at point	of use (no		· ·	1	,) to (61)		, ,		1671.95	
	If instantaneous water heating (46)m= 26 22.74 Water storage loss:	g at point 23.47	of use (no 20.46	19.63	16.94	15.7	18.01) to (61) 18.23	21.24	23.19	25.18	1671.95	(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	If instantaneous water heating (46)m= 26 22.74 Water storage loss: Storage volume (litres)	g at point 23.47 includin	of use (no 20.46 g any so	19.63 olar or W	16.94 /WHRS	15.7 storage	18.01) to (61) 18.23	21.24	23.19	25.18	1671.95	(46)

A Framework Community	Water storage loss:				
Energy lost from water storage, kWh/year	•		0		(48)
b) fi manufacturer's declared cylinder loss factor is not known:	Temperature factor from Table 2b		0		(49)
Hot water storage loss factor from Table 2 (kWhVlitre/day) 10.03 0.78 0	Energy lost from water storage, kWh/year (48)	x (49) =	250		(50)
From the learning see section 4.3 Solution Soluti	·				
Volume factor from Table 2a	· · · · · · · · · · · · · · · · · · ·		0.03		(51)
Temperature factor from Table 2b Energy Jost from water storage, kWh/year (47) x (51) x (52) x (53) =	, ,		0.70		(52)
Energy lost from water storage, kWh/year					
Enter (50) or (54) in (55) Water storage loss calculated for each month	·	y (51) y (52) y (53) =			, ,
Water storage loss calculated for each month ((56)m= (65) x (41)m ((56)m= (66) x (41) x (56)m= (65) x (41)m ((56)m= (66) x (45, 13) x (160, 68) x (155, 49) x (160, 68) x (150, 49) x (150		X (01) X (02) X (00) =			` '
It cylinder contains dedicated solar storage, (57)m = (56)m x ([50) - [4111)] + (50), else (57)m = (56)m x where (1111) is from Appendix H (57)m = (60.68 145.13 160.68 155.49 160.68 150.68 150.68		$m = (55) \times (41) m$	0.10		(00)
It cylinder contains dedicated solar storage, (57)m = (56)m x ([50) - [4111]) + (50), else (57)m = (56)m x where (1111) is from Appendix H (57)m = (66)8	(56)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 160	0.68 155.49 160.68	155.49 160.68		(56)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (69)m 128.38 115.95 128.38 124.24 128.38 141.92 43.31 43.31 43.31 41.92 128.38 124.24 128.38 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	` '			ix H	
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (69)m 128.38 115.95 128.38 124.24 128.38 141.92 43.31 43.31 41.92 128.38 124.24 128.38 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m (61)m (61)m (61)m (61)m (61)m (61)m (61)m (61)m (62)m (61)m (62)m	(57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 160	0.68 155.49 160.68	155.49 160.68		(57)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat). (59)m = 128.38 115.95 128.38 124.24 128.38 144.92 143.31 43.31 41.92 128.38 124.24 128.38 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (61) Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (64)m + (62)m + 462.4 126.99 445.5 416.12 419.93 310.34 308.64 324.08 318.93 430.67 434.32 456.93 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter 0* if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Primary circuit loss (annual) from Table 3	•	0		(58)
(69) 128.38 115.95 128.38 124.24 128.38 41.92 43.31 43.31 41.92 128.38 124.24 128.38 (59)	, ,	(41)m			
Combit loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(modified by factor from Table H5 if there is solar water heating a	nd a cylinder thermo	stat)		
(61) me 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(59)m= 128.38 115.95 128.38 124.24 128.38 41.92 43.31 43	.31 41.92 128.38	124.24 128.38		(59)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 462.4	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m				
(62) 62 462.4 412.69 445.5 416.12 419.93 310.34 308.64 324.08 318.93 430.67 434.32 456.93 (62)	(61)m= 0 0 0 0 0 0 0	0 0	0 0		(61)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Total heat required for water heating calculated for each month (62)	$m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m	
(add additional lines if FCHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(62)m= 462.4 412.69 445.5 416.12 419.93 310.34 308.64 324	4.08 318.93 430.67	434.32 456.93		(62)
(63)m=	Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (er	ter '0' if no solar contribut	on to water heating)		
Output from water heater (64)m= 462.4 412.69 445.5 416.12 419.93 310.34 308.64 324.08 318.93 430.67 434.32 456.93 Output from water heater (annual)	(add additional lines if FGHRS and/or WWHRS applies, see Appen-	dix G)			
(64)m= 462.4 412.69 445.5 416.12 419.93 310.34 308.64 324.08 318.93 430.67 434.32 456.93 Coultivate from water heater (annual)	(63)m= 0 0 0 0 0 0	0 0	0 0		(63)
Coulout from water heater (annual) Land	Output from water heater				
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m= 160.34 143.17 154.72 144.74 146.22 71.08 69.45 74.58 73.94 149.79 150.79 158.52 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 182.06 182.	(64)m= 462.4 412.69 445.5 416.12 419.93 310.34 308.64 324	4.08 318.93 430.67	434.32 456.93		_
(65)m=		Output from water heater	r (annual) ₁₁₂	4740.55	(64)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 182.06 182	Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (6)	61)m] + 0.8 x [(46)m	+ (57)m + (59)m]	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 182.06 182.0	(65)m= 160.34 143.17 154.72 144.74 146.22 71.08 69.45 74	.58 73.94 149.79	150.79 158.52		(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 182.06	include (57)m in calculation of (65)m only if cylinder is in the dwel	ling or hot water is fr	om community h	eating	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	5. Internal gains (see Table 5 and 5a):				
(66)m= 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 94.19 83.66 68.04 51.51 38.5 32.51 35.12 45.65 61.28 77.8 90.81 96.81 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 588.25 594.35 578.97 546.22 504.89 466.03 440.08 433.98 449.36 482.1 523.44 562.29 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 66.9	Metabolic gains (Table 5), Watts				
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 94.19 83.66 68.04 51.51 38.5 32.51 35.12 45.65 61.28 77.8 90.81 96.81 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 588.25 594.35 578.97 546.22 504.89 466.03 440.08 433.98 449.36 482.1 523.44 562.29 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 66.9	Jan Feb Mar Apr May Jun Jul A	ug Sep Oct	Nov Dec		
(67)m= 94.19 83.66 68.04 51.51 38.5 32.51 35.12 45.65 61.28 77.8 90.81 96.81 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 588.25 594.35 578.97 546.22 504.89 466.03 440.08 433.98 449.36 482.1 523.44 562.29 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 56.24 <td>(66)m= 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06</td> <td>2.06 182.06 182.06</td> <td>182.06 182.06</td> <td></td> <td>(66)</td>	(66)m= 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06	2.06 182.06 182.06	182.06 182.06		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m=	Lighting gains (calculated in Appendix L, equation L9 or L9a), also	see Table 5			
(68)m= 588.25 594.35 578.97 546.22 504.89 466.03 440.08 433.98 449.36 482.1 523.44 562.29 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 (69)	(67)m= 94.19 83.66 68.04 51.51 38.5 32.51 35.12 45	.65 61.28 77.8	90.81 96.81		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 (69)	Appliances gains (calculated in Appendix L, equation L13 or L13a),	also see Table 5			
(69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 (69)	(68)m= 588.25 594.35 578.97 546.22 504.89 466.03 440.08 433	3.98 449.36 482.1	523.44 562.29		(68)
	Cooking gains (calculated in Appendix L, equation L15 or L15a), als	so see Table 5			
Pumps and fans gains (Table 5a)	(69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56	.24 56.24 56.24	56.24 56.24		(69)
	Pumps and fans gains (Table 5a)				
(70)m =	(70)m= 0 0 0 0 0 0 0	0 0	0 0		(70)

Losses	e.g. e	vaporation	(negat	ive valu	es) (Tal	ole	5)								_		
(71)m=	-121.37	-121.37 -	-121.37	-121.37	-121.37	-1	21.37	-121.37	-121	1.37	-121.37	-121.3	7 -121.37	-121.37			(71)
Water h	eating	gains (Ta	ble 5)												_		
(72)m=	215.51	213.05	207.96	201.03	196.53	9	8.73	93.34	100).24	102.69	201.3	3 209.43	213.07			(72)
Total in	terna	l gains =					(66)	m + (67)m	+ (68	8)m +	(69)m + (7	70)m +	(71)m + (72)m	_		
(73)m=	1014.87	1007.99	971.89	915.68	856.84	7	14.19	685.47	696	6.8	730.25	878.1	7 940.61	989.09			(73)
6. Sola	Ť																
_		calculated us	•	r flux from	Table 6a	and		•	tions	to con	vert to the	e applic		tion.			
Orientat		Access Fa Table 6d	ctor	Area m²			Flu	x ole 6a			g_ ıble 6b		FF Table 6c			iins (W)	
NI d		Table ou							1		ible on	_	rable oc			· ,	_
North	0.9x	1	×	5		X		0.63	X		0.85	×	0.7	=		56.94	(74)
North	0.9x	0.54	X	1.	8	X	1	0.63	Х		0.85	×	0.7	=		11.07	(74)
North	0.9x	1	X	5		X	2	0.32	X		0.85	X	0.7	=		108.82	(74)
North	0.9x	0.54	X	1.	8	X	2	0.32	X		0.85	X	0.7	=		21.15	(74)
North	0.9x	1	X	5		X	3	4.53	X		0.85	X	0.7	=		184.91	(74)
North	0.9x	0.54	X	1.	8	X	3	4.53	X		0.85	X	0.7	=		35.95	(74)
North	0.9x	1	X	5		X	5	5.46	/ X		0.85	X	0.7			297.01	(74)
North	0.9x	0.54	X	1.	8	Х	5	5.46	Х		0.85	X	0.7	=		57.74	(74)
North	0.9x	1	X	5		X	7	4.72	x		0.85	X	0.7	=		400.1	(74)
North	0.9x	0.54	X	1.	8	X	7	4.72	X		0.85	X	0.7	=		77.78	(74)
North	0.9x	1	X	5		X	7	9.99	х		0.85	X	0.7	=		428.32	(74)
North	0.9x	0.54	X	1.	В	x	7	9.99	Х		0.85	X	0.7	=		83.27	(74)
North	0.9x	1	X	5		Х	7	4.68	x		0.85	X	0.7	=		399.89	(74)
North	0.9x	0.54	X	1.	8	X	7	4.68	X		0.85	X	0.7	=		77.74	(74)
North	0.9x	1	X	5	;	X	5	9.25	X		0.85	X	0.7	=		317.26	(74)
North	0.9x	0.54	X	1.	8	X	5	9.25	X		0.85	X	0.7	=		61.68	(74)
North	0.9x	1	X	5		X	4	1.52	X		0.85	X	0.7	=		222.32	(74)
North	0.9x	0.54	X	1.	8	X	4	1.52	x		0.85	X	0.7	=		43.22	(74)
North	0.9x	1	X	5		X	2	4.19	x		0.85	x	0.7	=		129.53	(74)
North	0.9x	0.54	X	1.	8	X	2	4.19	x		0.85	X	0.7	=		25.18	(74)
North	0.9x	1	X	5	;	X	1	3.12	х		0.85	x	0.7	=		70.25	(74)
North	0.9x	0.54	X	1.	8	X	1	3.12	x		0.85	x	0.7	=		13.66	(74)
North	0.9x	1	x	5		X	8	3.86	x		0.85	×	0.7			47.47	(74)
North	0.9x	0.54	x	1.	В	X	8	3.86	x		0.85	x	0.7	 =		9.23	(74)
South	0.9x	0.3	x	1.	5	X	4	6.75	х		0.85	x	0.7	<u> </u>		33.8	(78)
South	0.9x	0.3	x	1.	5	X	7	6.57	x		0.85	X	0.7	=		55.35	(78)
South	0.9x	0.3	x	1.	5	X	9	7.53	x		0.85	X	0.7	=		70.51	(78)
South	0.9x	0.3	x	1.	5	x	1	10.23	x		0.85	X	0.7			79.69	(78)
South	0.9x	0.3	x	1.	5	X	1	14.87	x		0.85	X	0.7			83.04	(78)

110.55

0.85

0.7

South

0.9x

79.92

(78)

South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 78.08 South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 75.83 South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 73.66 South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 59.7 South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 128.59	(78) (78) (78) (78) (78) (78) (80) (80) (80)
South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 73.66 South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 59.7 South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x <td>(78) (78) (78) (78) (80) (80) (80)</td>	(78) (78) (78) (78) (80) (80) (80)
South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 59.7 South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(78) (78) (78) (80) (80) (80)
South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(78) (78) (80) (80) (80)
South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(78) (80) (80) (80)
West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(80) (80) (80)
West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(80)
West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(80)
West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	== ` `
W	(80)
West 0.9x 1 x 6.25 x 113.09 x 0.85 x 0.7 = 378.51	
	(80)
West 0.9x 1 x 6.25 x 115.77 x 0.85 x 0.7 = 387.47	(80)
West 0.9x 1 x 6.25 x 110.22 x 0.85 x 0.7 = 368.89	(80)
West 0.9x 1 x 6.25 x 94.68 x 0.85 x 0.7 = 316.87	(80)
West 0.9x 1 x 6.25 x 73.59 x 0.85 x 0.7 = 246.29	(80)
West 0.9x 1 x 6.25 x 45.59 x 0.85 x 0.7 = 152.58	(80)
West 0.9x 1 x 6.25 x 24.49 x 0.85 x 0.7 = 81.96	(80)
West 0.9x 1 x 6.25 x 16.15 x 0.85 x 0.7 = 54.06	(80)
Rooflights 0.9x 1 x 3.45 x 26 x 0.65 x 0.7 = 36.73	(82)
Rooflights 0.9x 1 x 3.45 x 54 x 0.65 x 0.7 = 76.29	(82)
Rooflights 0.9x 1 x 3.45 x 96 x 0.65 x 0.7 = 135.63	(82)
Rooflights 0.9x 1 x 3.45 x 150 x 0.65 x 0.7 = 211.92	(82)
Rooflights 0.9x 1 x 3.45 x 192 x 0.65 x 0.7 = 271.25	(82)
Rooflights 0.9x 1 x 3.45 x 200 x 0.65 x 0.7 = 282.55	(82)
Rooflights 0.9x 1 x 3.45 x 189 x 0.65 x 0.7 = 267.01	(82)
Rooflights 0.9x 1 x 3.45 x 157 x 0.65 x 0.7 = 221.81	(82)
Rooflights 0.9x 1 x 3.45 x 115 x 0.65 x 0.7 = 162.47	(82)
Rooflights 0.9x 1 x 3.45 x 66 x 0.65 x 0.7 = 93.24	(82)
Rooflights 0.9x 1 x 3.45 x 33 x 0.65 x 0.7 = 46.62	(82)
Rooflights 0.9x 1 x 3.45 x 21 x 0.65 x 0.7 = 29.67	(82)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 204.28 390.2 638.76 955.21 1210.69 1261.53 1191.62 993.44 747.96 460.24 252.55 169.63	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 1219.15 1398.2 1610.65 1870.89 2067.53 1975.72 1877.09 1690.24 1478.21 1338.41 1193.16 1158.72	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 1 1 0.99 0.98 0.94 0.86 0.74 0.8 0.95 0.99 1 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 18.9 19.07 19.4 19.9 20.36 20.72 20.89 20.85 20.52 19.96 19.38 18.91	(87)
25.7	()

Tampagatura during hapting pariodo in root of duralling from Toble O	'h2 /9C\	
Temperature during heating periods in rest of dwelling from Table 9, (88)m= 20.09 20.09 20.1 20.12 20.13 20.15 20.15 20.16	n2 (°C) 20.14 20.13 20.12 20.11	(88)
	20.14 20.13 20.12 20.11	(00)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		(00)
(89)m= 1 1 0.99 0.97 0.92 0.82 0.65 0.72	0.92 0.98 1 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 t	7 in Table 9c)	
(90)m= 18.13 18.3 18.63 19.15 19.6 19.96 20.1 20.08	19.78 19.22 18.63 18.15	(90)
	fLA = Living area ÷ (4) =	0.19 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 -$	_A) × T2	
(92)m= 18.27 18.44 18.78 19.29 19.75 20.1 20.25 20.22	19.92 19.36 18.77 18.29	(92)
Apply adjustment to the mean internal temperature from Table 4e, w	ere appropriate	
(93)m= 18.87 19.04 19.38 19.89 20.35 20.7 20.85 20.82	20.52 19.96 19.37 18.89	(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table	b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a		
Jan Feb Mar Apr May Jun Jul Au	Sep Oct Nov Dec	
Utilisation factor for gains, hm: (94)m=	0.93 0.98 1 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	0.93	(34)
(95)m= 1215.64 1391.29 1593.8 1819.81 1920.33 1675.13 1364.5 1328.4	1381.06 1316.9 1187.63 1156.03	(95)
Monthly average external temperature from Table 8	1001.00 110.00 110.00	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)		
	2473.17 3666.26 4861.58 5892.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(9	')m – (95)m] x (41)m	
Space heating requirement for each month, kWh/month = 0.024 x [(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0	7)m - (95)m] x (41)m 0 1747.92 2645.24 3524.14	
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0	0 1747.92 2645.24 3524.14	0017.52 (98)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 T	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20	0017.52 (98) 89.01 (99)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 T Space heating requirement in kWh/m²/year	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20	
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 T Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20	
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 T Space heating requirement in kWh/m²/year	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20	
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 The space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including microscopic Space heating: Fraction of space heat from secondary/supplementary system	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20	89.01 (99)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) =	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP)	0 (201) 1 (202)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 The space heating requirement in kWh/m²/year 9a. Energy requirements — Individual heating systems including microstation of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) =	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) =	0 (201) 1 (202) 1 (204)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) =	0 (201) 1 (202) 1 (204) 61 (206)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, %	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] =	0 (201) 1 (202) 1 (204) 61 (206) 0 (208)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) =	0 (201) 1 (202) 1 (204) 61 (206)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Space heating requirement (calculated above)	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = Sep Oct Nov Dec	0 (201) 1 (202) 1 (204) 61 (206) 0 (208)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements — Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Au Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] =	0 (201) 1 (202) 1 (204) 61 (206) 0 (208) kWh/year
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul August Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 (211)m = {[(98)m x (204)] } x 100 ÷ (206)	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = Sep Oct Nov Dec 0 1747.92 2645.24 3524.14	0 (201) 1 (202) 1 (204) 61 (206) 0 (208)
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Au Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 5822.59 4831.74 4431.64 2961.29 1789.16 0 0 0	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = 2045.24 3524.14 0 1747.92 2645.24 3524.14	0 (201) 1 (202) 1 (204) 61 (206) 0 (208) kWh/year
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Au Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 5822.59 4831.74 4431.64 2961.29 1789.16 0 0 0	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = 2045.24 3524.14 0 1747.92 2645.24 3524.14	0 (201) 1 (202) 1 (204) 61 (206) 0 (208) kWh/year
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Au Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 5822.59 4831.74 4431.64 2961.29 1789.16 0 0 0 T Space heating fuel (secondary), kWh/month	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = 2045.24 3524.14 0 1747.92 2645.24 3524.14	0 (201) 1 (202) 1 (204) 61 (206) 0 (208) kWh/year
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 The space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including microstation of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aur Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 5822.59 4831.74 4431.64 2961.29 1789.16 0 0 0 The space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)	0 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = Sep Oct Nov Dec 0 1747.92 2645.24 3524.14 0 2865.45 4336.46 5777.28 al (kWh/year) = Sum(211) _{15,1012} = 32	0 (201) 1 (202) 1 (204) 61 (206) 0 (208) kWh/year
(98)m= 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 T Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including microscopy of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = Fraction of total heating from main system 1 (204) = Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aur Space heating requirement (calculated above) 3551.78 2947.36 2703.3 1806.39 1091.38 0 0 0 (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 1747.92 2645.24 3524.14 al per year (kWh/year) = Sum(98) _{15,912} = 20 CHP) - (201) = 202) × [1 - (203)] = 2045.24 3524.14 0 1747.92 2645.24 3524.14	0 (201) 1 (202) 1 (204) 61 (206) 0 (208) kWh/year

Output from water heater (calculated a	bove)		,					•	-	
462.4 412.69 445.5 416.12	419.93	310.34	308.64	324.08	318.93	430.67	434.32	456.93		٦
Efficiency of water heater	T 57.05 T					F0.70		T 50.00	51	(216
(217)m= 59.65 59.57 59.35 58.84	57.85	51	51	51	51	58.72	59.36	59.66]	(217
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$									_	
(219)m= 775.15 692.83 750.59 707.21	725.91	608.51	605.17	635.44	625.35	733.39	731.69	765.92		_
				Tota	al = Sum(2				8357.18	(219
Annual totals Space heating fuel used, main system	1					k\	Wh/yeaı	r	kWh/year 32815.61	٦
Water heating fuel used									8357.18	1
Electricity for pumps, fans and electric	keep-hot									_
central heating pump:								156	1	(230
boiler with a fan-assisted flue								45	j	(230
Total electricity for the above, kWh/yea	ar			sum	of (230a).	(230g) =			201	(231
Electricity for lighting									665.36	(232)
10a. Fuel costs - individual heating sy	vstems:									
		Fu kW	el /h/ye <mark>ar</mark>			Fuel P (Table			Fuel Cost £/year	
Spa <mark>ce he</mark> ating - main system 1		(21	1) x			3.4	8	x 0.01 =	1141.98	(240)
Spa <mark>ce he</mark> ating - mai <mark>n sys</mark> tem 2		(213	3) x			0		x 0.01 =	0	(241)
Space heating - secondary		(21	5) x			13.	19	x 0.01 =	0	(242)
Water heating cost (other fuel)		(219	9)			3.4	8	x 0.01 =	290.83	(247)
Pumps, fans and electric keep-hot		(23	1)			13.	19	x 0.01 =	26.51	(249)
(if off-peak tariff, list each of (230a) to Energy for lighting	(230g) se	parately (232		licable a	nd apply	fuel pri		rding to × 0.01 =	Table 12a 87.76	(250)
Additional standing charges (Table 12))								120	(251
Appendix Q items: repeat lines (253) a	nd (254)	as need	ded							
Total energy cost	(245)(247) + (25	50)(254)	=					1667.09	(255)
11a. SAP rating - individual heating s	ystems									
Energy cost deflator (Table 12)									0.42	(256)
Energy cost factor (ECF)	[(255) x	(256)] ÷ [((4) + 45.0]	=					2.59	(257)
SAP rating (Section 12)									63.81	(258)
		ms incli	ıdina mi	cro-CHF)					
12a. CO2 emissions – Individual heat	ing syste		aanig iiii							
12a. CO2 emissions – Individual heat	ing syste	En	ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	1805.15	(264)
Space and water heating	(261) + (262) + (263) + (264) =			8893.32	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	104.32	(267)
Electricity for lighting	(232) x	0.519	=	345.32	(268)
Total CO2, kg/year	sum o	of (265)(271) =		9342.96	(272)
CO2 emissions per m ²	(272)	÷ (4) =		41.54	(273)
El rating (section 14)				54	(274)

13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	40035.04 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	10195.75 (264)
Space and water heating	(261) + (262) + (263) + (264) =		50230.79 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	617.07 (267)
Electricity for lighting	(232) x	0 =	2042.66 (268)
'Total Primary Energy	sum	of (265)(271) =	52890.53 (272)
Primary energy kWh/m²/year	(272)) ÷ (4) =	235.18 (273)

		User Details:				
Assessor Name:		Stroma Nur	nber:			
Software Name:	Stroma FSAP 2012	Software Ve	ersion:	Versio	n: 1.0.1.24	
	Pr	operty Address: Flat 4				
Address :						
1. Overall dwelling dime	nsions:					
		Area(m²)	Av. Height(m)		Volume(m³)
Basement		55.52 (1a) x	3.1	(2a) =	172.11	(3a)
Ground floor		83.55 (1b) x	2.6	(2b) =	217.23	(3b)
First floor		85.82 (1c) x	3.28	(2c) =	281.49	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n	224.89 (4)				
Dwelling volume		(3a)+(3	8b)+(3c)+(3d)+(3e)+	.(3n) =	670.83	(5)
2. Ventilation rate:						
	main secondary heating heating	, other	total		m³ per hou	r
Number of chimneys		+ 1 =	1 x 4	HO =	40	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 2	20 =	0	(6b)
Number of intermittent far	ns		4 x 1	0 =	40	(7a)
Number of passive vents			0 x 1	0 =	0	(7b)
Number of flueless gas fir	res		0 x 4	10 =	0	(7c)
				Air ch	anges per ho	
				All Cil	anges per no	_
·	ys, flues and fans = (6a)+(6b)+(7a een carried out or is intended, proceed			÷ (5) =	0.12	(8)
Number of storeys in the	•	to (17), otherwise continue	110111 (9) 10 (10)	Г	0	(9)
Additional infiltration	ic dwelling (113)		[(9)-	1]x0.1 =	0	(10)
	25 for steel or timber frame or	0.35 for masonry cons		1,0.1 -	0	(11)
	esent, use the value corresponding to	•	il dollori	L	<u> </u>	(11)
deducting areas of opening		,		_		
If suspended wooden f	loor, enter 0.2 (unsealed) or 0.	1 (sealed), else enter ()		0	(12)
If no draught lobby, ent	er 0.05, else enter 0				0	(13)
Percentage of windows	and doors draught stripped				0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =		0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	Ī	0	(16)
Air permeability value,	q50, expressed in cubic metres	s per hour per square r	metre of envelope	area	15	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (8)$), otherwise (18) = (16)			0.87	(18)
Air permeability value applies	s if a pressurisation test has been done	e or a degree air permeabilit	y is being used			
Number of sides sheltere	d			[4	(19)
Shelter factor		(20) = 1 - [0.075 x]	(19)] =	İ	0.7	(20)
Infiltration rate incorporati	ing shelter factor	(21) = (18) x (20) =	=	Ī	0.61	(21)
Infiltration rate modified for	or monthly wind speed			-		_
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind spe	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (22a)m = (22)m -	- 4									
(22a)m= 1.27 1.25 1.23	T T	08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltration rate (allow	ing for shelte	ar and wind s	need) –	(21a) v i	(22a)m	•		•	•	
0.78 0.76 0.75		65 0.58	0.58	0.56	0.61	0.65	0.68	0.71]	
Calculate effective air change		applicable ca	ise	<u> </u>		!		ļ	J 	
If mechanical ventilation:	" 1 (22)	(00.) = (.=	. (22)	\ (22.)				0 (23a)
If exhaust air heat pump using App						o) = (23a)				0 (23b)
If balanced with heat recovery: effi	-	_				Ob.\ma . (00h) [/	1 (00.5)	. 4001	0 (23c)
a) If balanced mechanical v	 	n neat recov	ery (MVF	1R) (24a 0	0 = (2.0)	2b)m + (. 0	23b) x [*	1 – (23c) 0	i ÷ 100]]	(24a)
b) If balanced mechanical v	<u> </u>								J	(244)
$\frac{\text{(24b)m}}{\text{(24b)m}} = 0 \qquad 0 \qquad 0$			0	0	0	0	0	0	1	(24b)
c) If whole house extract ve					utside				J	` ,
if $(22b)m < 0.5 \times (23b)$,	•	•				.5 × (23b)			
(24c)m= 0 0 0	0	0 0	0	0	0	0	0	0		(24c)
d) If natural ventilation or w	•	•						•		
if (22b)m = 1, then (24d	<u>, , , , , , , , , , , , , , , , , , , </u>	· ·	<u> </u>		•	_			1	(2.4.0)
(24d)m= 0.8 0.79 0.78		71 0.67	0.67	0.66	0.69	0.71	0.73	0.76		(24d)
Effective air change rate - e		· ·	· `		, ,	1 0 74	0.70		1	(05)
(25)m= 0.8 0.79 0.78	0.72 0.	71 0.67	0.67	0.66	0.69	0.71	0.73	0.76	l	(25)
3. Heat losses and heat loss						_				
3. Heat losses and Heat loss	parameter:						_			
ELEMENT Gross area (m²)	Openings m ²	Net Ar A ,ı		U-valu W/m2		A X U (W/I	〈)	k-value kJ/m²-l		A X k kJ/K
ELEMENT Gross	Openings						<) 			
ELEMENT Gross area (m²)	Openings	Α ,ι	m ² x	W/m2	K =	(W/I	<) 			kJ/K
ELEMENT Gross area (m²) Doors	Openings	A ,ı	m² x x x1/	W/m2 2	0.04] =	4.2	<) 			kJ/K (26)
ELEMENT Gross area (m²) Doors Windows Type 1	Openings	2.1 ₂	m ² x x 1/1 x 1/1	W/m2 2 /[1/(4.5)+	0.04] = 0.04] =	4.2 5.72	<) 			kJ/K (26) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2	Openings	A ,1 2.1 1.5 5	x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] =	(W/I 4.2 5.72 7.08	<) 			(26) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3	Openings	A ,1 2.1 1.5 5	x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 5.72 7.08 6.86	<)			kJ/K (26) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Openings	A ,1 2.1 1.5 5 1.8 6.25	x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 5.72 7.08 6.86 8.84	\$) 			kJ/K (26) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights	Openings	A ,1 2.1 1.5 5 1.8 6.25 3.45	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175				kJ/K (26) (27) (27) (27) (27) (27b)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1	Openings	A ,1 2.1 1.5 5 1.8 6.25 3.45	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88				(26) (27) (27) (27) (27) (27b) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2	Openings m ²	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03	x1/ x1/ x1/ x1/ x1/ 2 x 3 x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.25 0.25	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075				kJ/K (26) (27) (27) (27) (27) (27b) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type 1 76.26	Openings m ²	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075				kJ/K (26) (27) (27) (27) (27) (27b) (28) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 80.4	Openings m² 0 20.75	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26	x1/x1/x1/x2/x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25 0.45	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 13.27	0 20.75	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 13.27	x1/x1/x1/x1/x2/x x1/x2/x x1/x2	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.25 0.25 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71				kJ/K (26) (27) (27) (27) (27) (27b) (28) (28) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type4 9.84	0 20.75 0	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.00 76.26 13.27	x1/x1/x1/x1/x2/x x1/x2/x x1/x2	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.25 0.25 0.25 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type4 Walls Type4 Walls Type5 69.86	0 20.75 0 0	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 59.66 13.27 9.84	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25 0.45 0.2 0.45	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01 31.44				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 Walls Type4 G9.86 Roof Type1 6	0 20.75 0 0	A ,1 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 13.27 9.84 69.86	x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[0.25 0.25 0.25 0.45 0.2 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01 31.44 1.2				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 Walls Type4 G9.86 Roof Type1 G 6 Roof Type2 Roof Type3 Roof Type2 Roof Type2 Roof Type3 Roof Type2 Roof Type3 Roof Type2 Roof Type3 Roof Type4 Roof Type2 Roof Type4 R	0 20.75 0 0 0	A , r 2.1 1.5 5 1.8 6.25 3.45 55.52 28.03 76.26 13.27 9.84 69.86 28.23	x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x1/x	W/m2 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5) + (0.25 0.25 0.25 0.45 0.2 0.2 0.45 0.2	0.04] = 0.04]	(W/I 4.2 5.72 7.08 6.86 8.84 5.175 13.88 7.0075 19.07 26.84 2.71 2.01 31.44 1.2 5.65				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (30) (30)

Party wall													
Party wall	Party wall				24.18	3 x	0	=	0	\neg \vdash			(32)
*for vivindows and roof windows, use effective window U-value calculated using formula 1/(1/U-value)+0.0/fj as given in paragraph 3.2 ** include the areas on both sides of internal valls and partitions Fabric heat Ioss, W/K = S (A x k) Heat capacity Cm = S(A x k) ** (28)(30) + (32) = \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Party wall				43.68	3 x	0	<u> </u>	0	Ħ Ē		1 =	(32)
Fabric heat loss, W/K = S (A x U) (28)(30) + (32) =	Party wall				67.24	x x	0	<u> </u>	0	Ħ Ē		1 =	(32)
Heat capacity Cm = S(A x k)						ated using	formula 1	/[(1/U-valu	e)+0.04] a	s given in	paragraph	3.2	_
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Fabric heat loss, W/K =	S (A x	U)				(26)(30)	+ (32) =				175.34	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 17 can be used instead of a detailed calculation. Thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly Ventilation heat loss calculated monthly Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= (37) Heat transfer coefficient, W/K (38)m= (37) (38) (38) (38) (38) (38) (38) (38) (38	Heat capacity Cm = S(A	Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0	(34)
Thermal bridgings: S (1 x Y) calculated using Appendix K (39) it details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly (38) m = 0.33 x (25) m x (6) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Nov Dec Nov Nov	Thermal mass paramete	er (TMF	P = Cm ÷	-TFA) ir	n kJ/m²K			Indica	tive Value:	Medium	ĺ	250	(35)
Total fabric heat loss calculated monthly (38) = 0.15 x(31) (33) + (36) = (233.76 (37) (37) (38) (ŭ			constructi	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	ible 1f		
Ventilation heat loss calculated monthly (38)	Thermal bridges : S (L)	x Y) cal	culated i	using Ap	pendix l	<						58.42	(36)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 177.31 174.72 172.19 160.27 158.05 147.67 145.75 151.67 158.05 162.55 167.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (411.07 408.48 405.95 394.04 391.81 381.43 381.43 379.51 385.43 391.81 396.32 401.03 Average = Sum(39) - v/12 394.03 394.04 391.81 381.43 381.43 379.51 385.43 391.81 396.32 401.03 Heat loss parameter (HLP), W/m²K (40)m = (38)m + (40) 40.00		are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)		ı		–
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		ام مامده	را ملامر م مص					` '	` '	OF) ·- (F)	l	233.76	(37)
177.31 174.72 172.19 160.27 158.05 147.67 147.67 145.75 151.67 158.05 162.55 167.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m 411.07 408.48 405.95 394.04 391.81 381.43 381.43 379.51 385.43 391.81 396.32 401.03 Average = Sum(39) /12=		1			1	11	۸				Daa		
Heat transfer coefficient, W/K (39)m = (411.07	 			,	-	-	Ť	<u> </u>					(38)
Heat loss parameter (HLP), W/m²K Separameter	` '		100.27	100.00	147.07	147.07	140.70	l .			107.27		(00)
Average = Sum(39)y/12\(\) 394.03 (39)			304.04	301.81	381 //3	381 //3	370 51				401.03		
Heat loss parameter (HLP), W/m²K (40)m= 1.83	(33)1112 411.07 400.40	403.93	334.04	391.01	301.43	301.43	379.51					394.03	(39)
Average Sum(40) /12 /12 /14 /	Heat loss parameter (H	LP), W/	m²K						_			00.000	
Manual average hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	(40)m= 1.83 1.82	1.81	1.75	1.74	1.7	1.7	1.69	1.71	1.74	1.76	1.78		
4. Water heating energy requirement: KWh/year:	Number of days in mon	th (Tabl	e 1a)					•	Average =	Sum(40) _{1.}	.12 /12=	1.75	(40)
4. Water heating energy requirement: Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₋₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₋₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₋₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₋₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) _{1.12} = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) _{1.12} = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	4. Water heating energ	gy requi	rement:								kWh/ye	ear:	
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) _{1.12} = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) _{1.12} = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Assumed occupancy, N	I								3.	03		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	if TFA > 13.9 , N = $1 +$		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.				` ,
not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44)112 = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45)112 = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	•	ter usag	je in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		106	6.26		(43)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	•		0 ,		•	•	to achieve	a water us	se target o	,			
(44)m= 116.89 112.64 108.39 104.14 99.89 95.64 95.64 99.89 104.14 108.39 112.64 116.89 Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44) ₁₁₂ = 1275.17 (44) Energy content of hot water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 \text{ kWh/month}$ (see Tables 1b, 1c, 1d) (45)m= 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 167.88 Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Hot water usage in litres per o	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 173.35	(44)m= 116.89 112.64	108.39	104.14	99.89	95.64	95.64	99.89	104.14	108.39	112.64	116.89		
Total = Sum(45) ₁₁₂ = 1671.95 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	Energy content of hot water u	ısed - cald	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600					1275.17	(44)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)			136 30	130.87	112.93	104.65	120.09	121.52	141.62	154.59	167.88		
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	(45)m= 173.35 151.61	156.45	130.33										
Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)	` ' L L			hot water	r storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	:	1671.95	(45)
	If instantaneous water heating	g at point	of use (no		· ·	1	,) to (61)		, ,		1671.95	
	If instantaneous water heating (46)m= 26 22.74 Water storage loss:	g at point 23.47	of use (no 20.46	19.63	16.94	15.7	18.01) to (61) 18.23	21.24	23.19	25.18	1671.95	(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	If instantaneous water heating (46)m= 26 22.74 Water storage loss: Storage volume (litres)	g at point 23.47 includin	of use (no 20.46 g any so	19.63 olar or W	16.94 /WHRS	15.7 storage	18.01) to (61) 18.23	21.24	23.19	25.18	1671.95	(46)

Water storage loss:			
 a) If manufacturer's declared loss factor is known (kWh/day): 		0	(48)
Temperature factor from Table 2b		0	(49)
Energy lost from water storage, kWh/year	$(48) \times (49) =$	250	(50)
b) If manufacturer's declared cylinder loss factor is not known	1:		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.03	(51)
If community heating see section 4.3 Volume factor from Table 2a		0.78	(52)
Temperature factor from Table 2b		0.78	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	5.18	(54)
Enter (50) or (54) in (55)		5.18	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(56)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68	3 160.68 155.49 160.68	155.49 160.68	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m where (H11) is from Append	ix H
(57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68	3 160.68 155.49 160.68	155.49 160.68	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59) m = $(58) \div 3$	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	` '	stat)	
(59)m= 128.38 115.95 128.38 124.24 128.38 41.92 43.31	43.31 41.92 128.38	124.24 128.38	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (4	1)m/		
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 462.4 412.69 445.5 416.12 419.93 310.34 308.6	4 324.08 318.93 430.67	434.32 456.93	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant	tity) (enter '0' if no solar contribut	on to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	appendix G)		
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater			
(64)m= 462.4 412.69 445.5 416.12 419.93 310.34 308.64	4 324.08 318.93 430.67	434.32 456.93	
	Output from water heate	r (annual) ₁₁₂	4740.55 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m]
(65)m= 160.34 143.17 154.72 144.74 146.22 71.08 69.45	74.58 73.94 149.79	150.79 158.52	(65)
include (57)m in calculation of (65)m only if cylinder is in the	e dwelling or hot water is fi	om community h	eating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts			
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	
(66)m= 151.71 151.71 151.71 151.71 151.71 151.71 151.71	1 151.71 151.71 151.71	151.71 151.71	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5		
(67)m= 38.69 34.36 27.95 21.16 15.82 13.35 14.43	18.75 25.17 31.96	37.3 39.77	(67)
Appliances gains (calculated in Appendix L, equation L13 or L	.13a), also see Table 5		
(68)m= 394.13 398.22 387.91 365.97 338.27 312.24 294.88	5 290.76 301.07 323.01	350.71 376.74	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	a), also see Table 5		
(69)m= 38.17 38.17 38.17 38.17 38.17 38.17 38.17	38.17 38.17 38.17	38.17 38.17	(69)
Pumps and fans gains (Table 5a)			
(70)m= 0 0 0 0 0 0	0 0 0	0 0	(70)
		·	

Losses e.g. evaporation (negative control of the co	· · · · · ·		1 404 07 1 4	104 07 404 07	1 404 07 1 44	04.07		(71)
(71)m= -121.37 -121.37 -121.37	-121.37 -121.37	-121.37 -121.37	-121.37 -1	121.37 -121.37	-121.37 -12	21.37		(71)
Water heating gains (Table 5) (72)m= 215.51 213.05 207.96	201.03 196.53	98.73 93.34	100.24 1	02.69 201.33	209.43 2	13.07		(72)
()	201.03 190.53	ļ	<u> </u>	69)m + (70)m + (13.07		(12)
Total internal gains = (73)m= 716.84 714.15 692.33	656.67 619.13	492.84 471.14	, , , , ,	197.45 624.82	, , , ,	98.08		(73)
(73)m= 716.84 714.15 692.33 6. Solar gains:	636.67 619.13	492.84 471.14	476.27 4	197.45 624.62	005.95	96.06		(10)
Solar gains are calculated using sola	r flux from Table 6a	and associated equa	ations to conv	ert to the applica	able orientation.			
Orientation: Access Factor	Area	Flux	g.	<u>_</u>	FF		Gains	
Table 6d	m²	Table 6a	Tab 	ole 6b	Table 6c		(W)	_
North 0.9x 0.77 x	5	x 10.63	x 0).85 ×	0.7] = [43.85	(74)
North 0.9x 0.54 x	1.8	× 10.63	x 0).85 ×	0.7] = [11.07	(74)
North 0.9x 0.77 x	5	× 20.32	x 0).85 ×	0.7	<u> </u>	83.79	(74)
North 0.9x 0.54 x	1.8	× 20.32	x 0).85 ×	0.7	<u> </u>	21.15	(74)
North 0.9x 0.77 x	5	× 34.53	x 0).85 ×	0.7	<u> </u>	142.38	(74)
North 0.9x 0.54 x	1.8	× 34.53	x 0).85 ×	0.7	<u> </u>	35.95	(74)
North 0.9x 0.77 x	5	× 55.46	× 0).85 ×	0.7		228.7	(74)
North 0.9x 0.54 x	1.8	× 55.46	x 0).85 ×	0.7	<u> </u>	57.74	(74)
North 0.9x 0.77 x	5	× 74.72	× 0).85 ×	0.7] = <u> </u>	308.08	(74)
North 0.9x 0.54 x	1.8	× 74.72	x0).85 ×	0.7	<u> </u> = <u> </u>	77.78	(74)
North 0.9x 0.77 x	5	× 79.99	× 0).85 ×	0.7	<u> </u>	329.81	(74)
North 0.9x 0.54 x	1.8	× 79.99	x 0).85 ×	0.7	=	83.27	(74)
North 0.9x 0.77 x	5	× 74.68	x 0).85 ×	0.7	_ = _	307.92	(74)
North 0.9x 0.54 x	1.8	× 74.68	x 0).85 ×	0.7] = [77.74	(74)
North 0.9x 0.77 x	5	× 59.25	x 0).85 ×	0.7] = [244.29	(74)
North 0.9x 0.54 x	1.8	× 59.25	x 0).85 ×	0.7] = [61.68	(74)
North 0.9x 0.77 x	5	× 41.52	x 0).85 ×	0.7] = [171.19	(74)
North 0.9x 0.54 x	1.8	× 41.52	x 0).85 ×	0.7] = [43.22	(74)
North 0.9x 0.77 x	5	x 24.19	x 0).85 ×	0.7] = [99.74	(74)
North 0.9x 0.54 x	1.8	x 24.19	x 0).85 ×	0.7] = [25.18	(74)
North 0.9x 0.77 x	5	x 13.12	x 0).85 ×	0.7] = [54.09	(74)
North 0.9x 0.54 x	1.8	x 13.12	x 0).85 ×	0.7] = [13.66	(74)
North 0.9x 0.77 x	5	x 8.86	x 0).85 ×	0.7] = [36.55	(74)
North 0.9x 0.54 x	1.8	x 8.86	x 0).85 ×	0.7] = [9.23	(74)
South 0.9x 0.3 x	1.5	x 46.75	x 0).85 ×	0.7] = [33.8	(78)
South 0.9x 0.3 x	1.5	x 76.57	x 0).85 ×	0.7] = [55.35	(78)
South 0.9x 0.3 x	1.5	x 97.53	x 0).85 x	0.7] = [70.51	(78)
South 0.9x 0.3 x	1.5	x 110.23	x 0).85 ×	0.7] = [79.69	(78)
South 0.9x 0.3 x	1.5	x 114.87	x 0).85 ×	0.7] = [83.04	(78)
South 0.9x 0.3 x	1.5	x 110.55	x 0).85 x	0.7] = [79.92	(78)

South	0.9x	0.3	х	1.	5	x	10	08.01	x		0.85	x		0.7		=	78.08	(78)
South	0.9x	0.3	x	1.		x	_	04.89	×		0.85	×		0.7	一	=	75.83	(78)
South	0.9x	0.3	х	1.	5	x	10	01.89	x		0.85	x	T	0.7		=	73.66	(78)
South	0.9x	0.3	x	1.	5	x	8	2.59	x		0.85	X		0.7		=	59.7	(78)
South	0.9x	0.3	x	1.5	5	X	5	5.42	x		0.85	x		0.7		=	40.06	(78)
South	0.9x	0.3	X	1.	5	x		40.4	x		0.85	X		0.7		=	29.2	(78)
West	0.9x	0.77	х	6.2	25	X	1	9.64	X		0.85	X		0.7		=	50.61	(80)
West	0.9x	0.77	х	6.2	25	X	3	8.42	X		0.85	X		0.7		=	99.01	(80)
West	0.9x	0.77	х	6.2	25	X	6	3.27	x		0.85	X		0.7		=	163.06	(80)
West	0.9x	0.77	х	6.2	25	X	9	2.28	x		0.85	X		0.7		=	237.81	(80)
West	0.9x	0.77	х	6.2	25	X	1	13.09	x		0.85	X		0.7		=	291.45	(80)
West	0.9x	0.77	X	6.2	25	X	1	15.77	x		0.85	X		0.7		=	298.35	(80)
West	0.9x	0.77	X	6.2	25	X	1	10.22	x		0.85	X		0.7		=	284.04	(80)
West	0.9x	0.77	X	6.2	25	X	9	4.68	X		0.85	X		0.7		=	243.99	(80)
West	0.9x	0.77	X	6.2	25	X	7	3.59	x		0.85	X		0.7		=	189.65	(80)
West	0.9x	0.77	X	6.2	25	X	4	5.59	x		0.85	X		0.7		=	117.49	(80)
West	0.9x	0.77	X	6.2	25	X	2	4.49	X		0.85	X		0.7		=	63.11	(80)
West	0.9x	0.77	X	6.2	25	X	1	6.15	X		0.85	X		0.7		=	41.62	(80)
Rooflights	0.9x	1	x	3.4	5	X		26	x		0.65	X		0.7		=	36.73	(82)
Rooflights	0.9x	1	X	3.4	5	Х		54	x		0.65	X		0.7		=	76.29	(82)
Rooflights	0.9x	1	X	3.4	5	X		96	X		0.65	X		0.7		=	135.63	(82)
Rooflights	0.9x	1	x	3.4	5	X		150	Х		0.65	X		0.7		=	211.92	(82)
Rooflights	0.9x	1	x	3.4	5	X		192	X		0.65	X		0.7		=	271.25	(82)
Rooflights	0.9x	1	X	3.4	5	Х		200	X		0.65	X		0.7		=	282.55	(82)
Rooflights		1	X	3.4	5	X		189	X		0.65	X		0.7		=	267.01	(82)
Rooflights	0.9x	1	Х	3.4	5	X		157	X		0.65	X		0.7		=	221.81	(82)
Rooflights	0.9x	1	X	3.4	5	X		115	X		0.65	X		0.7		=	162.47	(82)
Rooflights		1	х	3.4	-5	X		66	X		0.65	X		0.7		=	93.24	(82)
Rooflights	0.9x	1	Х	3.4	5	X		33	X		0.65	X		0.7		=	46.62	(82)
Rooflights	0.9x	1	X	3.4	5	X		21	X		0.65	X		0.7		=	29.67	(82)
Solar gai						_			r –		ım(74)m			I			ı	(00)
` ′	76.06	335.6	547.52	815.86	1031.61		073.9	1014.8	847	.59	640.18	395.3	36	217.54	146.	28		(83)
Total gai		-		<u> </u>		<u> </u>			400/	- 07	4407.00	4000	47	000.40	044	20	1	(94)
` ' L	892.9	1049.75		1472.53			66.73	1485.94	1325	5.87	1137.63	1020.	17	883.49	844.	36		(84)
7. Mear																		7
•		during h	• .			-			ole 9	, Th1	ı (°C)						21	(85)
		tor for ga				Ť				ı			. T	<u>, </u>			1	
_	Jan	Feb	Mar	Apr	May	+	Jun	Jul	 	ug	Sep	Oc	t	Nov	De	ec		(00)
(86)m=	1	1	1	0.99	0.97		0.92	0.83	3.0	38	0.97	1		1	1			(86)
		temper				_		i 	r								ı	
(87)m=	18.78	18.94	19.27	19.75	20.23	2	20.62	20.83	20.	78	20.41	19.8	5	19.26	18.7	'9		(87)

Lempera													
(00)	ture during l		1				1	<u> </u>	00.40	00.40	00.44		(00)
(88)m= 20	0.09 20.09	20.1	20.12	20.13	20.15	20.15	20.16	20.14	20.13	20.12	20.11		(88)
Utilisation	n factor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	1 1	1	0.99	0.96	0.89	0.75	0.82	0.96	0.99	1	1		(89)
Mean into	ernal tempe	rature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m= 18	3.01 18.17	18.5	19.01	19.48	19.88	20.06	20.03	19.68	19.1	18.51	18.04		(90)
	•	•	•					f	LA = Livin	g area ÷ (4	1) =	0.19	(91)
Mean into	ernal tempe	rature (fo	r the wh	ole dwel	lling) – fl	Δ ν Τ1	⊥ (1 _ fl	Δ) v T2					
	3.15 18.31	18.64	19.15	19.62	20.02	20.21	20.17	19.81	19.24	18.65	18.18		(92)
` ′	justment to t	L								.0.00	.00		, ,
· · · · · —	3.75 18.91	19.24	19.75	20.22	20.62	20.81	20.77	20.41	19.84	19.25	18.78		(93)
	heating req	<u> </u>	L						1919	751			
•	the mean in			re obtain	ed at ste	en 11 of	Table 9h	n so tha	t Ti m=(7	76)m an	d re-calc	ulate	
	ation factor f		•		ou at ou	ορ 11 O	Table of	5, 00 tria		ojiii aii	a ro caio	diato	
J	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	n factor for g	ains, hm):						•				
(94)m=	1 1	1	0.99	0.96	0.91	0.82	0.87	0.97	0.99	1	1		(94)
Useful ga	ains, hmGm	, W = (9	4)m x (8	4)m									
(95)m= 89	1.96 1047.67	1234.05	1452.48	1584.75	1423.37	1214.91	1149.72	1100.26	1013.03	881.95	843.67		(95)
Monthly a	average exte	ernal tem	perature	from Ta	able 8								
(96)m= 4	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 me	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 593	39.98 5724.81	5172.5	4273.88	3338.33	2294.49	1603.97	1657.25	2433.32	3621.21	4815.94	5845.8		(97)
Space he	eating requir	ement fo	r each n	nonth, k\	/Vh/mont	h = 0.02	24 x [(97))m – (95)m] x (41)m			
(98)m= 375	55.73 3143.04	2930.21	2031.41	1304.67	0	0	0	0	1940.49	2832.47	3721.58		
							Tota	l per vear	(kWh/year) = Sum(9	8), 50 40 =	04050.0	(00)
Space be								,	` .		O)15,912 —	21659.6	(98)
Space ne	eating requir	ement in	kWh/m²	² /year							0/15,912	96.31	(99)
·					vstems i	ncluding					O / 15,912 —		=
9a. Energy	y requireme				ystems i	ncluding					O)15,912 —		=
9a. Energy	y requireme	nts – Ind	ividual h	eating sy		J	micro-C				O)15,912 —		=
9a. Energy Space he	y requireme eating: of space hea	nts – Ind at from s	ividual h econdar	eating sy		system	micro-C	CHP)				96.31	(99)
9a. Energy Space he Fraction	y requireme eating: of space hea	nts – Ind at from s at from m	ividual h econdar nain syst	eating sy y/supple em(s)		system	micro-C (202) = 1 -	CHP) - (201) =			() 	96.31 0 1	(99) (201) (202)
9a. Energy Space he Fraction Fraction	y requirements eating: of space head of space head of total heat	nts – Ind at from s at from m ng from	ividual h econdar nain syst main sys	eating sy y/supple em(s) stem 1		system	micro-C	CHP) - (201) =			[[96.31 0 1	(99) (201) (202) (204)
9a. Energy Space he Fraction Fraction Fraction Efficiency	y requirements eating: of space heat of total heat y of main sp	nts – Ind at from s at from m ng from ace heat	ividual h econdar nain syst main sys ing syste	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =			[[96.31 0 1 1 61	(99) (201) (202) (204) (206)
9a. Energy Space he Fraction Fraction Fraction Efficiency	y requirements eating: of space head of space head of total heat	nts – Ind at from s at from m ng from ace heat	ividual h econdar nain syst main sys ing syste	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =			()	96.31 0 1	(99) (201) (202) (204)
Space he Fraction Fraction Efficiency	y requirements eating: of space heat of total heat y of main sp	nts – Ind at from s at from m ng from ace heat	ividual h econdar nain syst main sys ing syste	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =		Nov	Dec	96.31 0 1 1 61	(99) (201) (202) (204) (206) (208)
Space he Fraction Fraction Efficiency Space he Space he	y requirements eating: of space heat of total heat y of main sp y of seconda an Feb eating require	at from s at from m ng from ace heat ary/suppl Mar ement (c	econdar nain syst main syst ing syste ementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system	micro-C (202) = 1 - (204) = (20	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	96.31 0 1 1 61 0	(99) (201) (202) (204) (206) (208)
Space he Fraction Fraction Efficiency Space he Space he	y requirements eating: of space heat of total heat y of main sp y of seconda	at from s at from m ng from ace heat ary/suppl Mar ement (c	econdar nain syst main syst ing syste ementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system	micro-C (202) = 1 - (204) = (20	CHP) - (201) = 02) × [1 -	(203)] =	Nov		96.31 0 1 1 61 0	(99) (201) (202) (204) (206) (208)
Space he Fraction Fraction Fraction Efficiency Efficiency Space he	y requirements eating: of space heat of total heat y of main sp y of seconda an Feb eating require	at from s at from m ng from ace heat ary/suppl Mar ement (c	econdary nain systemain systementar Apr calculate 2031.41	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system n, % Jul	micro-C (202) = 1 - (204) = (204)	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	96.31 0 1 1 61 0	(99) (201) (202) (204) (206) (208)
Space he Fraction Fraction Fraction Efficiency Efficiency Space he 375	y requirements eating: of space heat of total heating y of main space y of secondar an Feb eating requirements 55.73 3143.04	at from s at from m ng from ace heat ary/suppl Mar ement (c) 2930.21	econdary nain systemain systemater Apr calculate 2031.41 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 1304.67	mentary g system Jun	system n, % Jul	micro-C (202) = 1 - (204) = (204)	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	96.31 0 1 1 61 0	(99) (201) (202) (204) (206) (208) ear
Space he Fraction Fraction Fraction Efficiency Efficiency Space he 375	y requirements eating: of space heat of total heating y of main space y of secondar an Feb eating requirements 55.73 3143.04	at from s at from m ng from ace heat ary/suppl Mar ement (c) 2930.21	econdary nain systemain systemater apr calculate 2031.41 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 1304.67	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = 0	Sep 0	(203)] = Oct	Nov 2832.47	Dec 3721.58	96.31 0 1 1 61 0	(99) (201) (202) (204) (206) (208) ear
Space he Fraction Fraction Efficiency Efficiency Space he 375 (211)m = 615	y requirements eating: of space heat of total heating y of main space y of secondar an Feb eating requirements 55.73 3143.04	at from s at from m ng from ace heat ary/suppl Mar ement (c 2930.21 04)] } x 1 4803.62	econdary nain systemain systematar Apr calculate 2031.41 00 ÷ (20 3330.19	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 1304.67	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = 0	Sep 0	(203)] = Oct 1940.49 3181.13	Nov 2832.47	Dec 3721.58	96.31 0 1 1 61 0 kWh/ye	(99) (201) (202) (204) (206) (208) ear
Space he Fraction Fraction Fraction Efficiency Efficiency Space he 375 (211)m = 615	y requirements eating: of space heat of space heat of total heat y of main sp y of seconda an Feb eating require 55.73 3143.04 ([(98)m x (20) 56.93 5152.53	at from s at from m ng from ace heat ary/suppl Mar ement (c 2930.21 04)] } x 1 4803.62	econdary nain systemain systemain systementar Aprealculated 2031.41 00 ÷ (20 3330.19	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 1304.67	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = 0	Sep 0	(203)] = Oct 1940.49 3181.13	Nov 2832.47	Dec 3721.58	96.31 0 1 1 61 0 kWh/ye	(99) (201) (202) (204) (206) (208) ear
Space he Fraction Fraction Fraction Efficiency Efficiency Space he 375 (211)m = 615 Space he = {[(98)m :	y requirements eating: of space heat of space heat of total heat y of main sp y of seconda an Feb eating require 55.73 3143.04 ([(98)m x (20) 56.93 5152.53	at from s at from m ng from ace heat ary/suppl Mar ement (c 2930.21 04)] } x 1 4803.62	econdary nain systemain systemain systementar Aprealculated 2031.41 00 ÷ (20 3330.19	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 1304.67	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	Oct 1940.49 3181.13 ar) = Sum(2	Nov 2832.47 4643.4 211) _{15,1012}	3721.58 6100.96	96.31 0 1 1 61 0 kWh/ye	(99) (201) (202) (204) (206) (208) ear
Space he Fraction Fraction Fraction Efficiency Efficiency Space he 375 (211)m = { 615 Space he = {[(98)m]:	y requirements eating: of space heat of space heat of total heati y of main sp y of secondar an Feb eating require 55.73 3143.04 ([(98)m x (206.93 5152.53) eating fuel (sex (201)] } x 1	at from s at from m ng from ace heat ary/suppl Mar ement (c 2930.21 04)] } x 1 4803.62 secondar 00 ÷ (20	econdary nain systemain systemain systematar Apr calculate 2031.41 00 ÷ (20 3330.19	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 1304.67 06) 2138.8	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 1940.49 3181.13 ar) =Sum(2	Nov 2832.47 4643.4 211) _{15,1012}	3721.58 6100.96	96.31 0 1 1 61 0 kWh/ye	(99) (201) (202) (204) (206) (208) ear

Water heating								
Output from water heater (calculated above)							1	
	10.34 308.64	324.08	318.93	430.67	434.32	456.93		7(040)
Efficiency of water heater	54 54						51	(216)
(217)m= 59.72 59.64 59.46 59.03 58.22	51 51	51	51	58.9	59.45	59.72		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
· / · · · · · · · · · · · · · · · · · ·	08.51 605.17	635.44	625.35	731.17	730.56	765.12		
	Į.	Tota	I = Sum(2	19a) ₁₁₂ =			8343	(219)
Annual totals				k'	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1							35507.54	
Water heating fuel used							8343	7
Electricity for pumps, fans and electric keep-hot								_
central heating pump:						156		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			201	(231)
Electricity for lighting							683.29	(232)
12a. CO2 emissions – Individual heating systems	s including mi	icro-CHF)			_		
	Energy kWh/ye <mark>ar</mark>			kg CO	ion fac 2/kWh	tor	Em <mark>issio</mark> ns kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	7669.63	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	1802.09	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =		•		9471.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	104.32	(267)
Electricity for lighting	(232) x			0.5	19	=	354.63	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		9930.66	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			44.16	(273)

El rating (section 14)

Property Details: Flat 1

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

 Basement floor
 55.75 m²
 3.1 m

 Floor 1
 156.34 m²
 2.6 m

 Floor 2
 156.01 m²
 3.28 m

Living area: 52.13 m² (fraction 0.142)

Front of dwelling faces: Unspecified

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			Wood
D2	Manufactur <mark>er</mark>	Half glazed	low-E, En = 0.2, hard coat	No	Metal
W1	SAP 2012	Windows	Single-glazed	No	
W2	SAP 2012	Windows	Single-glazed	No	Wood
W3	SAP 2012	Windows	Single-glazed	No	Wood
W4	SAP 2012	Windows	Single-glazed	No	Wood
W5	SAP 2012	Windows	Single-glazed	No	Wood
W6	SAP 2012	Windows	Single-glazed	No	Wood
W7	SAP 2012	Windows	Single-glazed	No	Wood
W8	SAP 2012	Windows	low-E, $En = 0.2$, hard coat	No	Wood
W09	SAP 2012	Windows	Single-glazed	No	Wood
w10	SAP 2012	Windows	Single-glazed	No	Wood
w11	SAP 2012	Windows	Single-glazed	No	Wood
w12	SAP 2012	Windows	Single-glazed	No	Wood
w13	SAP 2012	Windows	Single-glazed	No	Wood

Name:	Gap:	Frame Fac	tor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
D2	16mm or more mm	0.8	0.65	2	1.64	1
W1		0.7	0.85	4.5	1.5	2
W2		0.7	0.85	4.5	1.64	1
W3		0.7	0.85	4.5	1.64	1
W4		0.7	0.85	4.5	1.64	1
W5		0.7	0.85	4.5	1.64	1
W6		0.7	0.85	4.5	0.83	1
W7		0.7	0.85	4.5	1.64	1
W8	16mm or more	0.7	0.72	2.1	3.1	3

W09	0.7	0.85	4.8	5.13	1
w10	0.7	0.85	4.5	2.4	1
w11	0.7	0.85	4.5	2.4	1
w12	0.7	0.85	4.5	2.4	1
w13	0.7	0.85	4.5	2.83	3

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D1	J.	corridor		1	2.1
D2		External wall GF	West	0.78	2.1
W1		External wall GF	South	1	1.5
W2		External wall GF	West	1.09	1.5
W3		External wall GF	South West	1.09	1.5
W4		External wall GF	West	1.09	1.5
W5		External wall GF	North West	1.09	1.5
W6		External wall GF	West	0.753	1.1
W7		External wall GF	South West	1.09	1.5
W8		External wall GF	North	1.24	2.5
W09		External FF	South	2.33	2.2
w10		External FF	South West	1.09	2.2
w11		External FF	West	1.09	2.2
w12		External FF	North West	1.09	2.2
w13		External FF	North	1.09	2.6

Overshading: More than average

Opaque Elements:							
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements	<u>s</u>						
Base <mark>ment</mark> wall	87.11	0	87.11	0.45	0	False	N/A
Exte <mark>rnal w</mark> all GF	101.74	22.97	78.77	0.45	0	False	N/A
corri <mark>dor GF</mark>	43.34	0	43.34	0.45	0.9	False	N/A
Copr <mark>ridor FF</mark>	53.64	0	53.64	0.45	0.9	False	N/A
External FF	119.93	20.82	99.11	0.45	0	False	N/A
internal	23.62	0	23.62	0.2	0		N/A
Basement floor	55.75			0.25			N/A
ground floor	100.58			0.25			N/A
internal floor	24.67			0.25			N/A
Internal Elements	<u>S</u>						
Party Elements							
party wall Basemer	nt 30.03						N/A
Party wall FF	25.87						N/A

memai briages.	

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation

Pressure test: No (Assumed)

Ventilation:

Natural ventilation (extract fans)

Number of chimneys:

2 (main: 0, secondary: 1, other: 1)

Number of open flues:

0

Number of open flues: 0
Number of fans: 6
Number of passive stacks: 0
Number of sides sheltered: 4
Pressure test: 15

Main heating system

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: SAP Tables

SAP Table: 115 Wall mounted

Systems with radiators

Design flow temperature: Unknown

Open

Boiler interlock: Yes

Main heating Control:

Main heating Control: No time or thermostatic control of room temperature

Control code: 2101

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel:mains gas
Hot water cylinder

Cylinder volume: 250 litres

Cylinder insulation: Factory 15 mm Primary pipework insulation: False

Cylinderstat: False

Cylinder in heated space: False

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory:

Low energy lights:

Terrain type:

No conservatory

100%

Low rise urban / suburban

Terrain type:

EPC language:

Wind turbine:

Photovoltaics:

Low rise

English

No

No

None

Assess Zero Carbon Home: No

		User Details:					
Assessor Name:		Stroma	Numbe	er:			
Software Name:	Stroma FSAP 2012	Softwa	re Versi	on:	Versio	n: 1.0.1.24	
	Pro	operty Address: I	Flat 1				
Address :							
Overall dwelling dime	ensions:	A (2)		- 11-1-1-(/)		V - I (2)	
Basement		Area(m²) 55.75	А 1a) х [v. Height(m) 3.1	(2a) =	Volume(m³)	(3a)
Ground floor			1b) x	2.6		406.48	(3b)
First floor			1c) x	3.28		511.71](3c)
	a)+(1b)+(1c)+(1d)+(1e)+(1n)		L	3.20	(20) -	511.71	(3c)
`	a)+(1b)+(1c)+(1a)+(1e)+(111)	`	4) (3a)+(3b)+(3	3c)+(3d)+(3e)+	(3n) - [7 .5
Dwelling volume			(3a)+(3b)+(3	oc)+(ou)+(oe)+	(311) =	1091.02	(5)
2. Ventilation rate:	main secondary	other		otal		m³ per houi	,
	heating heating	,			40 [III per nour	_
Number of chimneys	0 + 1	1	=	2	40 =	80	(6a)
Number of open flues	0 + 0	+ 0	=		20 =	0	(6b)
Number of intermittent fa				0	10 =	60	(7a)
Number of passive vents				0 x	10 =	0	(7b)
Number of flueless gas f	ires			0 x	40 =	0	(7c)
					Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =		140	÷ (5) =	0.13	(8)
	peen carried out or is intended, proceed		ontinue from		+ (5) =	0.13	(0)
Number of storeys in t	he dwelling (ns)					0	(9)
Additional infiltration				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber frame or 0	0.35 for masonry	construc	tion	Ī	0	(11)
**	resent, use the value corresponding to t	he greater wall area	(after		•		_
deducting areas of openi	ngs); ir equal user 0.35 floor, enter 0.2 (unsealed) or 0.1	(sealed), else e	enter 0		[0	(12)
If no draught lobby, en	, ,	(554.54), 5.55			L [0	(13)
•	s and doors draught stripped					0	(14)
Window infiltration		0.25 - [0.2 x	(14) ÷ 100]	=	Į [0	(15)
Infiltration rate		(8) + (10) +	(11) + (12)	+ (13) + (15) =	L	0	(16)
	q50, expressed in cubic metres				l area [15	(17)
,	lity value, then $(18) = [(17) \div 20] + (8)$			o or onvolope	, a.oa [0.88	(18)
•	es if a pressurisation test has been done			eing used	L	0.00	(,
Number of sides sheltered	ed		-		[4	(19)
Shelter factor		(20) = 1 - [0	0.075 x (19)]	=	•	0.7	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18)	x (20) =			0.61	(21)
Infiltration rate modified t	for monthly wind speed						
Jan Feb	Mar Apr May Jun	Jul Aug	Sep	Oct Nov	Dec		
Monthly average wind sp	peed from Table 7						

4.9

5.1

(22)m=

5

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

Wind Factor (22a)m = (′22)m ÷	4											
(22a)m= 1.27 1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
A discrete discribination sets	(alland			ماد ماد دا م		(04 =)	(00-)				ı		
Adjusted infiltration rate	0.75	0.68	0.66	0.58	0.58	0.57	(22a)m	0.66	0.69	0.72]		
Calculate effective air c						0.07	0.01	0.00	0.03	0.72	J		
If mechanical ventilat	tion:											0	(23a)
If exhaust air heat pump us) = (23a)				0	(23b)
If balanced with heat recov	•	-	_									0	(23c)
a) If balanced mecha					- 	- ` ` - 	ŕ	 		``	· ÷ 100] I		(04-)
(24a)m= 0 0	0	0	0	0	0 (1	0	0	0	0	0			(24a)
b) If balanced mecha	inical ve	entilation 0	without	heat red	covery (N	ЛV) (24b	0) m = (22)	2b)m + (2 0	23b) 0	0	l		(24b)
(),	-					<u> </u>			U	0			(240)
c) If whole house extr if (22b)m < 0.5 ×			•	-				.5 × (23b))				
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural ventilatio	n or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	ļ.	Į.		ı		
if (22b)m = 1, the								0.5]					
(24d)m= 0.81 0.8	0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(24d)
Effective air change r	rate - er) or (2 <mark>4</mark> b	o) or (24	c) or (24	d) in box	(25)				1		
(25)m= 0.81 0.8	0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(25)
3. Heat losses and hea	at l <mark>oss</mark> p	oaramete	er:										
ELEMENT Gross	s	Openin	gs	Net Ar		U-valı		AXU		k-value			Xk
ELEMENT Gross area (s		gs	A ,r	m²	W/m2	2K	(W/I	<)	k-value kJ/m²-l			J/K
ELEMENT Gross area (Doors Type 1	s	Openin	gs	A ,r	m² x	W/m2 2	= [(W/I	<)				J/K (26)
ELEMENT Gross area (Doors Type 1 Doors Type 2	s	Openin	gs	A ,r 2.1 1.64	m ² x	W/m2 2 2	= [= [4.2 3.28	<) 				J/K (26) (26)
ELEMENT Gross area (Doors Type 1 Doors Type 2 Windows Type 1	s	Openin	gs	A ,r 2.1 1.64 1.5	x x x1/	W/m2 2 2 /[1/(4.5)+	= [0.04] = [4.2 3.28 5.72	<) 				(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64	x x x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [0.04] = [4.2 3.28 5.72 6.25	<) 				(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64	x x x1/ x1/ x1/	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	(W/I 4.2 3.28 5.72 6.25 6.25	<) 				(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 3.28 5.72 6.25 6.25	<) 				(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64	x x x1/ x1/ x1/ x1/ x1/	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/I 4.2 3.28 5.72 6.25 6.25 6.25	<) 				(26) (26) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83	x x x1/ x1/ x1/ x1/ x1/ x1/	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17	<)				(26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 0.83 1.64	x x x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25	\$) 				(26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1	x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	=	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01	<) 				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.8)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x x x x x x x x x x	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 20.66 9.15	\$) 				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.8)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12 Windows Type 13	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 1.64 2.4 2.4 2.83	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66 9.15 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x	W/m2 2 (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Floor Type 3		24.67	X	0.25	= [6.1675				(28)
Walls Type1 87.11	0	87.11	x	0.45	= [39.2				(29)
Walls Type2 101.74	22.97	78.77	x	0.45	= [35.45				(29)
Walls Type3 43.34	0	43.34	x	0.32	=	13.88				(29)
Walls Type4 53.64	0	53.64	x	0.32	=	17.18				(29)
Walls Type5 119.93	20.82	99.11	x	0.45	=	44.6				(29)
Roof 23.62	0	23.62	x	0.2	= [4.72				(30)
Total area of elements, m ²		612.48								(31)
Party wall		30.03	x	0	= [0				(32)
Party wall		25.87	x	0	<u> </u>	0				(32)
* for windows and roof windows, use eff			ed using	formula 1		e)+0.04] a	s given in	paragraph	n 3.2	<u> </u>
** include the areas on both sides of inte Fabric heat loss, W/K = S (A x U	•	titions		(26)(30)	+ (32) =				352.15	(33)
Heat capacity $Cm = S(A \times k)$	<i>5</i>)			(==)(==)		.(30) + (32) + (32a).	(32e) =	0	(34)
Thermal mass parameter (TMP	= Cm ÷ TFA) ir	n kJ/m²K			., ,	tive Value:		()	250	(35)
For design assessments where the deta	ŕ		anown pre	ecisely the	indicative	values of	TMP in Ta	able 1f	200	(00)
can be used instead of a detailed calcula										_
Thermal bridges : S (L x Y) calculate the state of the st									91.87	(36)
if details of thermal bridging are not know Total fabric heat loss	$0wn (36) = 0.15 \times (36)$	(1)			(33) +	(36) =			444.02	(37)
Ventilation heat loss calculated	monthly					$= 0.33 \times (2)$	25)m x (5)		717.02	(0.7
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 290.64 286.34 282.13	262.36 258.66	241.43	241.43	238.24	248.07	258.66	266.14	273.97		(38)
Heat transfer coefficient, W/K			T		(39)m	= (37) + (3	88)m	•		
(39)m= 734.66 730.36 726.15	706.38 702.68	685.45	685.45	682.26	692.09	702.68	710.16	717.99		
	017	-				Average =	` '	12 /12=	706.36	(39)
Heat loss parameter (HLP), W/n (40)m= 2 1.98 1.97	n²K 1.92 1.91	1.86	1.86	1.85	(40)m 1.88	= (39)m ÷	1.93	1.95	1	
(40)111= 2 1.90 1.91	1.92 1.91	1.00	1.00	1.05		Average =			1.92	(40)
Number of days in month (Table	e 1a)				•	go	-			
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 heating energy require	ement:							kWh/y	ear:	
Assumed occupancy, N							3.	.22	1	(42)
if TFA > 13.9, N = 1 + 1.76 x [if TFA £ 13.9, N = 1	[1 - exp(-0.0003	349 x (TFA	A -13.9))2)] + 0.0	0013 x (T	ΓFA -13.			ı	, ,
Annual average hot water usage								0.69]	(43)
Reduce the annual average hot water us not more that 125 litres per person per c	• •	•	-	o acriieve	a water US	e larget of				
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot water usage in litres per day for each	<u> </u>								J	
(44)m= 121.75 117.33 112.9	108.47 104.04	99.62	99.62	104.04	108.47	112.9	117.33	121.75]	
	<u>!</u>	•				Γotal = Sur	n(44) ₁₁₂ =	=	1328.23	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 180.56 157.92 162.96 142.07 136.32 117.63 109 125.08 126.58 147.51 161.02 174.86 (45)m =Total = $Sum(45)_{1...12}$ = 1741.52 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)27.08 23.69 24.44 21.31 20.45 17.64 16.35 22.13 24.15 26.23 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year $(48) \times (49) =$ 250 (50)b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51)0.03 If community heating see section 4.3 Volume factor from Table 2a 0.78 (52)Temperature factor from Table 2b 0.78 (53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 5.18 (54)Enter (50) or (54) in (55) (55)5.18 Water storage loss calculated for each month $((56)m = (55) \times (41)m$ 145.13 (56)m= 160.68160.68 155.49 160.68 155.49 160.68 160.68 155.49 160.68 155.49 160.68 (56)If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 160.68 155.49 160.68 155.49 160.68 (57)(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) 128.38 115.95 (59)(59)m =128.38 124.24 128.38 41.92 43.31 41.92 128.38 124.24 128.38 Combi loss calculated for each month (61)m = (60) \div 365 x (41)m 0 0 0 0 0 0 (61)(61)m =0 0 0 Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 421.8 452.01 315.04 312.99 329.07 (62)469.61 419 425.37 323.99 436.57 440.75 463.91 (62)m =Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)(63)m =0 0 0 0 0 0 0 Output from water heater 469.61 452.01 (64)m =419 421.8 425.37 315.04 312.99 329.07 323.99 436.57 440.75 463.91 (64)Output from water heater (annual) 1...12 4810.11 Heat gains from water heating, kWh/month $0.25 (0.85 \times (45)) + (61) + 0.8 \times ((46)) + (57) + (59) +$ 146.63 76.24 (65)162.74 145.27 156.88 148.03 72.65 70.89 75.62 151.75 152.93 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

(66)m= 193.23	66)m= 193.23 193.23 193.23 193.23 193.23 193.23 193.23 193.23 193.23 193.23 193.23 (66)													
Lighting gains	s (calculate	ed in Ap	pendix l	_, equati	ion	L9 or L9a), a	lso s	ee Table	e 5		•			
(67)m= 128.45	114.09	92.78	70.24	52.51	4	4.33 47.9	62.	26 83.	57	106.11	123.84	132.02		(67)
Appliances g	ains (calcu	lated in	Append	lix L, eq	uat	ion L13 or L13	3a),	also see	Tab	le 5				
(68)m= 763.18	3 771.1	751.15	708.66	655.03	60	04.63 570.95	563	.03 582	.99	625.47	679.11	729.51		(68)
Cooking gain	s (calculate	ed in Ap	pendix	L, equat	ion	L15 or L15a)	, als	o see Ta	able 5	5	•			
(69)m= 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 (69)														
Pumps and fa	ans gains (Table 5	ia)					-						
(70)m= 0	0	0	0	0		0 0	0	0)	0	0	0		(70)
Losses e.g. e	vaporation	(negat	ive value	es) (Tab	le 5	5)								
(71)m= -128.82	2 -128.82 -	-128.82	-128.82	-128.82	-12	28.82 -128.82	-128	.82 -128	.82	-128.82	-128.82	-128.82		(71)
Water heating	g gains (Ta	able 5)												
(72)m= 218.73	216.18	210.87	203.65	198.96	1	00.9 95.29	102	.47 105	.03	203.97	212.4	216.19		(72)
Total interna	ıl gains =					(66)m + (67)m	+ (68	3)m + (69)ı	m + (7	0)m + (1	71)m + (72)	m		
(73)m= 1232.3	2 1223.32	1176.75	1104.51	1028.45	8	71.8 836.09	849	.72 893	.54	1057.5	1137.3	1199.67		(73)
6. Solar gair														
		-		Table 6a	and	associated equa	tions		to the	applica		ion.		
Orientation:	Access Fa Table 6d	ctor	Area m²			Flux Table 6a		g_ Table	6h	Т	FF able 6c		Gains (W)	
Namila		<u> </u>			1					, ,			. /	–
North 0.9x		×	3.1		X [10.63	X	0.72		X	0.7	=	24.22	(74)
North 0.9x		×	2.8		X [10.63	X	0.85		X	0.7	=	26.11	(74)
North 0.9x		×	3.1	_	×	20.32	Х	0.72	_	X	0.7	=	46.29	(74)
North 0.9x		×	2.8		Х	20.32	X	0.85		X	0.7	=	49.89	(74)
North 0.9x	0.0 .	×	3.1		X	34.53	X	0.72]	0.7	=	78.66	(74)
North 0.9x		×	2.8		X [34.53	X	0.85]	0.7	=	84.77	(74)
North 0.9x		×	3.1		X [55.46	X	0.72]	0.7	=	126.35	(74)
North 0.9x		×	2.8		х [Г	55.46	X	0.85]	0.7	=	136.17	(74)
		×	3.1		х Г	74.72	X	0.72]	0.7	=	170.2	(74)
		×	2.8		х Г	74.72	X	0.85]	0.7	=	183.43	(74)
		X	3.1		х Г	79.99	X	0.72]	0.7	=	182.2	(74)
		×	2.8		х Г	79.99	X	0.85]	0.7	=	196.37	(74)
		×	3.1		X [74.68	X	0.72] × [0.7	=	170.11	(74)
North 0.9x		×	2.8		X [74.68	X	0.85]	0.7	=	183.33	(74)
North 0.9x		×	3.1		X [59.25	X	0.72]	0.7	=	134.96	(74)
North 0.9x		×	2.8		X [59.25	X	0.85]	0.7	=	145.45	(74)
North 0.9x		×	3.1		х Г	41.52	X	0.72]	0.7	=	94.57	(74)
North 0.9x		X	2.8		x [41.52	X	0.85]	0.7	=	101.93	(74)
North 0.9x		X	3.1		X	24.19	X	0.72]	0.7	=	55.1	(74)
North 0.9x		X	2.8		X	24.19	X	0.85]	0.7	=	59.39	(74)
North 0.9x	0.54	X	3.1		x	13.12	X	0.72	2	X	0.7	=	29.88	(74)

North		_		,						ı				_
North	North	0.9x	0.54	X	2.83	X	13.12	X	0.85	X	0.7	=	32.2	(74)
South		0.9x	0.54	X	3.1	X	8.86	X	0.72	X	0.7	=	20.19	(74)
South		0.9x	0.54	X	2.83	X	8.86	X	0.85	X	0.7	=	21.76	(74)
South 0.9% 0.3 x 1.5 x 76.57 x 0.85 x 0.7 = 36.9 (78) South 0.9% 1 x 5.13 x 76.57 x 0.85 x 0.7 = 210.34 (78) South 0.9% 1 x 5.13 x 97.53 x 0.85 x 0.7 = 210.34 (78) South 0.9% 0.3 x 1.5 x 97.53 x 0.85 x 0.7 = 267.44 (78) South 0.9% 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 267.44 (78) South 0.9% 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 363.33 (78) South 0.9% 1 x 5.13 x 110.23 x 0.85 x 0.7 = 362.83 (78) South 0.9% 1 x 5.13 x 110.23 x 0.85 x 0.7 = 362.83 (78) South 0.9% 1 x 5.13 x 110.23 x 0.85 x 0.7 = 362.83 (78) South 0.9% 1 x 5.13 x 114.87 x 0.85 x 0.7 = 363.28 (78) South 0.9% 1 x 5.13 x 114.87 x 0.85 x 0.7 = 363.28 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 108.01 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 108.01 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 0.3 x 1.5 x 104.89	South	0.9x	0.3	X	1.5	X	46.75	X	0.85	X	0.7	=	22.53	(78)
South 0.9x 1	South	0.9x	1	X	5.13	X	46.75	X	0.85	X	0.7	=	128.43	(78)
South 0.9x	South	0.9x	0.3	X	1.5	x	76.57	X	0.85	X	0.7	=	36.9	(78)
South 0.9x 1 x 5.13 x 97.53 x 0.85 x 0.7 = 267.94 (78) South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 302.83 (78) South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 302.83 (78) South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 315.56 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 303.69 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 303.69 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 205.26 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 226.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 226.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.16 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.16 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.5 x 0.5 x 0.5 x 0.5 x 0.7 = 228.73 (78) South 0.9x 0.5 x 0.5 x 0.5 x 0.5 x 0.7 = 228.73 (78) South 0.9x 0.5 x 0.5 x 0.5 x 0.5 x	South	0.9x	1	X	5.13	X	76.57	X	0.85	x	0.7	=	210.34	(78)
South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 315.56 (78) South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 110.56 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 110.56 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 106.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 106.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 298.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 298.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 5.42 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 5.42 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 5.42 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 6.40 x 6.267 x 0.85 x 0.7 = 228.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 50.33 (72) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 50.33 (72) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 50.33 (72) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 =	South	0.9x	0.3	X	1.5	X	97.53	X	0.85	X	0.7	=	47.01	(78)
South 0.9x	South	0.9x	1	X	5.13	X	97.53	X	0.85	X	0.7	=	267.94	(78)
South 0.9x 0.3	South	0.9x	0.3	X	1.5	x	110.23	x	0.85	X	0.7	=	53.13	(78)
South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 296.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 119.47 (78) South 0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 177.45 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 177.45 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 227.2 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 227.2 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 227.2 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79)	South	0.9x	1	x	5.13	x	110.23	x	0.85	X	0.7	=	302.83	(78)
South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 296.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 283.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 56.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79)	South	0.9x	0.3	X	1.5	x	114.87	x	0.85	X	0.7] =	55.36	(78)
South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 303.69 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 296.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.6 x 36.79 0.85 x 0.7 = 110.98 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 110.98 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 50.39 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 50.39 (79)	South	0.9x	1	X	5.13	x	114.87	x	0.85	x	0.7	=	315.56	(78)
South 0.9x 0.3	South	0.9x	0.3	X	1.5	x	110.55	x	0.85	x	0.7	=	53.28	(78)
South 0.9× 1 x 5.13 x 108.01 x 0.85 x 0.7 = 296.72 (78) South 0.9× 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 298.16 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9× 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 279.89 (78) South 0.9× 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 226.87 (78) South 0.9× 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 152.24 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 0.54 x 1.64 x 36.79 x 0.85 x 0.7 = 110.98 (78) Southwest0.9× 0.54 x 1.64 x 36.79 x 0.85 x 0.7 = 25.54 (79) Southwest0.9× 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 29.72 (79) Southwest0.9× 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 29.72 (79) Southwest0.9× 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 29.72 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 40.67 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwest0.9× 0.54 x 1.64 x 1.64 x 106.25 x 0.85 x 0.7 = 50.39 (79)	South	0.9x	1	x	5.13	x	110.55	x	0.85	x	0.7] =	303.69	(78)
South 0.9× 0.3 x 5.13 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9× 1 x 5.13 x 101.89 x 0.85 x 0.7 = 298.81 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 298.81 (78) South 0.9× 1 x 5.13 x 101.89 x 0.85 x 0.7 = 299.72 (79) South 0.9× 1 x 5.13 x 101.89 x 0.85 x 0.7 = 226.87 (78) South 0.9× 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9× 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9× 1 x 5.13 x 82.59 x 0.85 x 0.7 = 26.71 (78) South 0.9× 1 x 5.13 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 40.67 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79)	South	0.9x	0.3	X	1.5	x	108.01	x	0.85	x	0.7	=	52.06	(78)
South 0.9x 1	South	0.9x	1	X	5.13	X	108.01	x	0.85	X	0.7	=	296.72	(78)
South 0.9x 0.3	South	0.9x	0.3	x	1.5	X	104.89	Х	0.85	X	0.7	=	50.55	(78)
South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.6 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 152.24 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85	South	0.9x	1	x	5.13	х	104.89	x	0.85	x	0.7	=	288.16	(78)
South 0.9x 0.3	South	0.9x	0.3	x	1.5	х	101.89	x	0.85	x	0.7	=	49.1	(78)
South 0.9x 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 110.98 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 36.79 0.85 x 0.7 = 25.54 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79)	South	0.9x	1	x	5.13	X	101.89	x	0.85	x	0.7	=	279.89	(78)
South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 19.47 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = <th< td=""><td>South</td><td>0.9x</td><td>0.3</td><td>x</td><td>1.5</td><td>x</td><td>82.59</td><td>Х</td><td>0.85</td><td>x</td><td>0.7</td><td>=</td><td>39.8</td><td>(78)</td></th<>	South	0.9x	0.3	x	1.5	x	82.59	Х	0.85	x	0.7	=	39.8	(78)
South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South (0.9x) 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79)	South	0.9x	1	x	5.13	x	82.59	X	0.85	x	0.7	=	226.87	(78)
South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest0.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwest0.9x	South	0.9x	0.3	x	1.5	х	55.42	x	0.85	x	0.7	=	26.71	(78)
South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest0.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x	South	0.9x	1	X	5.13	X	55.42	X	0.85	X	0.7	=	152.24	(78)
Southwest _{0.9x} 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest _{0.9x} 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest _{0.9x} 0.54 x 2.4 x 36.79 0.85 x 0.7 = 25.54 (79) Southwest _{0.9x} 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest _{0.9x} 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest _{0.9x} 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest _{0.9x} 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest _{0.9x} 0.54	South	0.9x	0.3	X	1.5	X	40.4	x	0.85	X	0.7	=	19.47	(78)
Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 2.4 x 36.79 0.85 x 0.7 = 25.54 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x <td></td> <td>ᆫ</td> <td>1</td> <td>X</td> <td>5.13</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.85</td> <td>x</td> <td>0.7</td> <td>=</td> <td>110.98</td> <td>(78)</td>		ᆫ	1	X	5.13	X	40.4	X	0.85	x	0.7	=	110.98	(78)
Southwesto.9x 0.54 x 2.4 x 36.79 0.85 x 0.7 = 25.54 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x	Southwe	st _{0.9x}	0.54	X	1.64	X	36.79]	0.85	X	0.7	=	17.45	(79)
Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x	Southwe	st _{0.9x}	0.54	X	1.64	X	36.79]	0.85	X	0.7	=	17.45	(79)
Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x <td>Southwe</td> <td>st_{0.9x}</td> <td>0.54</td> <td>x</td> <td>2.4</td> <td>x</td> <td>36.79</td> <td>]</td> <td>0.85</td> <td>X</td> <td>0.7</td> <td>=</td> <td>25.54</td> <td>(79)</td>	Southwe	st _{0.9x}	0.54	x	2.4	x	36.79]	0.85	X	0.7	=	25.54	(79)
Southwest0.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 50.39 (79)	Southwe	st _{0.9x}	0.54	X	1.64	X	62.67]	0.85	X	0.7	=	29.72	(79)
Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	X	1.64	X	62.67]	0.85	X	0.7	=	29.72	(79)
Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	x	2.4	x	62.67]	0.85	x	0.7	=	43.5	(79)
Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	X	1.64	x	85.75]	0.85	X	0.7	=	40.67	(79)
Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	X	1.64	x	85.75]	0.85	X	0.7] =	40.67	(79)
Southwest _{0.9x} 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest _{0.9x} 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	x	2.4	x	85.75]	0.85	x	0.7] =	59.51	(79)
Southwest _{0.9x} 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	x	1.64	x	106.25]	0.85	x	0.7] =	50.39	(79)
	Southwe	st _{0.9x}	0.54	x	1.64	x	106.25]	0.85	x	0.7	=	50.39	(79)
Southwest $0.9x$ 0.54	Southwe	st _{0.9x}	0.54	x	2.4	x	106.25]	0.85	x	0.7	=	73.74	(79)
0.07	Southwe	st _{0.9x}	0.54	x	1.64	x	119.01]	0.85	x	0.7] =	56.44	(79)
Southwest _{0.9x} 0.54 x 1.64 x 119.01 0.85 x 0.7 = 56.44 (79)	Southwe	st _{0.9x}	0.54	X	1.64	X	119.01]	0.85	x	0.7	=	56.44	(79)

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Southwest _{0.9x}	0.54	X	2.4	X	119.01	 	0.85	X	0.7	=	82.59	(79)
Southwest _{0.9x}	0.54	X	1.64	X	118.15	<u> </u>	0.85	X	0.7	=	56.03	<u> </u> (79)
Southwest _{0.9x}	0.54	X	1.64	X	118.15		0.85	X	0.7	=	56.03	(79)
Southwest _{0.9x}	0.54	X	2.4	X	118.15		0.85	X	0.7	=	82	(79)
Southwest _{0.9x}	0.54	X	1.64	X	113.91		0.85	X	0.7	=	54.02	(79)
Southwest _{0.9x}	0.54	X	1.64	X	113.91		0.85	X	0.7	=	54.02	(79)
Southwest _{0.9x}	0.54	X	2.4	X	113.91		0.85	X	0.7	=	79.05	(79)
Southwest _{0.9x}	0.54	X	1.64	X	104.39	[0.85	X	0.7	=	49.51	(79)
Southwest _{0.9x}	0.54	X	1.64	X	104.39		0.85	X	0.7	=	49.51	(79)
Southwest _{0.9x}	0.54	X	2.4	X	104.39		0.85	X	0.7	=	72.45	(79)
Southwest _{0.9x}	0.54	X	1.64	X	92.85		0.85	X	0.7	=	44.03	(79)
Southwest _{0.9x}	0.54	X	1.64	X	92.85		0.85	X	0.7	=	44.03	(79)
Southwest _{0.9x}	0.54	X	2.4	x	92.85		0.85	X	0.7	=	64.44	(79)
Southwest _{0.9x}	0.54	X	1.64	x	69.27		0.85	X	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	X	1.64	x	69.27		0.85	X	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	X	2.4	X	69.27		0.85	X	0.7	=	48.07	(79)
Southwest _{0.9x}	0.54	X	1.64	X	44.07		0.85	X	0.7	=	20.9	(79)
Southwest _{0.9x}	0.54	X	1.64	X	44.07		0.85	X	0.7	=	20.9	(79)
Southwest _{0.9x}	0.54	x	2.4	x	44.07		0.85	x	0.7	=	30.59	(79)
Southwest _{0.9x}	0.54	x	1.64	х	31.49		0.85	x	0.7	=	14.93	(79)
Southwest _{0.9x}	0.54	x	1.64	x	31.49		0.85	x	0.7	=	14.93	(79)
Southwest _{0.9x}	0.54	x	2.4	x	31.49		0.85	x	0.7	=	21.85	(79)
West 0.9x	0.54	x	1.64	x	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	1.64	х	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	0.83	X	19.64	X	0.85	X	0.7	=	4.71	(80)
West 0.9x	0.54	X	2.4	X	19.64	X	0.85	X	0.7	=	13.63	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	0.83	X	38.42	X	0.85	X	0.7	=	9.22	(80)
West 0.9x	0.54	X	2.4	x	38.42	X	0.85	X	0.7	=	26.66	(80)
West 0.9x	0.54	X	1.64	X	63.27	X	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	1.64	X	63.27	X	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	0.83	x	63.27	X	0.85	X	0.7	=	15.19	(80)
West 0.9x	0.54	X	2.4	x	63.27	X	0.85	X	0.7	=	43.91	(80)
West 0.9x	0.54	x	1.64	x	92.28	x	0.85	x	0.7	=	43.76	(80)
West 0.9x	0.54	x	1.64	x	92.28	x	0.85	X	0.7	=	43.76	(80)
West 0.9x	0.54	x	0.83	x	92.28	x	0.85	X	0.7	=	22.15	(80)
West 0.9x	0.54	X	2.4	x	92.28	x	0.85	x	0.7	=	64.04	(80)
West 0.9x	0.54	x	1.64	x	113.09	x	0.85	x	0.7	=	53.63	(80)
West 0.9x	0.54	x	1.64	x	113.09	x	0.85	x	0.7	j =	53.63	(80)
West 0.9x	0.54	X	0.83	x	113.09	x	0.85	X	0.7	=	27.14	(80)
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	.9x	0.54	X	2.4	X	113.09	X	0.85	X	0.7	=	78.49	(80)
West 0	.9x	0.54	X	1.64	X	115.77	X	0.85	X	0.7	=	54.9	(80)
	.9x	0.54	X	1.64	X	115.77	X	0.85	X	0.7	=	54.9	(80)
West 0	.9x	0.54	X	0.83	X	115.77	x	0.85	X	0.7	=	27.79	(80)
West 0	.9x	0.54	X	2.4	X	115.77	X	0.85	X	0.7	=	80.35	(80)
West 0	.9x	0.54	x	1.64	x	110.22	X	0.85	x	0.7	=	52.27	(80)
West 0	.9x	0.54	X	1.64	X	110.22	X	0.85	x	0.7	=	52.27	(80)
West 0	.9x	0.54	X	0.83	X	110.22	X	0.85	X	0.7	=	26.45	(80)
West 0	.9x	0.54	X	2.4	X	110.22	X	0.85	X	0.7	=	76.49	(80)
West 0	.9x	0.54	X	1.64	x	94.68	X	0.85	x	0.7	=	44.9	(80)
West 0	.9x	0.54	X	1.64	X	94.68	X	0.85	X	0.7	=	44.9	(80)
West 0	.9x	0.54	X	0.83	X	94.68	X	0.85	X	0.7	=	22.72	(80)
West 0	.9x	0.54	x	2.4	x	94.68	x	0.85	x	0.7	=	65.71	(80)
West 0	.9x	0.54	x	1.64	x	73.59	x	0.85	x	0.7	=	34.9	(80)
West 0	.9x	0.54	x	1.64	x	73.59	x	0.85	x	0.7	=	34.9	(80)
West 0	.9x	0.54	x	0.83	x	73.59	x	0.85	x	0.7	=	17.66	(80)
West 0	.9x	0.54	X	2.4	x	73.59	x	0.85	x	0.7	=	51.07	(80)
West 0	.9x	0.54	X	1.64	X	45.59	Х	0.85	X	0.7	=	21.62	(80)
West 0	.9x	0.54	x	1.64	x	45.59	x	0.85	x	0.7	=	21.62	(80)
West 0	.9x	0.54	x	0.83	х	45.59] x	0.85	x	0.7	=	10.94	(80)
West 0	.9x	0.54	x	2.4	x	45.59	x	0.85	x	0.7	=	31.64	(80)
West 0	.9x	0.54] x	1.64	x	24.49	Х	0.85	x	0.7	=	11.61	(80)
West 0	.9x	0.54	x	1.64	x	24.49	x	0.85	x	0.7	=	11.61	(80)
West 0	.9x	0.54	X	0.83	х	24.49	X	0.85	X	0.7	=	5.88	(80)
West 0	.9x	0.54	X	2.4	X	24.49	X	0.85	X	0.7	=	17	(80)
West 0	.9x	0.54	X	1.64	X	16.15	x	0.85	X	0.7	=	7.66	(80)
West 0	.9x	0.54	X	1.64	x	16.15	x	0.85	X	0.7	=	7.66	(80)
West 0	.9x	0.54	X	0.83	X	16.15	x	0.85	X	0.7	=	3.88	(80)
West 0	.9x	0.54	X	2.4	X	16.15	X	0.85	X	0.7	=	11.21	(80)
Northwest 0	.9x	0.54	X	1.64	x	11.28	x	0.85	x	0.7	=	5.35	(81)
Northwest 0	.9x	0.54	X	2.4	x	11.28	x	0.85	X	0.7	=	7.83	(81)
Northwest 0	.9x	0.54	X	1.64	X	22.97	x	0.85	X	0.7	=	10.89	(81)
Northwest 0	.9x	0.54	X	2.4	x	22.97	x	0.85	x	0.7	=	15.94	(81)
Northwest 0	.9x	0.54	X	1.64	x	41.38	x	0.85	x	0.7	=	19.62	(81)
Northwest 0	.9x	0.54	x	2.4	x	41.38	x	0.85	x	0.7	=	28.72	(81)
Northwest 0	.9x	0.54	×	1.64	x	67.96	x	0.85	X	0.7	=	32.23	(81)
Northwest 0	.9x	0.54	×	2.4	x	67.96	x	0.85	X	0.7] =	47.16	(81)
Northwest 0	.9x	0.54	×	1.64	x	91.35	x	0.85	X	0.7	<u> </u>	43.32	(81)
Northwest 0	.9x	0.54	×	2.4	x	91.35	x	0.85	x	0.7] =	63.39	(81)
Northwest 0	.9x	0.54	x	1.64	x	97.38	x	0.85	X	0.7	=	46.18	(81)
Northwest 0	.9x	0.54	X	2.4	x	97.38	x	0.85	X	0.7	=	67.59	(81)

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Northwest 0.9x	0.54	X	1.6	4	x [91.1	X	0.85	X	0.7	=	43.2	(81)
Northwest 0.9x	0.54	X	2.4	4	x	91.1	x	0.85	x	0.7	=	63.22	(81)
Northwest 0.9x	0.54	X	1.6	4	x	72.63	x	0.85	x	0.7	=	34.44	(81)
Northwest _{0.9x}	0.54	X	2.4	4	x [72.63	x	0.85	X	0.7	=	50.4	(81)
Northwest 0.9x	0.54	X	1.6	4	x	50.42	x	0.85	x	0.7		23.91	(81)
Northwest 0.9x	0.54	X	2.4	4	x	50.42	x	0.85	x	0.7	=	34.99	(81)
Northwest 0.9x	0.54	X	1.6	4	x [28.07	×	0.85	x	0.7	=	13.31	(81)
Northwest _{0.9x}	0.54	x	2.4	4	x	28.07	×	0.85	x	0.7	_ =	19.48	(81)
Northwest _{0.9x}	0.54	x	1.6	4	x	14.2	×	0.85	x	0.7	= =	6.73	(81)
Northwest 0.9x	0.54	x	2.4	4	x [14.2	×	0.85	x	0.7	_ =	9.85	(81)
Northwest 0.9x	0.54	X	1.6	4	x	9.21	= x	0.85	x	0.7		4.37	(81)
Northwest _{0.9x}	0.54	X	2.4	1	x [9.21	×	0.85	x	0.7	= =	6.39	(81)
Solar gains in (83)m= 311.88 Total gains – ir	545.52	786.68	1046.09	1239.64	12	61.31 1203.2 33)m , watts	23 105	n = Sum(74)m 3.66 875.44	(82)m 613.55	376.1	265.29		(83)
(84)m= 1544.2	1768.84	1963.42	2150.6	2268.1	21	33.11 2039.3	32 1903	3.38 1768.97	1671.0	5 1513.4	1464.96		(84)
7. Mean inter	nal temp	erature	(heating	season)						_		_
Temperature			<u>` </u>			area from T	able 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for ga	ains for I	iving are	ea, h1, <mark>m</mark>	(Se	ee Table 9a							
Jan	Feb	Mar	Apr	May	7,	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	1	0.99	0.98	0	0.96	0.9	0.98	1	1	1		(86)
Me <mark>an int</mark> ernal	temper	ature in I	iving are	ea T1 (fo	ollo	w steps 3 to	7 in T	able 9c)					
(87)m= 18.63	18.79	19.1	19.57	20.03		0.47 20.73	$\overline{}$		19.73	19.13	18.64		
Temperature	during h	eating n											(87)
(88)m= 20			arinds ir	rest of	dw	elling from	Tahle (_			(87)
(00)111- 20	20.01	20.01		20.05	$\overline{}$	elling from ⁻		9, Th2 (°C)	20.05	20.04	20.02		. ,
` '		20.01	20.04	20.05	20	0.07 20.07	20.	9, Th2 (°C)	20.05	20.04	20.02		(87)
Utilisation fac	tor for ga	20.01 ains for r	20.04 est of d	20.05 welling,	20 h2,i	0.07 20.07 m (see Tab	20. le 9a)	9, Th2 (°C) 07 20.06	1				(88)
Utilisation fac	tor for ga	20.01 ains for r	20.04 rest of d	20.05 welling, 0.98	20 h2,i	0.07 20.07 m (see Tab).93 0.83	20. le 9a)	9, Th2 (°C) 07 20.06 87 0.97	0.99	20.04	20.02		. ,
Utilisation fac (89)m= 1 Mean internal	tor for ga	20.01 ains for r 1 ature in t	20.04 est of do 0.99 the rest	20.05 welling, 0.98 of dwelli	20 h2,i	m (see Tab 0.93 0.83 T2 (follow s	20. le 9a) 0.8 steps 3	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab	0.99 le 9c)	1	1		(88)
Utilisation fac	tor for ga	20.01 ains for r	20.04 rest of d	20.05 welling, 0.98	20 h2,i	0.07 20.07 m (see Tab).93 0.83	20. le 9a) 0.8 steps 3	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab	0.99 le 9c) 18.93	18.32	1 17.82		(88)
Utilisation fac (89)m= 1 Mean internal	tor for ga	20.01 ains for r 1 ature in t	20.04 est of do 0.99 the rest	20.05 welling, 0.98 of dwelli	20 h2,i	m (see Tab 0.93 0.83 T2 (follow s	20. le 9a) 0.8 steps 3	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab	0.99 le 9c) 18.93	1	1 17.82	0.14	(88)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal	tor for ga 1 I tempera 17.96	20.01 ains for r 1 ature in t 18.27 ature (fo	20.04 rest of do 0.99 the rest 18.76 r the wh	20.05 welling, 0.98 of dwelli 19.23	h2,ing	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19.	9, Th2 (°C) 07 20.06 37 0.97 1 to 7 in Tab 88 19.52 — fLA) × T2	0.99 le 9c) 18.93 fLA = Liv	1 18.32 ring area ÷ (1 17.82 4) =	0.14	(88) (89) (90) (91)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91	tor for ga 1 I tempera 17.96 I tempera 18.07	20.01 ains for r 1 ature in t 18.27 ature (fo 18.39	20.04 est of dv 0.99 the rest 18.76 r the wh	20.05 welling, 0.98 of dwelli 19.23 ole dwe 19.34	20 h2,1 0 ing 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19. 11 + (1 3 2	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63	0.99 le 9c) 18.93 fLA = Liv	1 18.32 ring area ÷ (1 17.82	0.14	(88)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustn	tor for ga 1 I tempera 17.96 I tempera 18.07 nent to th	20.01 ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean	20.04 rest of do 0.99 the rest 18.76 r the wh 18.87 internal	20.05 welling, 0.98 of dwelli 19.23 ole dwe 19.34 temper	h2,1 0 19 19 19 19 19 19 19 19 19 19 19 19 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19. le 14 (1 a) 2 le 4e,	9, Th2 (°C) 07 20.06 37 0.97 4 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appli	0.99 lle 9c) 18.93 fLA = Liv	18.32 ing area ÷ (1 17.82 4) = 17.94	0.14	(88) (89) (90) (91) (92)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustn (93)m= 18.51	tor for ga 1 I tempera 17.96 I tempera 18.07 ment to the	20.01 ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99	20.04 est of dv 0.99 the rest 18.76 r the wh	20.05 welling, 0.98 of dwelli 19.23 ole dwe 19.34	h2,1 0 19 19 19 19 19 19 19 19 19 19 19 19 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19. le 14 (1 a) 2 le 4e,	9, Th2 (°C) 07 20.06 37 0.97 4 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appli	0.99 le 9c) 18.93 fLA = Liv	18.32 ing area ÷ (1 17.82 4) =	0.14	(88) (89) (90) (91)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustm (93)m= 18.51 8. Space hear	tor for ga 1 I tempera 17.96 I tempera 18.07 nent to the standard required to the standard required to the standard requirement to the s	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99	20.04 rest of do 0.99 the rest 18.76 r the wh 18.87 internal 19.47	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94	20 h2, 1 lling 11 atu	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19. steps 3 2 20. le 4e, 3 20	9, Th2 (°C) 07 20.06 37 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appl 6 20.23	0.99 le 9c) 18.93 fLA = Liv 19.04 opriate 19.64	18.32 ring area ÷ (18.44	1 17.82 4) = 17.94 18.54		(88) (89) (90) (91) (92)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustn (93)m= 18.51 8. Space heat Set Ti to the residual set of the residual	tor for ga 1 I tempera 17.96 I tempera 18.07 nent to the 18.67 ting requesting r	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99 uirement ernal ten	20.04 rest of do 0.99 the rest 18.76 r the wh 18.87 internal 19.47	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94 re obtain	20 h2, 1 lling 11 atu	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19. steps 3 2 20. le 4e, 3 20	9, Th2 (°C) 07 20.06 37 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appl 6 20.23	0.99 le 9c) 18.93 fLA = Liv 19.04 opriate 19.64	18.32 ring area ÷ (18.44	1 17.82 4) = 17.94 18.54		(88) (89) (90) (91) (92)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustm (93)m= 18.51 8. Space hear	tor for ga 1 I tempera 17.96 I tempera 18.07 nent to the 18.67 ting requesting r	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99 uirement ernal ten	20.04 rest of do 0.99 the rest 18.76 r the wh 18.87 internal 19.47	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94 re obtain	h2,ing 19 19 19 19 19 19 19 19 19 19 19 19 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 19. 11 + (1 3	9, Th2 (°C) 07 20.06 37 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appl 6 20.23	0.99 le 9c) 18.93 fLA = Liv 19.04 opriate 19.64	18.32 ing area ÷ (18.44 19.04 =(76)m an	1 17.82 4) = 17.94 18.54		(88) (89) (90) (91) (92)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustm (93)m= 18.51 8. Space heat Set Ti to the right the utilisation	tor for ga 1 I tempera 17.96 I tempera 18.07 Hent to the standard requesting requesting requesting factor for Feb	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99 uirement ernal ten or gains t Mar	20.04 est of do 0.99 the rest 18.76 r the wh 18.87 internal 19.47 nperaturusing Ta	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94 re obtair	h2,ing 19 19 19 19 19 19 19 19 19 19 19 19 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 19. 11 + (1 3	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appr 6 20.23	0.99 lle 9c) 18.93 fLA = Liv 19.04 opriate 19.64 at Ti,m=	18.32 ing area ÷ (18.44 19.04 =(76)m an	1 17.82 4) = 17.94 18.54 d re-cald		(88) (89) (90) (91) (92)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustn (93)m= 18.51 8. Space hea Set Ti to the r the utilisation Jan	tor for ga 1 I tempera 17.96 I tempera 18.07 Hent to the standard requesting requesting requesting factor for Feb	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99 uirement ernal ten or gains t Mar	20.04 est of do 0.99 the rest 18.76 r the wh 18.87 internal 19.47 nperaturusing Ta	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94 re obtair	h2,1 0 19 19 19 19 19 19 19 19 19 19 19 19 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 19. 11 + (1 3	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appr 6 20.23 de 9b, so the ug Sep	0.99 lle 9c) 18.93 fLA = Liv 19.04 opriate 19.64 at Ti,m=	18.32 ing area ÷ (18.44 19.04 =(76)m an	1 17.82 4) = 17.94 18.54 d re-cald		(88) (89) (90) (91) (92)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustm (93)m= 18.51 8. Space heat Set Ti to the right the utilisation Utilisation face	tor for ga 1 I tempera 17.96 I tempera 18.07 Hent to the standard requesting requesting requesting representation for galacter for g	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99 uirement ernal ten or gains t Mar ains, hm	20.04 rest of dv 0.99 the rest 18.76 r the wh 18.87 internal 19.47 nperatur using Ta Apr : 0.99	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94 re obtair ble 9a May 0.98	h2,1 0 19 19 19 19 19 19 19 19 19 19 19 19 19	m (see Tab 0.93	20. le 9a) 0.8 steps 3 19. 1 + (1 3	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appr 6 20.23 de 9b, so the ug Sep	0.99 lle 9c) 18.93 fLA = Liv 19.04 opriate 19.64 at Ti,m=	18.32 ing area ÷ (18.44 19.04 -(76)m an	1 17.82 4) = 17.94 18.54 d re-cald		(88) (89) (90) (91) (92) (93)
Utilisation fac (89)m= 1 Mean internal (90)m= 17.79 Mean internal (92)m= 17.91 Apply adjustn (93)m= 18.51 8. Space hea Set Ti to the r the utilisation Jan Utilisation fac (94)m= 1	tor for ga 1 I tempera 17.96 I tempera 18.07 Hent to the standard requesting requesting requesting representation for galacter for g	ains for r 1 ature in t 18.27 ature (fo 18.39 ne mean 18.99 uirement ernal ten or gains t Mar ains, hm 1 W = (94	20.04 rest of dv 0.99 the rest 18.76 r the wh 18.87 internal 19.47 nperatur using Ta Apr : 0.99	velling, 0.98 of dwelli 19.23 ole dwe 19.34 temper 19.94 re obtair ble 9a May 0.98 4)m	20	m (see Tab 0.93	20. le 9a) 0.8 steps 3 2 19. le 4e, 3 20 cof Table A	9, Th2 (°C) 07 20.06 87 0.97 1 to 7 in Tab 88 19.52 - fLA) × T2 0 19.63 where appr 6 20.23 de 9b, so the ug Sep	0.99 lle 9c) 18.93 fLA = Liv 19.04 opriate 19.64 at Ti,m= Oct 0.99	1 18.32 ing area ÷ (18.44 19.04 = (76)m an Nov	1 17.82 4) = 17.94 18.54 d re-calc		(88) (89) (90) (91) (92) (93)

Mont	hly avera	age exte	ernal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature, l	_m , W =	-[(39)m	x [(93)m	– (96)m]				
(97)m=	10440.38	10059.16	9067.87	7467.12	5791.16	3965.63	2763.21	2862.39	4242.48	6354.9	8476.07	10293.59		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Vh/mont	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m=	6620.48	5574.08	5292.55	3843.72	2663.22	0	0	0	0	3494.25	5015.68	6569.8		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	39073.78	(98)
Spac	e heating	g require	ement in	kWh/m²	/year							[106.15	(99)
9a. En	nergy rec	uiremer	nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
-	e heatir	_										Г		_
	ion of sp					mentary	-					Į	0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Effici	ency of r	nain spa	ace heat	ing syste	em 1								61	(206)
Effici	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Spac	e heating	•	· `											
	6620.48	5574.08	5292.55	3843.72	2663.22	0	0	0	0	3494.25	5015.68	6569.8		
(211 <mark>)</mark> n	n = {[(98]	,												(211)
	10853.24	9137.83	8676.31	6301.19	4365.94	0	0	0	0	5728.28		10770.16		_
								Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}		64055.38	(211)
	e heating	•		- 1	month									
$= \{[(98)]$ (215)m=	3)m x (20	0 (1)] } X 1	00 ÷ (20	0	0	0	0	0	0	0	0	0		
(213)m-	Ů	0		U	U	0	0			ar) =Sum(2			0	(215)
Water	heating	•							(, • • • • • • • • • • • • • • • • • •	715,1012			(213)
	t from wa		ter (calc	ulated al	oove)									
	469.61	419	452.01	421.8	425.37	315.04	312.99	329.07	323.99	436.57	440.75	463.91		
Efficie	ncy of w	ater hea	iter					•					51	(216)
(217)m=	60.22	60.18	60.07	59.84	59.4	51	51	51	51	59.7	60.05	60.22		(217)
	or water n = (64)	-					-	-	-					
, ,	779.85	696.3	752.43	704.88	716.16	617.73	613.71	645.24	635.27	731.27	733.99	770.35		
			<u> </u>					Tota	I = Sum(2	19a) ₁₁₂ =			8397.18	(219)
											A/I. /	. L	k/Mb/yoo	
Annua	al totals									K۱	wn/year		kWh/yea	r
	al totals heating	fuel use	ed, main	system	1					K\	Wh/year	[64055.38	r
Space				system	1					K\	wn/year	[[r
Space Water	heating	fuel use	ed			t				K1	wn/year	[64055.38	
Space Water Electri	heating heating	fuel use	ed ans and			t				K1	wn/year	156	64055.38	(230c)
Space Water Electri centr	heating heating city for p	fuel use umps, f	ed ans and :			t				K1	wn/year]] 	64055.38	

Electricity for lighting			907.39 (232)
10a. Fuel costs - individual heating systems:			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 × 0.01	= 2229.13 (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 × 0.01	= 292.22 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 26.51 (249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applicable and (232)	apply fuel price according to 13.19 x 0.01	
Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (254) as Total energy cost (245)(247)	s needed 7) + (250)(254) =		2787.55 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) × (25	(6)] ÷ [(4) + 45.0] =		0.42 (256) 2.83 (257) 60.46 (258)
Space heating (main system 1)	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	1813.79 (264)
Space and water heating	(261) + (262) + (263) + (264	4) =	15649.75 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	104.32 (267)
Electricity for lighting	(232) x	0.519 =	470.94 (268
Total CO2, kg/year		sum of (265)(271) =	16225.01 (272)
CO2 emissions per m ²		(272) ÷ (4) =	44.08 (273)
El rating (section 14)			49 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
			70447.50 (264)
Space heating (main system 1)	(211) x	1.22	78147.56 (261)
Space heating (main system 1) Space heating (secondary)	(211) x (215) x	3.07	78147.56 (261) 0 (263)

Primary energy kWh/m²/year		$(272) \div (4) =$		249.37	(273)
'Total Primary Energy		sum of (265)(271) =		91794.88	(272)
Electricity for lighting	(232) x	0	=	2785.69	(268)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	617.07	(267)
Space and water heating	(261) + (262) + (263) + (264) =		88392.12	(265)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Softwa	a Num are Vei			Versio	n: 1.0.1.24	
Address	-	Property A	Address	: Flat 1					
Address: 1. Overall dwelling dimer	nsions:								
1. Overall awelling alline	Tolorio.	Area	a(m²)		Av. He	ight(m)		Volume(m³)	
Basement			· ,	(1a) x		3.1	(2a) =	172.82	(3a)
Ground floor		15	56.34	(1b) x	2	2.6	(2b) =	406.48	(3b)
First floor		15	56.01	(1c) x	3	.28	(2c) =	511.71] (3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 3	68.1	(4)]` ′ [`
Dwelling volume		·)+(3c)+(3d	l)+(3e)+	.(3n) =	1091.02	(5)
2. Ventilation rate:									
2. Voltalation rate.	main seconda heating heating	ry	other		total			m³ per hour	r
Number of chimneys	heating heating 0 + 1	+ [1] = [2	X e	40 =	80	(6a)
Number of open flues	0 + 0	- + -	0	j = [0	x :	20 =	0	(6b)
Number of intermittent far	ns			'	6	X ·	10 =	60	(7a)
Number of passive vents				\	0	x	10 =	0	(7b)
Number of flueless gas fir	es			\	0	X ·	40 =	0	(7c)
	rs, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b				140		Air ch ÷ (5) =	anges per ho	ur
Number of storeys in th	•	3 a 10 (17), C	ou iei wise (onunue m	om (9) to (10)	ĺ	0	(9)
Additional infiltration	3 (1)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	r 0.35 for	masoni	y constr	uction		İ	0	(11)
if both types of wall are pro deducting areas of opening	esent, use the value corresponding t	to the greate	er wall are	a (after			•		
=	oor, enter 0.2 (unsealed) or ().1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripped						İ	0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =		İ	0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =	İ	0	(16)
Air permeability value, o	q50, expressed in cubic metro	es per ho	ur per s	quare m	etre of e	nvelope	area	15	(17)
If based on air permeabili	ty value, then (18) = [(17) ÷ 20]+	(8), otherwi	se (18) = ((16)			İ	0.88	(18)
Air permeability value applies	s if a pressurisation test has been do	ne or a deg	gree air pe	rmeability	is being us	sed	•		_
Number of sides sheltered	d							4	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	[9)] =		l	0.7	(20)
Infiltration rate incorporati	•		(21) = (18) x (20) =				0.61	(21)
Infiltration rate modified fo		1 1				l		1	
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed 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		

Wind Factor (22a)m = (′22)m ÷	4											
(22a)m= 1.27 1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
A discrete discribination sets	(alla)			ماد ماد دا م		(04 =)	(00-)				1		
Adjusted infiltration rate	0.75	0.68	0.66	0.58	0.58	0.57	(22a)m	0.66	0.69	0.72]		
Calculate effective air c						0.07	0.01	0.00	0.03	0.72	J		
If mechanical ventilat	tion:											0	(23a)
If exhaust air heat pump us) = (23a)				0	(23b)
If balanced with heat recov	•	-	_									0	(23c)
a) If balanced mecha					- 	- ` ` - 	ŕ	 		``	· ÷ 100] I		(04-)
(24a)m= 0 0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If balanced mecha	inical ve	entilation 0	without	heat red	covery (N	ЛV) (24b	0) m = (22)	2b)m + (2 0	23b) 0	0	l		(24b)
(),	-					<u> </u>			U	U			(240)
c) If whole house extr if (22b)m < 0.5 ×			•	-				.5 × (23b))				
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural ventilatio	n or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	ļ.	Į.	ļ.	ı		
if (22b)m = 1, the								0.5]					
(24d)m= 0.81 0.8	0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(24d)
Effective air change r	rate - er) or (2 <mark>4</mark> b	o) or (24	c) or (24	d) in box	(25)				1		
(25)m= 0.81 0.8	0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(25)
3. Heat losses and hea	at l <mark>oss</mark> p	oaramete	er:										
ELEMENT Gross	s	Openin	gs	Net Ar		U-valı		AXU		k-value			Xk
ELEMENT Gross area (s		gs	A ,r	m²	W/m2	2K	(W/I	<)	k-value kJ/m²-l			J/K
ELEMENT Gross area (Doors Type 1	s	Openin	gs	A ,r	m² x	W/m2 2	= [(W/I	<)				J/K (26)
ELEMENT Gross area (Doors Type 1 Doors Type 2	s	Openin	gs	A ,r 2.1 1.64	m ² x	W/m2 2 2	= [= [4.2 3.28	<) 				J/K (26) (26)
ELEMENT Gross area (Doors Type 1 Doors Type 2 Windows Type 1	s	Openin	gs	A ,r 2.1 1.64 1.5	x x x1/	W/m2 2 2 /[1/(4.5)+	= [0.04] = [4.2 3.28 5.72	<) 				(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64	x x x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [0.04] = [4.2 3.28 5.72 6.25	<) 				(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64	x x x1/ x1/ x1/	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	(W/I 4.2 3.28 5.72 6.25 6.25	<) 				(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 3.28 5.72 6.25 6.25	<) 				(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64	x x x1/ x1/ x1/ x1/ x1/	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/I 4.2 3.28 5.72 6.25 6.25 6.25	<) 				(26) (26) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83	x x x1/ x1/ x1/ x1/ x1/ x1/	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17	<)				(26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 0.83 1.64	x x x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25	\$) 				(26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1	x x x x x x x x x x x x x x x x x x x	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	=	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01	<) 				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.8)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x x x x x x x x x x	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 20.66 9.15	\$) 				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.8)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12 Windows Type 13	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 1.64 2.4 2.4 2.83	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66 9.15 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	s	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x	W/m2 2 (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+ (1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Floor Type 3					24.67	7 X	0.25	=	6.1675				(28)
Walls Type1	87.1	1	0		87.11	X	0.45	=	39.2				(29)
Walls Type2	101.	74	22.9	7	78.77	7 X	0.45	=	35.45				(29)
Walls Type3	43.3	34	0		43.34	1 X	0.32	=	13.88				(29)
Walls Type4	53.6	64	0		53.64	t x	0.32	=	17.18				(29)
Walls Type5	119.	93	20.8	2	99.11	X	0.45	=	44.6				(29)
Roof	23.6	62	0		23.62	<u>x</u>	0.2	=	4.72				(30)
Total area of e	lements	, m²			612.4	8							(31)
Party wall					30.03	3 X	0	=	0				(32)
Party wall					25.87	7 X	0	=	0				(32)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragrapi	h 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				352.15	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
can be used instead Thermal bridge				ısina Ar	nendix k	<						91.87	(36)
if details of therma		,				`						91.07	(30)
Tota <mark>l fabr</mark> ic he								(33) +	(36) =			444.02	(37)
Ven <mark>tilatio</mark> n hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 290.64	286.34	282.13	262.36	258.66	241.43	241.43	238.24	248.07	258.66	266.14	273.97		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m= 734.66	730.36	726.15	706.38	702.68	685.45	685.45	682.26	692.09	70 <mark>2.68</mark>	710.16	717.99		_
Heat loss para	meter (H	HLP), W/	m²K						Average = i = (39)m ÷		12 /12=	706.36	(39)
(40)m= 2	1.98	1.97	1.92	1.91	1.86	1.86	1.85	1.88	1.91	1.93	1.95		
N. salasa at da		- (I. / T - I. I	I - 4 - \						Average =	Sum(40) ₁	12 /12=	1.92	(40)
Number of day	ı —	<u> </u>		Mari	1	11	1	Can	0-4	Nex	Dag	1	
(41)m= 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31	-	(41)
(41)		01	00	01					01		1 01	J	(,
4 Water beet	ting once	rav roqui	romont:								kWh/y	oor:	
4. Water heat	ing ener	rgy requi	rement.								KVVII/y	ear.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	9)	.22]	(42)
Annual averag	e hot wa									11	0.69]	(43)
Reduce the annua							to achieve	a water us	se target o	f		•	
						·	Ι	0	0-4	Nan	Date	1	
Jan Hot water usage ii	Feb n litres per	Mar day for ea	Apr ach month	May $Vd,m = fa$	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	J	
(44)m= 121.75	117.33	112.9	108.47	104.04	99.62	99.62	104.04	108.47	112.9	117.33	121.75	1	
(44)111- 121.75	117.33	112.3	100.41	104.04	33.02	33.02	104.04	<u> </u>	Total = Su	<u> </u>	1	1328.23	(44)
									. J.a Ou			1020.20	(···)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 180.56 157.92 162.96 142.07 136.32 117.63 109 125.08 126.58 147.51 161.02 174.86 (45)m =Total = $Sum(45)_{1...12}$ = 1741.52 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)27.08 23.69 24.44 21.31 20.45 17.64 16.35 22.13 24.15 26.23 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year $(48) \times (49) =$ 250 (50)b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51)0.03 If community heating see section 4.3 Volume factor from Table 2a 0.78 (52)Temperature factor from Table 2b 0.78 (53)Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 5.18 (54)Enter (50) or (54) in (55) (55)5.18 Water storage loss calculated for each month $((56)m = (55) \times (41)m$ 145.13 (56)m= 160.68160.68 155.49 160.68 155.49 160.68 160.68 155.49 160.68 155.49 160.68 (56)If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 160.68 155.49 160.68 155.49 160.68 (57)(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) 128.38 115.95 (59)(59)m =128.38 124.24 128.38 41.92 43.31 41.92 128.38 124.24 128.38 Combi loss calculated for each month (61)m = (60) \div 365 x (41)m 0 0 0 0 0 0 (61)(61)m =0 0 0 Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 421.8 452.01 315.04 312.99 329.07 (62)469.61 419 425.37 323.99 436.57 440.75 463.91 (62)m =Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)(63)m =0 0 0 0 0 0 0 Output from water heater 469.61 452.01 (64)m =419 421.8 425.37 315.04 312.99 329.07 323.99 436.57 440.75 463.91 (64)Output from water heater (annual) 1...12 4810.11 Heat gains from water heating, kWh/month $0.25 (0.85 \times (45)) + (61) + 0.8 \times ((46)) + (57) + (59) +$ 146.63 76.24 (65)162.74 145.27 156.88 148.03 72.65 70.89 75.62 151.75 152.93 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

(66)m= 161.02 161.02 161.	.02 161.02	161.02 1	161.02 1	61.02 161	.02 161.02	161.02	161.02	161.02		(66)
Lighting gains (calculated in						101.02	101.02	101.02		(00)
(67)m= 51.71 45.93 37.3				9.28 25.		42.71	49.85	53.14		(67)
Appliances gains (calculate	!	1		!			1			
(68)m= 511.33 516.64 503				82.54 377		419.07	455	488.77		(68)
Cooking gains (calculated in		<u> </u>	!	!						, ,
(69)m= 39.1 39.1 39.	- i ·	39.1		39.1 39		39.1	39.1	39.1		(69)
Pumps and fans gains (Tab										
(70)m= 0 0 0		0	0	0 0	0	0	0	0		(70)
Losses e.g. evaporation (ne	egative val	ues) (Table	5)	I						
(71)m= -128.82 -128.82 -128		- 		28.82 -128	.82 -128.82	-128.82	-128.82	-128.82		(71)
Water heating gains (Table		1								
(72)m= 218.73 216.18 210.		198.96	100.9	5.29 102	.47 105.03	203.97	212.4	216.19		(72)
Total internal gains =			(66)m -	+ (67)m + (68	B)m + (69)m + ((70)m + (71)m + (72)	m		
(73)m= 853.08 850.05 822	.79 778.03	730.28 5	595.15 5	68.41 576	.08 600.58	737.05	788.56	829.41		(73)
6. Solar gains:										
Solar gains are calculated using	solar flux fror	n Table 6a and	d associate	d equations	to convert to th	e applica	able orientat	ion.		
Orientation: Access Facto			Flux	0.	g_ 		FF		Gains	
Table 6d	m²		Table	6a	Table 6b	_	Table 6c		(VV)	
North 0.9x 0.54	x 3	3.1 ×	10.6	3 ×	0.72	Х	0.7	=	24.22	(74)
North 0.9x 0.54	x 2	.83 ×	10.6	3 ×	0.85	x	0.7	=	26.11	(74)
North 0.9x 0.54	x 3	3.1 ×	20.3	2 ×	0.72	x	0.7	=	46.29	(74)
North 0.9x 0.54	x 2	.83 ×	20.3	2 x	0.85	Х	0.7	=	49.89	(74)
North 0.9x 0.54	x 3	3.1 ×	34.5	3 ×	0.72	X	0.7	=	78.66	(74)
North 0.9x 0.54	x 2	.83 ×	34.5	3 ×	0.85	X	0.7	=	84.77	(74)
North 0.9x 0.54	x 3	3.1 ×	55.4	6 ×	0.72	x	0.7	=	126.35	(74)
North 0.9x 0.54	x 2	.83 ×	55.4	6 ×	0.85	х	0.7	=	136.17	(74)
North 0.9x 0.54	x 3	3.1 ×	74.7	2 ×	0.72	х	0.7	=	170.2	(74)
North 0.9x 0.54	x 2	.83 ×	74.7	2 ×	0.85	x	0.7	=	183.43	(74)
North 0.9x 0.54	x 3	3.1 ×	79.9	9 ×	0.72	x	0.7	=	182.2	(74)
North 0.9x 0.54	x 2	.83 ×	79.9	9 x	0.85	x	0.7	=	196.37	(74)
North 0.9x 0.54	x 3	3.1 ×	74.6	8 ×	0.72	х	0.7	=	170.11	(74)
North 0.9x 0.54	x 2	.83 ×	74.6	8 ×	0.85	x	0.7	=	183.33	(74)
North 0.9x 0.54	x 3	3.1 ×	59.2	5 ×	0.72	x	0.7	=	134.96	(74)
North 0.9x 0.54	x 2	.83 ×	59.2	5 X	0.85	x	0.7	=	145.45	(74)
North 0.9x 0.54	x 3	3.1 ×	41.5	2 x	0.72	x	0.7	=	94.57	(74)
North 0.9x 0.54	x 2	.83 ×	41.5	2 x	0.85	x [0.7	=	101.93	(74)
North 0.9x 0.54	x 3	3.1 X	24.1	9 x	0.72	x [0.7	=	55.1	(74)
North 0.9x 0.54	x 2	.83 ×	24.1	9 x	0.85	X	0.7	=	59.39	(74)

	_		_		_						_		_
North	0.9x	0.54	X	2.83	X	13.12	X	0.85	X	0.7	=	32.2	(74)
North	0.9x	0.54	X	3.1	X	8.86	X	0.72	X	0.7	=	20.19	(74)
North	0.9x	0.54	X	2.83	X	8.86	x	0.85	X	0.7	=	21.76	(74)
South	0.9x	0.3	X	1.5	x	46.75	X	0.85	X	0.7	=	22.53	(78)
South	0.9x	0.77	X	5.13	x	46.75	X	0.85	X	0.7	=	98.89	(78)
South	0.9x	0.3	X	1.5	X	76.57	X	0.85	X	0.7	=	36.9	(78)
South	0.9x	0.77	X	5.13	x	76.57	X	0.85	X	0.7	=	161.96	(78)
South	0.9x	0.3	X	1.5	x	97.53	x	0.85	X	0.7	=	47.01	(78)
South	0.9x	0.77	X	5.13	x	97.53	X	0.85	X	0.7	=	206.31	(78)
South	0.9x	0.3	X	1.5	x	110.23	X	0.85	X	0.7	=	53.13	(78)
South	0.9x	0.77	X	5.13	x	110.23	X	0.85	X	0.7	=	233.18	(78)
South	0.9x	0.3	X	1.5	X	114.87	X	0.85	X	0.7	=	55.36	(78)
South	0.9x	0.77	X	5.13	x	114.87	x	0.85	X	0.7	=	242.98	(78)
South	0.9x	0.3	X	1.5	X	110.55	x	0.85	X	0.7	=	53.28	(78)
South	0.9x	0.77	X	5.13	x	110.55	X	0.85	X	0.7	=	233.84	(78)
South	0.9x	0.3	X	1.5	x	108.01	x	0.85	X	0.7	=	52.06	(78)
South	0.9x	0.77	X	5.13	X	108.01	X	0.85	X	0.7	=	228.48	(78)
South	0.9x	0.3	X	1.5	X	104.89	X	0.85	X	0.7	=	50.55	(78)
South	0.9x	0.77	X	5.13	х	104.89	x	0.85	x	0.7	=	221.88	(78)
South	0.9x	0.3	X	1.5	х	101.89	x	0.85	x	0.7	=	49.1	(78)
South	0.9x	0.77	X	5.13	X	101.89	X	0.85	x	0.7	=	215.52	(78)
South	0.9x	0.3	X	1.5	x	82.59	Х	0.85	x	0.7	=	39.8	(78)
South	0.9x	0.77	X	5.13	x	82.59	X	0.85	x	0.7	=	174.69	(78)
South	0.9x	0.3	X	1.5	х	55.42	x	0.85	x	0.7	=	26.71	(78)
South	0.9x	0.77	X	5.13	x	55.42	x	0.85	X	0.7	=	117.22	(78)
South	0.9x	0.3	X	1.5	X	40.4	X	0.85	X	0.7	=	19.47	(78)
South	0.9x	0.77	X	5.13	x	40.4	X	0.85	X	0.7	=	85.45	(78)
Southwe	st _{0.9x}	0.54	X	1.64	x	36.79		0.85	X	0.7	=	17.45	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	36.79		0.85	X	0.7	=	17.45	(79)
Southwe	st _{0.9x}	0.54	X	2.4	x	36.79		0.85	X	0.7	=	25.54	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	62.67		0.85	X	0.7	=	29.72	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	62.67		0.85	X	0.7	=	29.72	(79)
Southwe	st _{0.9x}	0.54	X	2.4	x	62.67		0.85	X	0.7	=	43.5	(79)
Southwe	st _{0.9x}	0.54	X	1.64	X	85.75		0.85	X	0.7	=	40.67	(79)
Southwe	st _{0.9x}	0.54	X	1.64	X	85.75		0.85	X	0.7	=	40.67	(79)
Southwe	st _{0.9x}	0.54	x	2.4	x	85.75		0.85	x	0.7	=	59.51	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	106.25		0.85	x	0.7	=	50.39	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	106.25		0.85	x	0.7	=	50.39	(79)
Southwe	st _{0.9x}	0.54	x	2.4	x	106.25		0.85	x	0.7	=	73.74	(79)
Southwe	st _{0.9x}	0.54	x	1.64	x	119.01		0.85	x	0.7	=	56.44	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	119.01		0.85	X	0.7	=	56.44	(79)

Southwest _{0.9x}	0.54	1 🗸	0.4	l v	440.04	1	0.05	v	0.7	1 =	00.50	(79)
Southwest _{0.9x}	0.54	l x	2.4	X I v	119.01]]	0.85	x	0.7]]	82.59	
Southwest _{0.9x}	0.54	x	1.64	x	118.15]]	0.85	X	0.7] =] =	56.03	
Southwest _{0.9x}	0.54] ^ x	2.4	^ x	118.15 118.15]]	0.85	X	0.7] - =	56.03 82	(79)
Southwest _{0.9x}	0.54] ^ x	1.64	^ x	113.91]]	0.85	X	0.7]	54.02](79)
Southwest _{0.9x}	0.54	^ x	1.64	^ x	113.91]]	0.85	X	0.7] -] =	54.02	(79)
Southwest _{0.9x}	0.54] ^ x	2.4	^ x	113.91]]	0.85	X	0.7] -] =	79.05	(79)
Southwest _{0.9x}	0.54] ^] _X	1.64	x	104.39]]	0.85	X	0.7]	49.51	(79)
Southwest _{0.9x}	0.54	l x	1.64	l x	104.39] 	0.85	x	0.7]] =	49.51	(79)
Southwest _{0.9x}	0.54	l L	2.4	l X	104.39	!]	0.85	x	0.7] =	72.45	(79)
Southwest _{0.9x}	0.54	X	1.64	x	92.85	! 	0.85	x	0.7] =	44.03	(79)
Southwest _{0.9x}	0.54	X	1.64	X	92.85	<u> </u>	0.85	x	0.7	=	44.03	(79)
Southwest _{0.9x}	0.54	×	2.4	X	92.85	İ	0.85	x	0.7	, =	64.44	(79)
Southwest _{0.9x}	0.54	X	1.64	x	69.27	ĺ	0.85	x	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	x	1.64	x	69.27		0.85	x	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	×	2.4	x	69.27	ĺ	0.85	x	0.7	j =	48.07	(79)
Southwest _{0.9x}	0.54	×	1.64	x	44.07	j	0.85	x	0.7	j =	20.9	(79)
Southwest _{0.9x}	0.54	x	1.64	X	44.07		0.85	X	0.7	=	20.9	(79)
Southwest _{0.9x}	0.54	x	2.4	х	44.07	İ.	0.85	x	0.7	=	30.59	(79)
Southwest _{0.9x}	0.54	×	1.64	х	31.49		0.85	x	0.7] <u>=</u>	14.93	(79)
Southwest _{0.9x}	0.54	x	1.64	X	31.49		0.85	x	0.7	=	14.93	(79)
Southwest _{0.9x}	0.54	X	2.4	x	31.49		0.85	x	0.7	=	21.85	(79)
West 0.9x	0.54	x	1.64	x	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	1.64	х	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	0.83	X	19.64	X	0.85	X	0.7	=	4.71	(80)
West 0.9x	0.54	X	2.4	X	19.64	x	0.85	X	0.7	=	13.63	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	0.83	x	38.42	x	0.85	X	0.7	=	9.22	(80)
West 0.9x	0.54	X	2.4	X	38.42	X	0.85	X	0.7	=	26.66	(80)
West 0.9x	0.54	X	1.64	X	63.27	х	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	1.64	x	63.27	x	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	0.83	X	63.27	x	0.85	X	0.7	=	15.19	(80)
West 0.9x	0.54	X	2.4	x	63.27	x	0.85	X	0.7	=	43.91	(80)
West 0.9x	0.54	X	1.64	X	92.28	X	0.85	X	0.7	=	43.76	(80)
West 0.9x	0.54	X	1.64	x	92.28	x	0.85	X	0.7	=	43.76	(80)
West 0.9x	0.54	X	0.83	X	92.28	X	0.85	X	0.7	=	22.15	(80)
West 0.9x	0.54	X	2.4	X	92.28	X	0.85	X	0.7	=	64.04	(80)
West 0.9x	0.54	X	1.64	X	113.09	X	0.85	X	0.7	=	53.63	(80)
West 0.9x	0.54	X	1.64	X	113.09	X	0.85	X	0.7] = 1	53.63	(80)
West 0.9x	0.54	X	0.83	X	113.09	X	0.85	X	0.7	=	27.14	(80)

West	٥.٠.٠		1		1		1		١		1		7(00)
West	0.9x	0.54	X	2.4	X	113.09	X	0.85	X	0.7] = 1	78.49	(80)
West	0.9x	0.54	X	1.64	X	115.77	X	0.85	X	0.7] = 1	54.9	(80)
	0.9x	0.54	X	1.64	X	115.77] X]	0.85	X	0.7] = 1	54.9	(80)
West	0.9x	0.54	X	0.83	X	115.77	X	0.85	X	0.7	=	27.79	(80)
West	0.9x	0.54	X	2.4	X	115.77	X	0.85	X	0.7	=	80.35	(80)
West	0.9x	0.54	X	1.64	X	110.22	X	0.85	X	0.7	=	52.27	(80)
West	0.9x	0.54	X	1.64	X	110.22	X	0.85	X	0.7	=	52.27	(80)
West	0.9x	0.54	X	0.83	X	110.22	X	0.85	X	0.7	=	26.45	(80)
West	0.9x	0.54	X	2.4	X	110.22	X	0.85	X	0.7	=	76.49	(80)
West	0.9x	0.54	X	1.64	X	94.68	X	0.85	X	0.7	=	44.9	(80)
West	0.9x	0.54	X	1.64	X	94.68	X	0.85	X	0.7	=	44.9	(80)
West	0.9x	0.54	X	0.83	X	94.68	Х	0.85	X	0.7	=	22.72	(80)
West	0.9x	0.54	X	2.4	x	94.68	X	0.85	X	0.7	=	65.71	(80)
West	0.9x	0.54	X	1.64	x	73.59	X	0.85	X	0.7	=	34.9	(80)
West	0.9x	0.54	X	1.64	X	73.59	X	0.85	X	0.7	=	34.9	(80)
West	0.9x	0.54	X	0.83	x	73.59	X	0.85	x	0.7	=	17.66	(80)
West	0.9x	0.54	X	2.4	x	73.59	X	0.85	X	0.7	=	51.07	(80)
West	0.9x	0.54	X	1.64	X	45.59	Х	0.85	X	0.7	=	21.62	(80)
West	0.9x	0.54	x	1.64	x	45.59	x	0.85	X	0.7	=	21.62	(80)
West	0.9x	0.54	x	0.83	х	45.59] x	0.85	x	0.7	=	10.94	(80)
West	0.9x	0.54	x	2.4	X	45.59	x	0.85	x	0.7	=	31.64	(80)
West	0.9x	0.54	x	1.64	x	24.49	Х	0.85	x	0.7	=	11.61	(80)
West	0.9x	0.54	x	1.64	x	24.49	X	0.85	x	0.7	=	11.61	(80)
West	0.9x	0.54	x	0.83	х	24.49	x	0.85	x	0.7	=	5.88	(80)
West	0.9x	0.54	x	2.4	x	24.49	x	0.85	x	0.7	=	17	(80)
West	0.9x	0.54	X	1.64	x	16.15	X	0.85	x	0.7	=	7.66	(80)
West	0.9x	0.54	x	1.64	x	16.15	x	0.85	x	0.7	=	7.66	(80)
West	0.9x	0.54	x	0.83	x	16.15	x	0.85	x	0.7	=	3.88	(80)
West	0.9x	0.54	x	2.4	x	16.15	X	0.85	x	0.7	=	11.21	(80)
Northwes	t 0.9x	0.54	x	1.64	x	11.28	x	0.85	x	0.7	=	5.35	(81)
Northwes	t 0.9x	0.54	x	2.4	x	11.28	х	0.85	x	0.7	=	7.83	(81)
Northwes	t 0.9x	0.54	x	1.64	x	22.97	x	0.85	x	0.7] =	10.89	(81)
Northwes	t 0.9x	0.54	x	2.4	x	22.97	x	0.85	x	0.7] =	15.94	(81)
Northwes	t 0.9x	0.54	x	1.64	x	41.38	x	0.85	x	0.7	=	19.62	(81)
Northwes	t 0.9x	0.54	x	2.4	x	41.38	x	0.85	x	0.7	=	28.72	(81)
Northwes	t 0.9x	0.54	x	1.64	x	67.96	x	0.85	х	0.7	j =	32.23	(81)
Northwes	t _{0.9x}	0.54	x	2.4	x	67.96	x	0.85	x	0.7	j =	47.16	(81)
Northwes	t 0.9x	0.54	×	1.64	x	91.35	x	0.85	x	0.7	j =	43.32	(81)
Northwes	t 0.9x	0.54	x	2.4	×	91.35	x	0.85	x	0.7	j =	63.39	(81)
Northwes	t 0.9x	0.54	×	1.64	x	97.38	x	0.85	x	0.7	=	46.18	(81)
Northwes	t 0.9x	0.54	×	2.4	x	97.38	x	0.85	x	0.7	=	67.59	(81)
	L								ı				_ '

Northwest 0.9x	0.54	X	1.64	4	х	91.1	хГ	0.85	x	0.7	=	43.2	(81)
Northwest _{0.9x}	0.54	x	2.4	ļ.	x =	91.1	x	0.85	_ x [0.7	=	63.22	(81)
Northwest 0.9x	0.54	x	1.64	4	x	72.63	x	0.85	x [0.7	=	34.44	(81)
Northwest 0.9x	0.54	x	2.4	ļ	x	72.63	x	0.85	= x [0.7	=	50.4	(81)
Northwest _{0.9x}	0.54	x	1.6	4	x $\overline{}$	50.42	×	0.85	_ x [0.7	=	23.91	(81)
Northwest _{0.9x}	0.54	x	2.4		х	50.42	×	0.85	×	0.7	=	34.99	(81)
Northwest 0.9x	0.54	x	1.64	4	х	28.07	×	0.85	- x [0.7	=	13.31	(81)
Northwest _{0.9x}	0.54	x	2.4		х	28.07	×	0.85	= x [0.7	-	19.48	(81)
Northwest _{0.9x}	0.54	x	1.64	4	х	14.2	×	0.85	x	0.7	=	6.73	(81)
Northwest 0.9x	0.54	x	2.4	ļ.	x \Box	14.2	×	0.85	_ x [0.7	=	9.85	(81)
Northwest _{0.9x}	0.54	x	1.64	4	x $\overline{\ }$	9.21	×	0.85	_ x [0.7	=	4.37	(81)
Northwest _{0.9x}	0.54	x	2.4		x \Box	9.21	×	0.85	x	0.7	=	6.39	(81)
_					_		_		_				
Solar gains in	watts, cald	culated	for each	n month			(83)m =	= Sum(74)m .	(82)m				
(83)m= 282.34	497.14	725.05	976.44	1167.06	1191	.46 1134.99	987.3	8 811.06	561.36	341.09	239.77		(83)
Total gains – ir	nternal and	d solar	(84)m =	(73)m -	+ (83))m , watts							
(84)m= 1135.42	1347.19 1	547.84	1754.48	1897.34	1786	1703.4	1563.4	46 1411.64	1298.42	1129.65	1069.18		(84)
7. Mean inter	nal tempe	rature (heating	season)						_		
Temperature	during he	ating pe	eriods in	the livir	ng are	ea from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	7							, ,					
Jan	Feb	Mar	Apr	May	Ju		Au	g Sep	Oct	Nov	Dec		
(86)m= 1	1	1	1	0.99	0.9		0.95	-	1	1	1		(86)
Maan intarnal	temperat	ura in li	vina are	2 T1 (fc	Moll	etane 3 to	7 in Ta	hla ac)					
		T			llow 20.	steps 3 to 7	7 in Ta		19.65	19.05	18.55		(87)
(87)m= 18.54	18.69	19.01	19.48	19.96	20.	4 20.68	20.63	3 20.24	19.65	19.05	18.55		(87)
(87)m= 18.54 Temperature	18.69 during hea	19.01 ating pe	19.48 eriods in	19.96 rest of	20. dwell	4 20.68 ling from Ta	20.63 able 9,	3 20.24 Th2 (°C)					
(87)m= 18.54 Temperature (88)m= 20	18.69 during hea	19.01 ating pe	19.48 eriods in 20.04	19.96 rest of 20.05	20. dwell 20.0	20.68 ling from Ta 20.07	20.63 able 9,	3 20.24 Th2 (°C)			18.55		(87) (88)
Temperature (88)m= 20 Utilisation fac	during hea	ating pe	19.48 eriods in 20.04 est of dv	rest of 20.05 velling, I	20.0 dwell 20.0 h2,m	20.68 ling from Ta 27 20.07 (see Table	20.63 able 9, 20.03	Th2 (°C) 7 20.06	20.05	20.04	20.02		(88)
(87)m= 18.54 Temperature (88)m= 20	18.69 during hea	19.01 ating pe	19.48 eriods in 20.04	19.96 rest of 20.05	20. dwell 20.0	20.68 ling from Ta 27 20.07 (see Table	20.63 able 9,	Th2 (°C) 7 20.06					
Temperature (88)m= 20 Utilisation fac	during hea	ating pe 20.01 ns for re	19.48 eriods in 20.04 est of dv	19.96 rest of 20.05 velling, I	20.dwell 20.d h2,m	20.68 ling from Ta 27 20.07 (see Table 6 0.89	20.63 able 9, 20.03 9a) 0.92	Th2 (°C) 7 20.06	20.05	20.04	20.02		(88)
Temperature (88)m= 20 Utilisation fac (89)m= 1	during head 20.01 tor for gain 1 temperat	ating pe 20.01 ns for re	19.48 eriods in 20.04 est of dv	19.96 rest of 20.05 velling, I	20.dwell 20.d h2,m	4 20.68 ling from Ta 07 20.07 (see Table 6 0.89 2 (follow ste	20.63 able 9, 20.03 9a) 0.92	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44	20.05 1 e 9c) 18.85	20.04	1 17.73		(88)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal	during head 20.01 tor for gain 1 temperat	ating per 20.01 ns for recovery	19.48 eriods in 20.04 est of dv 1 he rest of	rest of 20.05 velling, I 0.99	20.dwell 20.d h2,m 0.9	4 20.68 ling from Ta 07 20.07 (see Table 6 0.89 2 (follow ste	20.63 able 9, 20.03 9a) 0.92 eps 3 t	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44	20.05 1 e 9c) 18.85	20.04	1 17.73	0.14	(88)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal	during head 20.01 tor for gain 1 temperat 17.86	ating per 20.01 ns for reconstruction to 1 ns.18	19.48 eriods in 20.04 est of dv 1 he rest of 18.67	19.96 rest of 20.05 velling, I 0.99 of dwelli 19.15	20.0 dwell 20.0 h2,m 0.9 ng T2	20.68 ling from Ta 27 20.07 (see Table 6 0.89 2 (follow ste 61 19.87	20.63 able 9, 20.03 9a) 0.92 eps 3 t	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44	20.05 1 e 9c) 18.85	20.04	1 17.73	0.14	(88) (89) (90)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7	during head 20.01 tor for gain 1 temperat 17.86	ating per 20.01 ns for reconstruction to 1 ns.18	19.48 eriods in 20.04 est of dv 1 he rest of 18.67	19.96 rest of 20.05 velling, I 0.99 of dwelli 19.15	20.0 dwell 20.0 h2,m 0.9 ng T2	20.68 20.68 20.07 20.07 20.07 (see Table 6 0.89 2 (follow stee 61 19.87 19.87 2	20.63 able 9, 20.03 9a) 0.92 eps 3 t	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44 ft fLA) × T2	20.05 1 e 9c) 18.85	20.04	1 17.73	0.14	(88) (89) (90)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98	ating per 20.01 ns for re 1 ls.18 rure in the sure (for 18.3	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who	19.96 rest of 20.05 velling, I 0.99 of dwelli 19.15	20.0 dwell 20.0 h2,m 0.9 ng T2 19.6	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44 f fLA) × T2 4 19.56	20.05 1 e 9c) 18.85 LA = Livi	20.04 1 18.24 ng area ÷ (4	20.02 1 17.73 4) =	0.14	(88) (89) (90) (91)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98	ating per 20.01 ns for re 1 ls.18 rure in the sure (for 18.3	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who	19.96 rest of 20.05 velling, I 0.99 of dwelli 19.15	20.0 dwell 20.0 h2,m 0.9 ng T2 19.6	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44 fLA) × T2 4 19.56 where approximation of the process of the proce	20.05 1 e 9c) 18.85 LA = Livi	20.04 1 18.24 ng area ÷ (4	20.02 1 17.73 4) =	0.14	(88) (89) (90) (91)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 nent to the 18.58	19.01 ating per 20.01 ns for re 1 ls.18 ure in the sure (for 18.3 er mean 18.9	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who 18.78 internal	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwel 19.26 tempera	20.0 dwell 20.0 h2,m 0.9 19.6 lling) 19.7 ature	20.68 20.68	20.63 able 9, 20.03 9a) 0.92 eps 3 t 19.83 + (1 - 19.94	Th2 (°C) 7 20.06 0.98 0 7 in Tabl 3 19.44 fLA) × T2 4 19.56 where approximation of the process of the proce	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate	20.04 1 18.24 ng area ÷ (4) 18.35	20.02 1 17.73 4) =	0.14	(88) (89) (90) (91) (92)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm (93)m= 18.42 8. Space hear Set Ti to the r	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 nent to the 18.58 ting requiremean inter	ating pe 20.01 ns for re 1 ture in the state of the sta	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who 18.78 internal 19.38	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwel 19.26 tempera 19.86	20.0 dwell 20.0 h2,m 0.9 19.6 lling) 19.7 ature 20.3	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83 + (1 - 19.94 2 4e, w 20.54	Th2 (°C) Th2	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate 19.56	20.04 1 18.24 ng area ÷ (4) 18.95	20.02 1 17.73 4) = 17.85		(88) (89) (90) (91) (92)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm (93)m= 18.42 8. Space hear Set Ti to the right of the utilisation	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 nent to the 18.58 ting requiremean interfactor for	ating per 20.01 Ins for re 1 Ins.18 I	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who 18.78 internal 19.38 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 20.04 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 20.04 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriod of the se	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwel 19.26 tempera 19.86 e obtain ble 9a	20.0 dwell 20.0 h2,m 0.9 19.6 19.7 ature 20.3	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83 + (1 - 19.94 20.54 Table	Th2 (°C) Th2	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate 19.56 t Ti,m=	20.04 1 18.24 ng area ÷ (4) 18.35 18.95 (76)m an	20.02 1 17.73 4) = 17.85 18.45		(88) (89) (90) (91) (92)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm (93)m= 18.42 8. Space hear Set Ti to the rithe utilisation Jan	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 nent to the 18.58 ting requiremean interfactor for Feb	ating per 20.01 Ins for ref 1 Ins.18	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who 18.78 internal 19.38 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriods in 19.48 experience of the seriod in 19.48 experienc	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwel 19.26 tempera 19.86	20.0 dwell 20.0 h2,m 0.9 19.6 lling) 19.7 ature 20.3	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83 + (1 - 19.94 2 4e, w 20.54	Th2 (°C) Th2	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate 19.56	20.04 1 18.24 ng area ÷ (4) 18.95	20.02 1 17.73 4) = 17.85		(88) (89) (90) (91) (92)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm (93)m= 18.42 8. Space hear Set Ti to the rethe utilisation Jan Utilisation face	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 temperat 18.58 ting requiremean interfactor for Feb tor for gain 18.69	ating per 20.01 Ins for reconstruction at 18.18 Insure (for 18.3 Insurement 18.9 Insurement 18	eriods in 20.04 est of dv 1 he rest of 18.67 the who internal 19.38 enperaturation Talendrich Apr	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwelli 19.26 tempera 19.86 e obtain ble 9a May	20.0 dwell 20.0 h2,m 0.9 19.6 19.7 ature 20.3	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83 + (1 - 19.94 20.54 Table Aug	Th2 (°C) Th2	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate 19.56 t Ti,m=	20.04 1 18.24 ng area ÷ (-4) 18.35 18.95 (76)m an Nov	20.02 1 17.73 4) = 17.85 18.45 Dec		(88) (89) (90) (91) (92) (93)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm (93)m= 18.42 8. Space head Set Ti to the right the utilisation Jan Utilisation fac (94)m= 1	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 nent to the 18.58 ting requirement interfactor for Feb tor for gain 1	ating per 20.01 Ins for reconstruction at 18.18 Insure (for 18.3 Insurement 18.9 Insurement 18	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who 18.78 internal 19.38 eriods in Apr 0.99	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwel 19.26 tempera 19.86 e obtain ble 9a May 0.98	20.0 dwell 20.0 h2,m 0.9 19.6 19.7 ature 20.3	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83 + (1 - 19.94 20.54 Table	Th2 (°C) Th2	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate 19.56 t Ti,m=	20.04 1 18.24 ng area ÷ (4) 18.35 18.95 (76)m an	20.02 1 17.73 4) = 17.85 18.45		(88) (89) (90) (91) (92)
Temperature (88)m= 20 Utilisation fac (89)m= 1 Mean internal (90)m= 17.7 Mean internal (92)m= 17.82 Apply adjustm (93)m= 18.42 8. Space hear Set Ti to the rethe utilisation Jan Utilisation face	during head 20.01 tor for gain 1 temperat 17.86 temperat 17.98 temperat 18.58 temperat 18.58 temperat 18.58 temperat 18.58 temperat 18.58 temperat 19.58 tem	ating per 20.01 Ins for reconstruction at 18.18 Insure in the 18.18 Insure in the 18.19 Insure in the 18.1	19.48 eriods in 20.04 est of dv 1 he rest of 18.67 the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.78 internal 19.38 experience of the who 18.7	rest of 20.05 velling, I 0.99 of dwelli 19.15 ole dwelli 19.26 tempera 19.86 e obtain ble 9a May 0.98 I)m	20.0 dwell 20.0 h2,m 0.9 19.6 19.7 ature 20.3	20.68 20.68	20.63 able 9, 20.07 9a) 0.92 eps 3 t 19.83 + (1 - 19.94 20.54 Table Aug	Th2 (°C) Th2	20.05 1 e 9c) 18.85 LA = Livi 18.96 ppriate 19.56 t Ti,m=	20.04 1 18.24 ng area ÷ (4 18.35 18.95 (76)m an Nov	20.02 1 17.73 4) = 17.85 18.45 Dec		(88) (89) (90) (91) (92) (93)

Monthly average external temperature from Table 8	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	_
(97)m= 10374.18 9991.3 9001.62 7406.13 5736.93 3921.84 2732.78 2827.2 4191.58 6297.3 8415.48 10230.4	6 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	_
(98)m= 6874.12 5809.83 5548.24 4076.28 2878.16 0 0 0 3722.61 5246.56 6816.34	ł
Total per year (kWh/year) = $Sum(98)_{15,912}$	40972.15 (98)
Space heating requirement in kWh/m²/year	111.31 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1 (204)
Efficiency of main space heating system 1	61 (206)
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)	٦
6874.12 5809.83 5548.24 4076.28 2878.16 0 0 0 3722.61 5246.56 6816.3	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
11269.06 9524.31 9095.48 6682.42 4718.3 0 0 0 6102.63 8600.92 11174.3	
Total (kWh/year) =Sum(211) _{15,1012} =	67 <mark>167.45 (211)</mark>
Space heating fuel (secondary), kWh/month	
$= \{ [(98)m \times (201)] \} \times 100 \div (208) $ $(215)m = 0 $	7
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 (215)
	0 (215)
Water heating Output from water heater (calculated above)	
469.61 419 452.01 421.8 425.37 315.04 312.99 329.07 323.99 436.57 440.75 463.91]
Efficiency of water heater	51 (216)
(217)m= 60.24 60.21 60.11 59.9 59.5 51 51 51 51 59.77 60.09 60.25	(217)
Fuel for water heating, kWh/month	_
(219) m = (64) m x $100 \div (217)$ m (219) m= 779.51 695.94 751.94 704.19 714.94 617.73 613.71 645.24 635.27 730.41 733.52 770.02	7
Total = Sum(219a) _{1,12} =	8392.42 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	67167.45
Water heating fuel used	8392.42
Electricity for pumps, fans and electric keep-hot	
central heating pump:	(230c)
boiler with a fan-assisted flue 45	(230e)

Electricity for lighting (232)913.16 12a. CO2 emissions – Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) 14508.17 (261)0.216 (215) x Space heating (secondary) (263)0.519 0 Water heating (219) x 0.216 1812.76 (264)(261) + (262) + (263) + (264) =Space and water heating (265)16320.93 Electricity for pumps, fans and electric keep-hot (231) x (267) 0.519 104.32 (232) x Electricity for lighting (268)0.519 473.93 sum of (265)...(271) =Total CO2, kg/year (272)16899.18



 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

45.91

47

Property Details: Flat 5

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

Floor 0 91.6 m² 3.28 m Floor 1 84.96 m² 2.65 m

Living area: 54.11 m² (fraction 0.591)

Front of dwelling faces: Unspecified

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			Wood
d2	Manufacturer	Half glazed	low-E, En = 0.2 , hard coat	No	Wood
W1	Manufactur <mark>e</mark> r	Windows	Single-glazed	No	Wood
W2	Manufacturer	Windows	Single-glazed	No	
W3	Manufacturer	Windows	Single-glazed	No	
W4	Manufacturer	Windows	Single-glazed	No	
w5	Manufacturer	Windows	Single-glazed	No	
W6	Manufacturer	Windows	Single-glazed	No	
w7	Manufacturer	Windows	Single-glazed	No	
RF1	Manufacturer	Roof Windows	low-F $En = 0.2$ hard coat	No	PVC-II

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
d2	16mm or more mm	0.7	0.65	2	2.06	1
W1		0.7	0.65	4.5	1.93	2

4 W2 16mm or more 0.7 0.65 4.5 1.8 3 W3 16mm or more 0.7 0.65 4.5 1.8 2 W4 16mm or more 0.7 0.65 4.5 1.84 0.7 0.65 4.5 1.43 3 w5 16mm or more 2 W6 0.65 4.5 1.43 16mm or more 0.7 3 w7 16mm or more 0.7 0.65 4.5 1.43 RF1 16mm or more 0.7 0.65 4.5 1.2 1

Name: D1	Type-Name:	Location: corridor	Orient:	Width: 1	Height: 2.1
d2		External wall GF	South	0.98	2.1
W1		External wall GF	South	0.963	2
W2		External wall GF	South	1	1.8
W3		External wall GF	East	1	1.8

W4	External wall GF	North	1.02	1.8
w5	External wall GF	North	1.02	1.4
W6	External wall GF	East	1.02	1.4
w7	External wall GF	South	1.02	1.4
RF1	Flat roof 2	Horizontal	1.518	0.792

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>ts</u>						
External wall GF	110.667	33.64	77.03	0.45	0	False	N/A
corridor GF	21.14	0	21.14	0.25	0.9	False	N/A
External FF	48.075	0	48.08	0.45	0	False	N/A
flat roof 1	39.87	0	39.87	0.2	0		N/A
Flat roof 2	84.96	1.2	83.76	0.2	0		N/A
above garage	68.67			0.25			N/A
Internal Element	<u>S</u>						
Party Elements							
party GF	71.63						N/A
Party wall FF	118.11						N/A

=0.15)

The	rmal bridges:		No i	nform	ation on the	ermal b	oridgii	ng (y=0	.15) (y	=
Vei	ntilation:									
Pres	sure test:		No (Assun	ned)					

Ventilation:

Number of chimneys:

Number of open flues:

Number of fans:

Number of passive stacks:

Natural ventilation (extract fans)

1 (main: 0, secondary: 0, other: 1)

2

Number of passive stacks:

Number of sides sheltered: 2
Pressure test: 15

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: SAP Tables

SAP Table: 115 Wall mounted Systems with radiators

Design flow temperature: Unknown

Open

Boiler interlock: Yes

Main heating Control:

Main heating Control: No time or thermostatic control of room temperature

Control code: 2101

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas

Hot water cylinder

Cylinder volume: 250 litres

Cylinder insulation: Factory 15 mm Primary pipework insulation: False

Cylinderstat: False

Cylinder in heated space: False

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

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

		Harris Batalla				
		User Details:				
Assessor Name:	0. 5015.0040	Stroma N				
Software Name:	Stroma FSAP 2012	Software		Versio	n: 1.0.1.24	
	Р	roperty Address: Fla	t 5			
Address: 1. Overall dwelling dimen	naiona:					
1. Overall dwelling dimen	1510115.	Area(m²)	Av. Height(m	1)	Volume(m³)	
Ground floor		91.6 (1a)		(2a) =	300.45	(3a)
First floor		84.96 (1b)	x 2.65	(2b) =	225.14] (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1r	176.56 (4)]
Dwelling volume		·	+(3b)+(3c)+(3d)+(3e)+	(3n) =	525.59	(5)
2. Ventilation rate:				L	020.00](")
2. Vertillation rate.	main secondar heating heating	y other	total		m³ per hour	
Number of chimneys		+ 1	1	x 40 =	40	(6a)
Number of open flues	0 + 0	+ 0	0	x 20 =	0	(6b)
Number of intermittent fan	s		2	x 10 =	20	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fire	es		0	x 40 =	0	(7c)
				Air ch	anges per hou	_ ur
Infiltration due to chimneys	s, flues and fans = $(6a)+(6b)+(7a)$	(a)+(7b)+(7c) =	60	÷ (5) =	0.11	(8)
If a pressurisation test has be	en ca <mark>rried o</mark> ut or is int <mark>ended,</mark> proceed	d to (17), otherwise contin	ue from (9) to (16)			_
Number of storeys in the	e dw <mark>elling</mark> (ns)				0	(9)
Additional infiltration				(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame or				0	(11)
if both types of wall are pre deducting areas of opening	sent, use the value corresponding to as): if equal user 0.35	the greater wall area (aft	er			
	oor, enter 0.2 (unsealed) or 0.	1 (sealed), else ente	er O	[0	(12)
If no draught lobby, ente	er 0.05, else enter 0			Ī	0	(13)
Percentage of windows	and doors draught stripped			Ī	0	(14)
Window infiltration	5	0.25 - [0.2 x (1 ²	4) ÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	ļ	0	(16)
	50, expressed in cubic metre	s per hour per squar	e metre of envelor	ا De area آ	15	(17)
· · · · · · · · · · · · · · · · · · ·	y value, then $(18) = [(17) \div 20] + (8)$				0.86	(18)
· ·	if a pressurisation test has been don		bility is being used	L	0.00	_(,
Number of sides sheltered	I			[2	(19)
Shelter factor		(20) = 1 - [0.07	5 x (19)] =	•	0.85	(20)
Infiltration rate incorporating	ng shelter factor	$(21) = (18) \times (20)$	0) =	j	0.73	(21)
Infiltration rate modified fo	r monthly wind speed					_
Jan Feb M	Mar Apr May Jun	Jul Aug S	ep Oct No	v Dec		
Monthly average wind spe	ed from Table 7					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor (22a)m = (22)m -	÷ 4											
(22a)m= 1.27 1.25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
		·			(24)	(22.)		ļ.	ļ.	ı		
Adjusted infiltration rate (allow 0.94 0.92 0.9	ving for st	nelter an	d wind s	o.7	(21a) x 0.68	(22a)m _{0.73}	0.79	0.00	0.00	1		
Calculate effective air change	1				0.00	0.73	0.79	0.83	0.86	J		
If mechanical ventilation:											0	(23a)
If exhaust air heat pump using App	pendix N, (2	23b) = (23a) × Fmv (6	equation (N	N5)) , othe	rwise (23b) = (23a)				0	(23b)
If balanced with heat recovery: eff	iciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					0	(23c)
a) If balanced mechanical v	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m = 0 0 0	0	0	0	0	0	0	0	0	0			(24a)
b) If balanced mechanical v	entilation	without	heat red	covery (N	MV) (24b	p)m = (2)	2b)m + (23b)		1		
(24b)m = 0 0 0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole house extract ve		-	-				F (00)	,				
if $(22b)m < 0.5 \times (23b)$,	tnen (24)	c) = (230)	o); otner\	wise (24)	$\frac{c}{0} = (220)$	o) m + 0	.5 × (23b	0	0	1		(24c)
(1,										J		(240)
d) If natural ventilation or w if (22b)m = 1, then (24c							0.5]					
(24d)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87			(24d)
Effective air change rate - e	enter (24a) or (24b	or (24	c) or (24	d) in box	(25)						
(25)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87]		(25)
										•		
3 Heat Incope and heat Inco	narameti											
3. Heat losses and heat loss			Net Ar	ea	U-valı	ue	AXU		k-value	.	Δ	λΧk
3. Heat losses and heat loss ELEMENT Gross area (m²)	Openin m	igs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l			A X k :J/K
ELEMENT Gross	Openin	igs						<)				
ELEMENT Gross area (m²)	Openin	igs	A ,r	m² x	W/m2	2K	(W/I	<) 				J/K
ELEMENT Gross area (m²) Doors Type 1	Openin	igs	A ,r	m ² x	W/m2	= = = = = = = = = = = = = = = = = = =	4.2	<) 				(26)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2	Openin	igs	A ,r 2.1 2.06	m ² x x x x1.	W/m2 2 2	= = = = = = = = = = = = = = = = = = =	4.2 4.12	<) 				(26) (26)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1	Openin	igs	A ,r 2.1 2.06 1.93	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(4.5)+	= 0.04] = 0.04] =	4.2 4.12 7.36	<) 				(26) (26) (27)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	Openin	igs	A ,r 2.1 2.06 1.93	x x x1. x1. x1.	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86	<) 				(26) (26) (27) (27)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3	Openin	igs	A ,r 2.1 2.06 1.93 1.8	x x x 1. x 1. x 1. x 1. x 1. x 1. x 1.	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86 6.86	<)				(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4	Openin	igs	A ,r 2.1 2.06 1.93 1.8 1.84	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86 6.86 7.02	<)				(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Openin	igs	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43	x x x1. x1. x1. x1. x1. x1.	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86 6.86 7.02 5.45	<)				(26) (26) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Openin	igs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45	S)				(26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Openin	igs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45					(26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights	Openin	gs 1 ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04]	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor	Openin m	gs 1 ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67	x x x x x x x x x x x x x x x x x x x	W/m2 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04]	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type 1 110.67	Openin m	gs 1 ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679 34.66					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14	Openin m	gs 1 ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03 21.14	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45	= 0.04] = 0.04	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 5.45 4.31					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 48.08	33.6 0	gs n ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.43 2.1.2 68.67 77.03 21.14 48.08	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.45	0.04] = 0.04]	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 34.66 4.31 21.63					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 Roof Type1 39.87	33.6 0 0	gs n ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.43 1.43 48.08 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.2	= 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = = = = = = = = = =	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679 34.66 4.31 21.63 7.97					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Party wall (32)71.63 0 Party wall (32)118.11 0 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss, $W/K = S(A \times U)$ (33)235.83 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium (35)250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)56.32 if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) =(37)292.15 Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m x (5)Feb May Jul Jan Mar Apr Jun Aug Sep Oct Nov Dec 162.79 159.83 (38)156.94 143.34 140.79 128.95 128.95 126.76 133.51 140.79 145.94 151.32 (38)m =Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =454.94 451.99 449.09 435.49 432.95 421.11 421.11 418.91 425.67 432.95 438.1 443.48 (39)Average = $Sum(39)_{1...12}/12=$ 435.48 Heat loss parameter (HLP), W/m2K (40)m = (39)m \div (4)2.58 (40)m =2.56 2.45 2.39 2.39 2.37 2.41 2.45 2.51 (40)Average = $Sum(40)_{1...12}/12=$ 2.47 Number of days in month (Table 1a) 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 heating energy requirement: kWh/year: Assumed occupancy, N 2.97 (42)if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 104.77 (43)Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Nov Jan Feb Mar Apr May Jun Jul Aug Sep Oct Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =115.24 111.05 106.86 102.67 98.48 94.29 94.29 98.48 102.67 106.86 111.05 115.24 Total = $Sum(44)_{1...12}$ = (44)1257.22 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m =170.9 149.47 154.24 134.47 129.03 111.34 103.18 118.4 119.81 139.63 152.41 165.51 Total = $Sum(45)_{1...12}$ = 1648.41 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)(46)m =25.64 22.42 23.14 20.17 19.35 16.7 15.48 17.76 17.97 20.94 22.86 24.83 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:

		(1.14.11	/ 1 \						ı		
a) If manufacturer's declared I		wn (kvvr	n/day):					0			(48)
Temperature factor from Table								0	ļ		(49)
Energy lost from water storage b) If manufacturer's declared of		or io not		(48) x (49) =		2	50			(50)
Hot water storage loss factor fr	•						0	.03	1		(51)
If community heating see section	,		-37				<u>0.</u>		i		(0.)
Volume factor from Table 2a							0.	78			(52)
Temperature factor from Table	2b						0.	.78			(53)
Energy lost from water storage	, kWh/year			(47) x (51) x (52) x (53) =	5.	18			(54)
Enter (50) or (54) in (55)							5.	.18			(55)
Water storage loss calculated to	for each month			((56)m = (55) × (41)	m					
(56)m= 160.68 145.13 160.68	155.49 160.68	155.49	160.68	160.68	155.49	160.68	155.49	160.68			(56)
If cylinder contains dedicated solar sto	rage, (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= 160.68 145.13 160.68	155.49 160.68	155.49	160.68	160.68	155.49	160.68	155.49	160.68			(57)
Primary circuit loss (annual) fro	m Table 2			l				0	, 		(58)
Primary circuit loss (armual) inc		59)m = ('58) ± 36	\$5 v (41)	m			0	i		(00)
(modified by factor from Tab	,		,	, ,		r thermo	stat)				
(59)m= 128.38 115.95 128.38	124.24 128.38	41.92	43.31	43.31	41.92	128.38	124.24	128.38			(59)
Combi loss calculated for each	month (61)m	(CO) · 20	SE (41) m							
Combi loss calculated for each		0	0 × (4)	0	0	0	0	0	l		(61)
(1)									(- 0)	(0.4)	
Total heat required for water h				· ·		, ,	` '		(59)m I	+ (61)	
(62)m= 459.96 410.55 443.3	414.2 418.08	308.75	307.17	322.39	317.22	428.68	432.14	454.56			(62)
Solar DHW input calculated using App						r contributi	on to wate	er heating)			
(add additional lines if FGHRS									l		(63)
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0	l		(63)
Output from water heater		ı				ı			I		
(64)m= 459.96 410.55 443.3	414.2 418.08	308.75	307.17	322.39	317.22	428.68	432.14	454.56			—
						ater heatei				4717	(64)
Heat gains from water heating,			<u> </u>	- ` 		-``		-]		
(65)m= 159.53 142.46 153.99	144.1 145.6	70.55	68.96	74.02	73.37	149.13	150.07	157.73			(65)
include (57)m in calculation	of (65)m only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating		
5. Internal gains (see Table 5	5 and 5a):										
Metabolic gains (Table 5), Wat	ts								_,		
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m= 178.28 178.28 178.28	178.28 178.28	178.28	178.28	178.28	178.28	178.28	178.28	178.28			(66)
Lighting gains (calculated in Ap	opendix L, equat	ion L9 o	r L9a), a	lso see	Table 5			-			
(67)m= 77.6 68.93 56.05	42.44 31.72	26.78	28.94	37.61	50.49	64.1	74.82	79.76	1		(67)
Appliances gains (calculated in	n Appendix L. ea	uation L	13 or L1	3a), also	see Ta	ble 5			1		
(68)m= 519.67 525.07 511.48	482.55 446.03	411.71	388.78	383.39	396.97	425.9	462.42	496.75			(68)
Cooking gains (calculated in A	<u> </u>	L	or L15a	<u> </u>	ļ	5		1	1		
(69)m= 55.8 55.8 55.8	55.8 55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8			(69)
Pumps and fans gains (Table 5	<u> </u>			L				<u> </u>	ł		• •
(70)m =	0 0	0	0	0	0	0	0	0	ĺ		(70)
()	<u> </u>	L				L		<u> </u>	İ		()

			,					_,										
	<u> </u>	aporatio	·	Ť	-		_			T				T	l			(74)
` '		-118.85		!	-118.85	-118.85	-1	18.85	-118.85	-118	3.85 -118.85	5 -11	8.85	-118.85	-118.	85		(71)
Water	$\overline{}$	gains (T	able	5)			_							,		_		
(72)m=	214.42	212	206.	97	200.14	195.7	9	97.99	92.68	99	49 101.9	20	0.44	208.43	212.0	01		(72)
Total i	nternal	gains =						(66)	m + (67)m	n + (6	8)m + (69)m +	⊦ (70)n	n + (71)m + (72)	m			
(73)m=	926.92	921.22	889.	73	840.35	788.68	6	51.71	625.62	635	664.59	80	5.67	860.89	903.	74		(73)
	lar gains																	
_			•			Table 6a	and			ations	to convert to	the ap	plica		ion.			
Orienta		Access Fable 6d	actor	•	Area m²			Flu	x ole 6a		g_ Table 6b	_	-	FF Fable 6c			Gains (W)	
	_	able ou						ı aı	ne oa	,	T able or	,	_	able oc			(۷۷)	_
North	0.9x	1		X	1.8	34	X	1	0.63	X	0.65		X	0.7	_	=	16.02	(74)
North	0.9x	1		X	1.4	3	X	1	0.63	X	0.65		X	0.7		=	18.68	(74)
North	0.9x	1		X	1.8	34	X	2	0.32	X	0.65		x	0.7		=	30.62	(74)
North	0.9x	1		X	1.4	3	X	2	0.32	X	0.65		x	0.7		=	35.7	(74)
North	0.9x	1		X	1.8	34	X	3	4.53	X	0.65		X	0.7		=	52.04	(74)
North	0.9x	1		X	1.4	3	X	3	4.53	X	0.65		x	0.7		=	60.66	(74)
North	0.9x	1		X	1.8	34	X	5	5.46	X	0.65		Х	0.7		=	83.58	(74)
North	0.9x	1		X	1.4	3	Х	5	5.46	X	0.65		х	0.7		=	97.44	(74)
North	0.9x	1		X	1.8	34	Х	7	4.72] x	0.65		Х	0.7		=	112.59	(74)
North	0.9x	1		X	1.4	3	X	7	4.72]/x	0.65		х	0.7		=	131.26	(74)
North	0.9x	1		X	1.8	4	X	7	9.99	_x	0.65		х	0.7		=	120.53	(74)
North	0.9x	1		X	1.4	3	x	7	9.99	х	0.65		х	0.7		=	140.51	(74)
North	0.9x	1		X	1.8	34	Х	7	4.68	x	0.65		х	0.7		=	112.53	(74)
North	0.9x	1		X	1.4	3	X	7	4.68	x	0.65		x	0.7		=	131.19	(74)
North	0.9x	1		X	1.8	34	X	5	9.25	x	0.65		x [0.7		=	89.28	(74)
North	0.9x	1		X	1.4	3	X	5	9.25	Īx	0.65		x	0.7		=	104.08	(74)
N I =	F		一一							ī		一	Ē		一	i		≒

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East	0.9x	3	X	1.8	X	92.28	X	0.65	X	0.7	=	204.06	(76)
East	0.9x	2	X	1.43	X	92.28	X	0.65	X	0.7	=	108.08	(76)
East	0.9x	3	X	1.8	X	113.09	X	0.65	X	0.7	=	250.08	(76)
East	0.9x	2	X	1.43	x	113.09	x	0.65	X	0.7	=	132.45	(76)
East	0.9x	3	X	1.8	X	115.77	x	0.65	X	0.7	=	256	(76)
East	0.9x	2	X	1.43	x	115.77	x	0.65	X	0.7	=	135.59	(76)
East	0.9x	3	X	1.8	x	110.22	x	0.65	X	0.7	=	243.73	(76)
East	0.9x	2	X	1.43	x	110.22	x	0.65	X	0.7	=	129.08	(76)
East	0.9x	3	x	1.8	x	94.68	x	0.65	X	0.7	=	209.36	(76)
East	0.9x	2	x	1.43	x	94.68	x	0.65	X	0.7	=	110.88	(76)
East	0.9x	3	X	1.8	x	73.59	x	0.65	X	0.7	=	162.73	(76)
East	0.9x	2	X	1.43	x	73.59	x	0.65	X	0.7	=	86.19	(76)
East	0.9x	3	x	1.8	х	45.59	x	0.65	x	0.7	=	100.81	(76)
East	0.9x	2	x	1.43	х	45.59	x	0.65	x	0.7	=	53.39	(76)
East	0.9x	3	x	1.8	x	24.49	x	0.65	X	0.7	=	54.15	(76)
East	0.9x	2	x	1.43	x	24.49	x	0.65	x	0.7	=	28.68	(76)
East	0.9x	3	x	1.8	х	16.15	x	0.65	x	0.7	=	35.72	(76)
East	0.9x	2	x	1.43	X	16.15	х	0.65	X	0.7	=	18.92	(76)
South	0.9x	1	x	1.93	х	46.75	x	0.65	x	0.7	=	73.9	(78)
South	0.9x	1	x	1.8	х	46.75	x	0.65	x	0.7	=	137.84	(78)
South	0.9x	1	x	1.43	x	46.75	x	0.65	x	0.7	=	82.13	(78)
South	0.9x	1	x	1.93	x	76.57	X	0.65	x	0.7	=	121.03	(78)
South	0.9x	1	x	1.8	x	76.57	X	0.65	x	0.7	=	225.75	(78)
South	0.9x	1	x	1.43	х	76.57	x	0.65	x	0.7	=	134.51	(78)
South	0.9x	1	X	1.93	x	97.53	x	0.65	X	0.7	=	154.17	(78)
South	0.9x	1	X	1.8	x	97.53	x	0.65	X	0.7	=	287.57	(78)
South	0.9x	1	x	1.43	x	97.53	x	0.65	x	0.7	=	171.34	(78)
South	0.9x	1	X	1.93	x	110.23	x	0.65	X	0.7	=	174.24	(78)
South	0.9x	1	x	1.8	х	110.23	x	0.65	x	0.7	=	325.02	(78)
South	0.9x	1	x	1.43	х	110.23	x	0.65	X	0.7	=	193.65	(78)
South	0.9x	1	x	1.93	x	114.87	x	0.65	x	0.7	=	181.57	(78)
South	0.9x	1	x	1.8	x	114.87	x	0.65	x	0.7	=	338.69	(78)
South	0.9x	1	x	1.43	x	114.87	x	0.65	x	0.7	=	201.8	(78)
South	0.9x	1	x	1.93	x	110.55	x	0.65	x	0.7	=	174.74	(78)
South	0.9x	1	x	1.8	x	110.55	x	0.65	x	0.7	j =	325.94	(78)
South	0.9x	1	x	1.43	x	110.55	x	0.65	x	0.7	=	194.21	(78)
South	0.9x	1	x	1.93	x	108.01	x	0.65	x	0.7	=	170.73	(78)
South	0.9x	1	x	1.8	x	108.01	x	0.65	x	0.7	=	318.46	(78)
South	0.9x	1	x	1.43	x	108.01	x	0.65	x	0.7	j =	189.75	(78)
South	0.9x	1	x	1.93	x	104.89	x	0.65	x	0.7	=	165.8	(78)
South	0.9x	1	x	1.8	x	104.89	x	0.65	x	0.7	=	309.27	(78)
			•		•		1				•		_

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South 0.9x	1	X	1.43	X	1	04.89	X	0.65	X	0.7	=	184.27	(78)
South 0.9x	1	X	1.93	X	1	01.89	X	0.65	X	0.7	=	161.05	(78)
South 0.9x	1	X	1.8	X	1	01.89	x	0.65	X	0.7	=	300.4	(78)
South 0.9x	1	X	1.43	X	1	01.89	X	0.65	X	0.7		178.99	(78)
South 0.9x	1	X	1.93	X	8	2.59	X	0.65	x	0.7	=	130.54	(78)
South 0.9x	1	X	1.8	X	8	2.59	X	0.65	X	0.7		243.5	(78)
South 0.9x	1	X	1.43	X	8	2.59	x	0.65	X	0.7		145.08	(78)
South 0.9x	1	X	1.93	X	5	5.42	X	0.65	x	0.7	=	87.6	(78)
South 0.9x	1	X	1.8	X	5	5.42	x	0.65	X	0.7	=	163.39	(78)
South 0.9x	1	X	1.43	X	5	5.42	X	0.65	X	0.7	=	97.35	(78)
South 0.9x	1	X	1.93	X		40.4	x	0.65	X	0.7	=	63.86	(78)
South 0.9x	1	X	1.8	X	4	40.4	X	0.65	X	0.7	=	119.11	(78)
South 0.9x	1	X	1.43	X	4	40.4	x	0.65	X	0.7	=	70.97	(78)
Rooflights _{0.9x}	1	X	1.2	X		26	x	0.65	X	0.7	=	12.78	(82)
Rooflights _{0.9x}	1	X	1.2	X		54	X	0.65	X	0.7	=	26.54	(82)
Rooflights _{0.9x}	1	X	1.2	X		96	x	0.65	X	0.7	=	47.17	(82)
Rooflights _{0.9x}	1	X	1.2	X		150	X	0.65	X	0.7	=	73.71	(82)
Rooflights 0.9x	1	X	1.2	X		192	Х	0.65	X	0.7	=	94.35	(82)
Rooflights 0.9x	1	X	1.2	х		200] x	0.65	X	0.7	=	98.28	(82)
Rooflights _{0.9x}	1	X	1.2	x		189	x	0.65	X	0.7	=	92.87	(82)
Rooflights 0.9x	1	X	1.2	X		157	x	0.65	X	0.7	=	77.15	(82)
Rooflights _{0.9x}	1	X	1.2	X		115	Х	0.65	x	0.7	=	56.51	(82)
Rooflights 0.9x	1	X	1.2	×		66	X	0.65	X	0.7	=	32.43	(82)
Rooflights 0.9x	1	X	1.2	x		33	X	0.65	x	0.7	=	16.22	(82)
Rooflights _{0.9x}	1	X	1.2	X		21	x	0.65	X	0.7	=	10.32	(82)
Solar gains in		1	- 1				` 	s = Sum(74)m.	·			Ī	
(83)m= 407.79	704.11	986.97	1259.78 14		1445.8	1388.35	125	0.1 1081.36	784.7	490.2	347.82		(83)
Total gains – i			<u>` </u>		` ,		1,000	- 04 4745 05	4500.6	0 4054.4	4054.55	l	(0.4)
(84)m= 1334.71		1876.7	2100.13 22		097.51	2013.98	1885	5.81 1745.95	1590.3	8 1351.1	1251.55		(84)
7. Mean inter				· ·									_
Temperature	•			_			ole 9,	Th1 (°C)				21	(85)
Utilisation fac								<u> </u>		1	_	1	
Jan	Feb	Mar		May	Jun	Jul	 	ug Sep	Oct	+	Dec		(00)
(86)m= 0.99	0.99	0.98	0.96).91	0.83	0.71	0.7	75 0.9	0.97	0.99	0.99		(86)
Mean interna		ture in I	iving area	T1 (follo	ow ste	ps 3 to 7	7 in T	able 9c)		_	ı	i	
(87)m= 18.35	18.6	19.02	19.6 2	0.14	20.59	20.82	20.	78 20.41	19.73	18.97	18.36		(87)
Temperature	during he	eating p	eriods in re	st of dv	welling	from Ta	able 9	9, Th2 (°C)		_			
(88)m= 19.71	19.72	19.73	19.77 1	9.77	19.81	19.81	19.	81 19.79	19.77	19.76	19.74		(88)
Utilisation fac	tor for ga	ins for r	est of dwel	ling, h2	2,m (se	e Table	9a)						
(89)m= 0.99	0.99	0.97	0.94	0.88	0.76	0.58	0.6	0.85	0.96	0.99	0.99		(89)
Mean interna	l tempera	ature in 1	the rest of o	dwelling	T2 (f	ollow ste	eps 3	to 7 in Tabl	e 9c)			-	
	•			•	٠ ،		•		,				

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	l												/00
90)m= 17.31	17.56	17.98	18.59	19.12	19.55	19.73	19.71	19.39	18.72	17.96	17.34		(90
								1	LA = Livin	g area ÷ (4	4) =	0.31	(9
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
92)m= 17.63	17.88	18.3	18.9	19.43	19.87	20.07	20.04	19.7	19.03	18.27	17.65		(9
Apply adjustr	nent to the	ne mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate	•			
93)m= 18.23	18.48	18.9	19.5	20.03	20.47	20.67	20.64	20.3	19.63	18.87	18.25		(9
8. Space hea	iting requ	uirement											
Set Ti to the	mean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation	factor fo	or gains	using Ta	ble 9a	1	1	1	1		1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac				ı	i	.		.	ı	 			
0.99 0.99	0.98	0.97	0.94	0.89	0.8	0.68	0.72	0.87	0.95	0.98	0.99		(9
Useful gains,					i	i		i	ı	i			
,	1596.53		1975.43		1685.95	1375.35	1365.72	1525.58	1517.91	1329.48	1241.1		(9
Monthly aver						1		1	1	1			
96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(9
Heat loss rate			<u>.</u>			-``	-``	<u> </u>		I	l		(0
,	6138.39			l	l	l	l	l	l	l	6230.15		(9
Space heatin													
	1 3052 13	2790.5	1900.6	1210.16	0	0	0	0	1778.78	2753.86	3711.85		
08)m= 3731.94	3032.13												\neg
38)m= [3/31.94	3002.13						Tota	per year	(kWh/year) = Sum(9	8) _{15,912} =	20929.82	(9
			kWh/m²	2/year			Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	20 <mark>929.82</mark> 118.54	╡`
Space heatin	g require	ement in			ystems i	ncluding			(kWh/year) = Sum(9	8) _{15,912} =		╡`
Space heatin	g require	ement in			ystems i	ncluding			(kWh/year) = Sum(9	8) _{15,912} =		╡`
Space heatin a. Energy rec Space heatin	ng require quiremen	ement in	vidual h	eating s			micro-C		(kWh/year) = Sum(9	8) _{15,912} =		(9
Space heatin a. Energy rec Space heatin Fraction of sp	ng require quiremen ng: pace hea	ement in	vidual h	eating sy		system	micro-C	CHP)	(kWh/year) = Sum(9	8)15,912 =	118.54	(9
Space heating a. Energy recommendation of space fraction of space	ng require quirement ng: pace head	ement in tots Indi at from so	vidual h econdary	eating sy y/supple em(s)		system	micro-C	CHP) - (201) =) = Sum(9	8) _{15,912} =	0	(9)
Space heating a. Energy reconstruction of space fraction of space fraction of to	ng require quirement ng: pace hea pace hea pace heating	ement in tots Indi at from so at from m	econdary nain syst	eating sy/supple em(s) stem 1		system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8)15,912 =	0 1	(9)
Space heating a. Energy recommendation Space heating Fraction of space fraction of to Efficiency of the	ng requirement ng: Dace head to tal heating main spa	ement in that - Indi at from so that from many from the	econdary nain systemain sy	eating sy/supple em(s) stem 1	mentary	system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8)15,912 =	0 1 1 1 61	(9)
Space heating a. Energy recommendation Space heating Fraction of space of the space	ng requirement ng: Dace head to tal heating main spa	ement in that - Indi at from m at from m ace heat ry/supple	econdary nain systemain sy	eating sy/supple em(s) stem 1	mentary	system	micro-C (202) = 1	CHP) - (201) = 02) × [1 -) = Sum(9	8)15,912 =	0 1 1 1 61	(9)
Space heating a. Energy recommendation Space heating Fraction of space fraction of to Efficiency of space fraction of to Efficiency of space fraction of to Efficiency of space fraction of to Efficiency of space fraction of to Jan	ng requirements pace head	ement in at from so at from m age heat ry/supple	econdary nain syst main syst ing syste ementar	eating sy/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8) _{15,912} =	0 1 1 1 61	(9)
Space heating a. Energy recommendation Space heating Fraction of space fraction of to Efficiency of space heating Space heating	ng requirement of the property	ement in ints Indicate from many from interest interes	econdary nain syst main syst ing syste ementar	eating sy/supple em(s) stem 1 em 1 y heating May d above	mentary g system Jun	system	(202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	0 1 1 1 61	(9)
Space heating a. Energy recommendation Space heating Fraction of space fraction of to Efficiency of space heating Space heating	ng requirements pace head	ement in at from so at from m age heat ry/supple	econdary nain syst main syst ing syste ementar	eating sy/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =	Nov		0 1 1 1 61	(9)
Space heating a. Energy recommendation a. Energy recommendation Space heating Fraction of space fraction of to Efficiency of space heating Space heating 3731.94	ng requirement of the property	ement in ints Indicate from many from interest from many from interest from many from interest from many from interest from i	econdary nain systemain systemain systementar Apralculater	eating sy/supple em(s) stem 1 em 1 May dabove; 1210.16	mentary g system Jun	system n, % Jul	(202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	0 1 1 1 61	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space heating a. Energy recommendation a. Energy recommendation Space heating Fraction of space fraction of to Efficiency of space heating Space heating 3731.94	g requirements pace head p	ement in the second of the sec	econdary nain systemain systemain systementar Apralculater	eating sy/supple em(s) stem 1 em 1 May dabove; 1210.16	g system Jun 0	system n, % Jul	(202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =	Nov 2753.86	Dec 3711.85	0 1 1 1 61	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space heating a. Energy recomplete space heating Fraction of space fraction of to be a specific space	g requirements pace head p	ement in the second of the sec	econdary nain systemain systementar Apr alculated 1900.6 00 ÷ (20	eating sy/supple em(s) stem 1 em 1 May dabove; 1210.16	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug	Sep 0	(203)] = Oct	Nov 2753.86 4514.52	Dec 3711.85	0 1 1 1 61	(9) (9) (9) (9) (9) (9) (9) (9) (9) (9)
Space heating a. Energy recomplete space heating Fraction of space fraction of to space sp	g requirements of the property	ement in the second of the sec	econdary nain systemain systementar Apr alculatee 1900.6 00 ÷ (20 3115.74	eating sy/supple em(s) stem 1 y heating May d above; 1210.16	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug	Sep 0	(203)] = Oct 1778.78 2916.03	Nov 2753.86 4514.52	Dec 3711.85	0 1 1 61 0 kWh/ye	(9) (9) (9) (9) (9) (9) (9) (9) (9) (9)
Space heating a. Energy recomplete space heating Fraction of space fraction of to the space heating Space heating Space heating 3731.94 211)m = {[(98) 6117.93]	g requirement pace head stal heating main spansecondar Feb g require 3052.13 g) m x (20 5003.5	ement in ints Indicate from many from interest from many from interest from many from interest from many from interest from many from interest from inter	econdary nain systemain systemain systementar Apr alculated 1900.6 00 ÷ (20 3115.74	eating sy/supple em(s) stem 1 y heating May d above; 1210.16	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug	Sep 0	(203)] = Oct 1778.78 2916.03	Nov 2753.86 4514.52	Dec 3711.85	0 1 1 61 0 kWh/ye	(9) (9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space heating a. Energy recomplete space heating Fraction of space fraction of to space heating Space heating 3731.94 211)m = {[(98) 6117.93]} Space heating {[(98)m x (20)]	g requirement pace head stal heating main spansecondar Feb g require 3052.13 g) m x (20 5003.5	ement in ints Indicate from many from interest from many from interest from many from interest from many from interest from many from interest from inter	econdary nain systemain systemain systementar Apr alculated 1900.6 00 ÷ (20 3115.74	eating sy/supple em(s) stem 1 y heating May d above; 1210.16	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug	Sep 0	(203)] = Oct 1778.78 2916.03	Nov 2753.86 4514.52	Dec 3711.85	0 1 1 61 0 kWh/ye	(9) (9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space heating a. Energy recomplete space heating Fraction of space fraction of to space heating Space heating 3731.94 211)m = {[(98) 6117.93]} Space heating {[(98)m x (20)]	g requirements of the property	ement in the secondary of the condar	econdary nain systemain systematar Apr nalculater 1900.6 00 ÷ (20 3115.74	eating sy/supple em(s) stem 1 em 1 y heating May d above; 1210.16 06) 1983.86	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	Sep 0 0 0 1 (kWh/yea	(203)] = Oct 1778.78 2916.03 ar) =Sum(2	Nov 2753.86 4514.52 211) _{15,1012}	Dec 3711.85 6084.99	0 1 1 61 0 kWh/ye	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space heating a. Energy recomplete space heating Fraction of space fraction of to space sp	g requirements of the property	ement in the secondary of the condar	econdary nain systemain systematar Apr nalculater 1900.6 00 ÷ (20 3115.74	eating sy/supple em(s) stem 1 em 1 y heating May d above; 1210.16 06) 1983.86	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	Sep 0 0 0 1 (kWh/yea	(203)] = Oct 1778.78 2916.03 ar) = Sum(2	Nov 2753.86 4514.52 211) _{15,1012}	Dec 3711.85 6084.99	0 1 1 61 0 kWh/ye	(g) (g) (g) (g) (g) (g) (g) (g) (g) (g)
Space heating Space heating Fraction of space fraction of space fraction of to space heating Space heating Space heating 3731.94 211)m = {[(98) 6117.93] Space heating Space heating (215)m = 0	g requirement pace head seconda Feb g require 3052.13 S)m x (20 5003.5 g fuel (so 01)] } x 1 0	ement in its Indicate from so that from many from its ry/supple Mar ement (c 2790.5 4)] } x 1 4574.59 econdary 00 ÷ (20 0	econdary nain systemain systemain systementar Apr alculated 1900.6 00 ÷ (20 3115.74 y), kWh/8) 0	eating sy/supple em(s) stem 1 em 1 y heating May d above; 1210.16 06) 1983.86	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	Sep 0 0 0 1 (kWh/yea	(203)] = Oct 1778.78 2916.03 ar) = Sum(2	Nov 2753.86 4514.52 211) _{15,1012}	Dec 3711.85 6084.99	0 1 1 61 0 kWh/ye	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space heating Space heating Fraction of space fraction of space fraction of to space heating Space heating 3731.94 211)m = {[(98) 6117.93]} Space heating Space heating Space heating Space heating (198)m x (200)	g requirement pace head seconda Feb g require 3052.13 S)m x (20 5003.5 g fuel (so 01)] } x 1 0	ement in its Indicate from so that from many from its ry/supple Mar ement (c 2790.5 4)] } x 1 4574.59 econdary 00 ÷ (20 0	econdary nain systemain systemain systementar Apr alculated 1900.6 00 ÷ (20 3115.74 y), kWh/8) 0	eating sy/supple em(s) stem 1 em 1 y heating May d above; 1210.16 06) 1983.86	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	Sep 0 0 0 1 (kWh/yea	(203)] = Oct 1778.78 2916.03 ar) = Sum(2	Nov 2753.86 4514.52 211) _{15,1012}	Dec 3711.85 6084.99	0 1 1 61 0 kWh/ye	(9 (9 (9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2

(217)m= 59.72 59.61 59.4 58.93	58.08 51	51 51	51	58.76	59.42	59.72		(217)
Fuel for water heating, kWh/month								
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 770.25 688.69 746.25 702.84 $	719.89 605.4	602.28 632.13	622	729.51	727.27	761.13]	
	•	Tota	al = Sum(2	19a) ₁₁₂ =			8307.64	(219)
Annual totals				k۷	Vh/year	•	kWh/year	_ _
Space heating fuel used, main systen	n 1						34311.17	
Water heating fuel used							8307.64	
Electricity for pumps, fans and electric	c keep-hot						_	
central heating pump:						156		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/ye	ear	sum	of (230a).	(230g) =			201	(231)
Electricity for lighting							548.19	(232)
10a. Fuel costs - individual heating s	systems:							
	Fı	ıel		Fuel P	rice		Fuel Cost	
	kV	Vh/year		(Table	12)		£/year	
Space heating - main system 1	(21	1) x		3.48	8	x 0.01 =	1194.03	(240)
Space heating - main system 2	(21	3) x		0		x 0.01 =	0	(241)
Space heating - secondary	(21	5) x		13.1	9	x 0.01 =	0	(242)
Wat <mark>er he</mark> ating cost (other fuel)	(21	9)		3.48	8	x 0.01 =	289.11	(247)
Pumps, fans and electric keep-hot	(23	31)		13.1	9	x 0.01 =	26.51	(249)
(if off-peak tariff, list each of (230a) to	(230g) separatel		and apply	fu <mark>el prio</mark>		rding to x 0.01 =	Table 12a	(250)
Energy for lighting	((230)
Additional standing charges (Table 12	,						120](251)
Additional standing charges (Table 12	2)	dod					120	_
Additional standing charges (Table 12 Appendix Q items: repeat lines (253)	2) and (254) as nee							(251)
Additional standing charges (Table 12	2) and (254) as nee (245)(247) + (2						120 1701.95	_
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating	2) and (254) as nee (245)(247) + (2						1701.95	(251)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating standard cost deflator (Table 12)	2) and (254) as nee (245)(247) + (2 systems	50)(254) =					1701.95 0.42	(251)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating standard cost deflator (Table 12) Energy cost factor (ECF)	2) and (254) as nee (245)(247) + (2	50)(254) =					0.42 3.23	(251) (255) (256) (257)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating standard cost deflator (Table 12)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷	50)(254) = [(4) + 45.0] =	D.				1701.95 0.42	(251)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷	50)(254) = (4) + 45.0] = uding micro-CHF	D.	Emissi	ion fac	tor	0.42 3.23 54.99	(251) (255) (256) (257) (258)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷ ating systems incl	50)(254) = [(4) + 45.0] =	D.	Emissi kg CO2		tor	0.42 3.23	(251) (255) (256) (257) (258)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷ ating systems incl Er kV	50)(254) = [(4) + 45.0] = uding micro-CHF			2/kWh	tor	0.42 3.23 54.99	(251) (255) (256) (257) (258)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating (Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12) 12a. CO2 emissions – Individual heating (Section 12)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷ ating systems incl Er kV (21	50)(254) = (4) + 45.0] = uding micro-CHF nergy Vh/year		kg CO2	2/kWh		0.42 3.23 54.99 Emissions kg CO2/yea	(251) (255) (256) (257) (258)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating (Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12) 12a. CO2 emissions – Individual heating (Space heating (main system 1)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷ ating systems incl Er kV (21 (21	50)(254) = ((4) + 45.0] = uding micro-CHF nergy Vh/year 1) x		kg CO2	2/kWh 6 9	=	0.42 3.23 54.99 Emissions kg CO2/yea	(251) (255) (256) (257) (258) (258)
Additional standing charges (Table 12 Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating (Section 12) Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12) 12a. CO2 emissions – Individual heating (Section 12) Space heating (main system 1) Space heating (secondary)	2) and (254) as nee (245)(247) + (2 systems [(255) x (256)] ÷ ating systems incl Er kV (21 (21 (21	50)(254) = ((4) + 45.0] = uding micro-CHF nergy Vh/year 1) x 5) x		0.21 0.51	2/kWh 6 9	=	0.42 3.23 54.99 Emissions kg CO2/yea 7411.21	(251) (255) (256) (257) (258) (258) (261) (263)

Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	104.32	(267)
Electricity for lighting	(232) x	0.519 =	284.51	(268)
Total CO2, kg/year		sum of (265)(271) =	9594.49	(272)
CO2 emissions per m ²		(272) ÷ (4) =	54.34	(273)
El rating (section 14)			45	(274)

13a. Primary Energy

13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	41859.63	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	10135.32	(264)
Space and water heating	(261) + (262) + (263) + (264)	4) =		51994.96	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	617.07	(267)
Electricity for lighting	(232) x	0	=	1682.94	(268)
'Total Primary Energy		sum of (265)(271) =		54294.96	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		307.52	(273)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.1.24 Property Address: Flat 5 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3.28 (2a) =300.45 (3a) 91.6 First floor (2b) (1b) x (3b) 2.65 225.14 84.96 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)176.56 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =(5) 525.59 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 40 0 1 1 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c) 0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.11 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)15 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.86 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.73 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4

4.3

4.5

4.7

4.9

4.4

4.3

3.8

3.8

3.7

5

(22)m =

5.1

Wind Factor (22a)m = (22)m -	. 4											
(22a)m= 1.27 1.25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjusted infiltration rate (allow			ما بديات ما م		(04a) v	(220)			l	ı		
Adjusted infiltration rate (allow 0.94 0.92 0.9	0.81	0.79	a wina s	0.7	0.68	(22a)m 0.73	0.79	0.83	0.86	1		
Calculate effective air change	1	l			0.00	0.75	0.75	0.00	0.00	J		
If mechanical ventilation:											0 (23	3a)
If exhaust air heat pump using App	pendix N, (2	(3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)				0 (23	3b)
If balanced with heat recovery: effi	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					0 (23	3c)
a) If balanced mechanical v	1	with hea		- ` ` 	- 	ŕ	2b)m + (1 – (23c)	÷ 100		
(24a)m= 0 0 0	0	0	0	0	0	0	0	0	0		(24	ŧa)
b) If balanced mechanical v	1				, 	í `	 	- 	ı	1		
(24b)m = 0 0 0	0	0	0	0	0	0	0	0	0		(24	1 b)
c) If whole house extract ve		-	-				E (00h	.\				
if $(22b)m < 0.5 \times (23b)$, (24c)m = 0 0 0	then (240	(230) = (230)	o); otnerv	wise (24)	$\frac{C}{C} = (220)$) m + 0	.5 × (23t	0	0	1	(24	4c)
(= 13)			Ů					0		J	(2-1	10)
d) If natural ventilation or wi if (22b)m = 1, then (24d)							0.5]					
(24d)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87		(24	4d)
Effective air change rate - e	nter (24a) or (24b	o) or (24	c) or (24	d) in box	k (25)						
(25)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87]	(25	5)
										•		
3 Heat losses and heat loss	naramet											
3. Heat losses and heat loss			Net Ar	ea	U-valı	ue	AXU		k-value	9	ΑΧk	
3. Heat losses and heat loss ELEMENT Gross area (m²)	paramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		A X k kJ/K	
ELEMENT Gross	Openin	gs						<) 				3)
ELEMENT Gross area (m²)	Openin	gs	A ,r	m² x	W/m2	2K	(W/I	<) 			kJ/K	
ELEMENT Gross area (m²) Doors Type 1	Openin	gs	A ,r	m ² x	W/m2	= = =	4.2	<) 			kJ/K (26	6)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2	Openin	gs	A ,r 2.1 2.06	m ² x x x x1	W/m2 2 2	= = = = = = = = = = = = = = = = = = =	4.2 4.12	<) 			kJ/K (26	6) 7)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1	Openin	gs	A ,r 2.1 2.06 1.93	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(4.5)+	= 0.04] = 0.04] =	4.2 4.12 7.36	<) 			kJ/K (26 (26	6) 7) 7)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	Openin	gs	A ,r 2.1 2.06 1.93	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86	<) 			kJ/K (26 (27 (27	6) 7) 7) 7)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3	Openin	gs	A ,r 2.1 2.06 1.93 1.8	x x x 1. x 1. x 1. x 1. x 1. x 1. x 1.	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86 6.86	<)			kJ/K (26 (26 (27 (27 (27	66) 77) 77) 77)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86 6.86 7.02	<)			kJ/K (26 (26 (27 (27 (27 (27	66) 77) 77) 77) 77)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.8 1.84	x x x1. x1. x1. x1. x1. x1. x1.	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 7.36 6.86 6.86 7.02 5.45	<)			kJ/K (26 (27 (27 (27 (27 (27	66) 77) 77) 77) 77) 77)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45	<)			kJ/K (26 (27 (27 (27 (27 (27 (27 (27)	66) 77) 77) 77) 77) 77) 77)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	6) 7) 7) 7) 7) 7) 7) 7)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor	Openin m	gs ₁₂	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04]	(W// 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type 1 110.67	Openin m	gs ₁₂	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679 34.66				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type 1 110.67 Walls Type 2 21.14	Openin m	gs ₁₂	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45	= 0.04] = 0.04	(W/I 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 5.45 4.31				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 48.08	33.6 0	gs ₁₂	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43 1.43 1.43 1.43 2.1.2 68.67 77.03 21.14 48.08	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.45	0.04] = 0.04]	(W// 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679 34.66 4.31 21.63				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 48.08 Roof Type1 39.87	33.60 0	gs ₁₂	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.43 1.43 48.08 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.2	= 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = = = = = = = = = =	(W// 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679 34.66 4.31 21.63 7.97				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 48.08	33.6 0	gs ₁₂	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43 1.43 1.43 1.43 2.1.2 68.67 77.03 21.14 48.08	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.25 0.45 0.45	0.04] = 0.04]	(W// 4.2 4.12 7.36 6.86 6.86 7.02 5.45 5.45 5.45 17.1679 34.66 4.31 21.63				kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (27 (27 (27	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c

Party wall (32)71.63 0 Party wall (32)118.11 0 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss, $W/K = S(A \times U)$ (33)235.83 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium (35)250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)56.32 if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) =(37)292.15 Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m x (5)Feb May Jul Jan Mar Apr Jun Aug Sep Oct Nov Dec 162.79 159.83 (38)156.94 143.34 140.79 128.95 128.95 126.76 133.51 140.79 145.94 151.32 (38)m =Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =454.94 451.99 449.09 435.49 432.95 421.11 421.11 418.91 425.67 432.95 438.1 443.48 (39)Average = $Sum(39)_{1...12}/12=$ 435.48 Heat loss parameter (HLP), W/m2K (40)m = (39)m \div (4)2.58 (40)m =2.56 2.45 2.39 2.39 2.37 2.41 2.45 2.51 (40)Average = $Sum(40)_{1...12}/12=$ 2.47 Number of days in month (Table 1a) 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 heating energy requirement: kWh/year: Assumed occupancy, N 2.97 (42)if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 104.77 (43)Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Nov Jan Feb Mar Apr May Jun Jul Aug Sep Oct Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =115.24 111.05 106.86 102.67 98.48 94.29 94.29 98.48 102.67 106.86 111.05 115.24 Total = $Sum(44)_{1...12}$ = (44)1257.22 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m =170.9 149.47 154.24 134.47 129.03 111.34 103.18 118.4 119.81 139.63 152.41 165.51 Total = $Sum(45)_{1...12}$ = 1648.41 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)(46)m =25.64 22.42 23.14 20.17 19.35 16.7 15.48 17.76 17.97 20.94 22.86 24.83 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:

a) If manufacturar's declared loss factor is known (k)///	h/day):				1	(40)
a) If manufacturer's declared loss factor is known (kW Tomperature factor from Table 2b	n/uay).			0] 1	(48)
Temperature factor from Table 2b	(40) (4	2)		0] 1	(49)
Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not	(48) x (4 t known:	9) =	2	50		(50)
Hot water storage loss factor from Table 2 (kWh/litre/d			0.	.03]	(51)
If community heating see section 4.3					ı	
Volume factor from Table 2a			0.	.78		(52)
Temperature factor from Table 2b			0.	.78		(53)
Energy lost from water storage, kWh/year	(47) x (5	1) x (52) x (53) =	5.	.18		(54)
Enter (50) or (54) in (55)			5.	.18		(55)
Water storage loss calculated for each month	((56)m =	(55) × (41)m	_		_	
(56)m= 160.68 145.13 160.68 155.49 160.68 155.49	160.68 160.68			160.68		(56)
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50)$ –	(H11)] ÷ (50), else (57)m = (56)m where	(H11) is fro	m Append	lix H	
(57)m= 160.68 145.13 160.68 155.49 160.68 155.49	160.68 160.68	155.49 160.68	155.49	160.68		(57)
Primary circuit loss (annual) from Table 3				0]	(58)
Primary circuit loss calculated for each month (59)m =	(58) ÷ 365 × (41)m			1	
(modified by factor from Table H5 if there is solar wa	ter heating and	a cylinder therm	ostat)			
(59)m= 128.38 115.95 128.38 124.24 128.38 41.92	43.31 43.31	41.92 128.38	124.24	128.38		(59)
Combi loss calculated for each month (61)m = (60) ÷ 3	65 × (41)m					
(61)m= 0 0 0 0 0 0	0 0	0 0	0	0		(61)
Total heat required for water heating calculated for each	ch month (62)m	$= 0.85 \times (45) \text{m}$	- (46)m +	(57)m +	ı (59)m + (61)n	n
(62)m= 459.96 410.55 443.3 414.2 418.08 308.75	307.17 322.39			454.56		(62)
Solar DHW input calculated using Appendix G or Appendix H (negat				Ier heating)		
(add additional lines if FGHRS and/or WWHRS applies						
(63)m= 0 0 0 0 0 0	0 0	0 0	0	0		(63)
Output from water heater	<u> </u>	1	.!		l	
(64)m= 459.96 410.55 443.3 414.2 418.08 308.75	307.17 322.39	317.22 428.68	432.14	454.56]	
	Ou	tput from water heat	_! er (annual)₁	12	4717	(64)
Heat gains from water heating, kWh/month 0.25 ´[0.85	5 × (45)m + (61)	m] + 0 8 x [(46)n	n + (57)m	+ (59)m	1	
(65)m= 159.53 142.46 153.99 144.1 145.6 70.55	68.96 74.02	73.37 149.13		157.73]	(65)
include (57)m in calculation of (65)m only if cylinder		or hot water is	from com	munity h	J neating	
5. Internal gains (see Table 5 and 5a):	o in the aweiling	g of flot water is	110111 00111	indinity i	loating	
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun	Jul Aug	Sep Oct	Nov	Dec	1	
Jan Feb Mar Apr May Jun	Jul Aug 148.56 148.56	+	+	148.56		(66)
	<u> </u>	!	140.50	140.00		(00)
Lighting gains (calculated in Appendix L, equation L9 c (67)m= 31.04 27.57 22.42 16.97 12.69 10.71	11.57 15.04	20.19 25.64	29.93	31.9	1	(67)
			29.93	31.9		(01)
Appliances gains (calculated in Appendix L, equation L	 		1 000 00		1	(00)
(68)m= 348.18 351.8 342.69 323.31 298.84 275.84	260.48 256.87	1 1	309.82	332.82		(68)
Cooking gains (calculated in Appendix L, equation L15	 		1.	l -	1	(00)
(69)m= 37.86 37.86 37.86 37.86 37.86 37.86	37.86 37.86	37.86 37.86	37.86	37.86		(69)
Pumps and fans gains (Table 5a)		1 1	1	1	1	
(70)m= 0 0 0 0 0	0 0	0 0	0	0		(70)

Lossa	S A A AV	anoratio	n (neas	ntive valu	ر (عمر) (عمر	ماما	5)								
	-118.85		-118.85	-118.85	-118.85	$\overline{}$	18.85	-118.85	-118	.85 -118.85	-118.8	5 -118.85	-118.85	1	(71)
` '	heating										<u> </u>			J	
(72)m=		212	206.97	200.14	195.7	7	97.99	92.68	99.	49 101.9	200.4	4 208.43	212.01	1	(72)
Total	internal	gains =	<u> </u>				(66)m + (67)m	1 + (68	3)m + (69)m +	(70)m +	(71)m + (72))m	1	
(73)m=	661.21	658.93	639.65	607.99	574.8	4	52.12	432.31	438	.97 455.64	579.0	1 615.74	644.3]	(73)
6. Sc	lar gains	5:			•										
Solar	gains are o	alculated	using sol	ar flux from	Table 6	a and	l assoc	iated equa	tions	to convert to th	e applic	able orientat	tion.		
Orient	ation: A			Area	l		Flu			g_ Table Ch		FF		Gains	
	<u>'</u>	Table 6d		m²			ra	ble 6a		Table 6b	_	Table 6c		(W)	
North	0.9x	0.77)	1.	84	X		10.63	X	0.65	X	0.7	=	12.34	(74)
North	0.9x	0.77)	1.	43	X		10.63	X	0.65	X	0.7	=	14.38	(74)
North	0.9x	0.77	,	1.	84	X		20.32	X	0.65	X	0.7	=	23.58	(74)
North	0.9x	0.77	,	1.	43	X		20.32	X	0.65	X	0.7	=	27.49	(74)
North	0.9x	0.77	,	1.	84	X		34.53	X	0.65	X	0.7	=	40.07	(74)
North	0.9x	0.77	,	1.	43	X		34.53	Х	0.65	X	0.7	_ =	46.71	(74)
North	0.9x	0.77	,	1.	84	X		55.46	X	0.65	X	0.7		64.36	(74)
North	0.9x	0.77	,	1.	43	X		55.46	Х	0.65	X	0.7		75.03	(74)
North	0.9x	0.77	,	1.	84	X		74.72	X	0.65	X	0.7	=	86.7	(74)
North	0.9x	0.77	,	1.	43	X		74.72	X	0.65	X	0.7	=	101.07	(74)
North	0.9x	0.77	,	1.	84	X		79.99	Х	0.65	X	0.7	=	92.81	(74)
North	0.9x	0.77	,	1.	43	X		79.99	Х	0.65	X	0.7	=	108.2	(74)
North	0.9x	0.77)	1.	84	X		74.68	X	0.65	X	0.7	=	86.65	(74)
North	0.9x	0.77)	1.	43	X		74.68	X	0.65	X	0.7	=	101.02	(74)
North	0.9x	0.77	>	1.	84	X		59.25	X	0.65	X	0.7	=	68.75	(74)
North	0.9x	0.77)	1.	43	X		59.25	X	0.65	X	0.7	=	80.14	(74)
North	0.9x	0.77)	1.	84	X		41.52	x	0.65	X	0.7	=	48.17	(74)
North	0.9x	0.77	>	1.	43	X	4	11.52	X	0.65	X	0.7	=	56.16	(74)
North	0.9x	0.77)	1.	84	X		24.19	X	0.65	X	0.7	=	28.07	(74)
North	0.9x	0.77)	1.	43	X		24.19	X	0.65	X	0.7	=	32.72	(74)
North	0.9x	0.77	>	1.	84	X		13.12	X	0.65	X	0.7	=	15.22	(74)
North	0.9x	0.77)	1.	43	X		13.12	X	0.65	X	0.7	=	17.74	(74)
North	0.9x	0.77)	1.	84	X		8.86	x	0.65	X	0.7	=	10.29	(74)
North	0.9x	0.77)	1.	43	X		8.86	x	0.65	X	0.7	=	11.99	(74)
East	0.9x	3)	1	8	X		19.64	X	0.65	х	0.7	=	33.44	(76)
East	0.9x	2)	1.	43	X		19.64	x	0.65	X	0.7	=	17.71	(76)

X

X

X

1.8

1.43

1.8

1.43

X

X

X

38.42

38.42

63.27

63.27

X

X

X

0.65

0.65

0.65

0.65

X

X

X

0.7

0.7

0.7

0.7

=

East

East

East

East

0.9x

0.9x

0.9x

0.9x

3

2

3

2

(76)

(76)

(76)

(76)

65.42

34.65

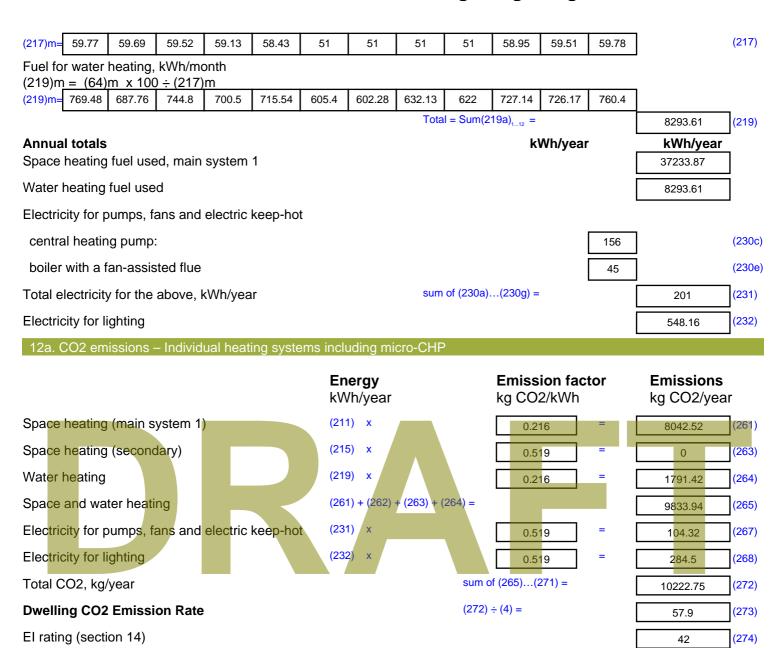
107.74

57.06

	_												_
East	0.9x	3	X	1.8	X	92.28	X	0.65	X	0.7	=	157.13	(76)
East	0.9x	2	X	1.43	X	92.28	X	0.65	X	0.7	=	83.22	(76)
East	0.9x	3	X	1.8	X	113.09	X	0.65	X	0.7	=	192.56	(76)
East	0.9x	2	X	1.43	x	113.09	x	0.65	X	0.7	=	101.99	(76)
East	0.9x	3	X	1.8	X	115.77	x	0.65	X	0.7	=	197.12	(76)
East	0.9x	2	X	1.43	X	115.77	X	0.65	X	0.7	=	104.4	(76)
East	0.9x	3	X	1.8	x	110.22	x	0.65	X	0.7	=	187.67	(76)
East	0.9x	2	X	1.43	x	110.22	x	0.65	X	0.7	=	99.39	(76)
East	0.9x	3	X	1.8	X	94.68	X	0.65	X	0.7	=	161.2	(76)
East	0.9x	2	X	1.43	x	94.68	x	0.65	X	0.7	=	85.38	(76)
East	0.9x	3	X	1.8	x	73.59	x	0.65	X	0.7	=	125.3	(76)
East	0.9x	2	X	1.43	x	73.59	x	0.65	X	0.7	=	66.36	(76)
East	0.9x	3	x	1.8	x	45.59	x	0.65	x	0.7	=	77.62	(76)
East	0.9x	2	x	1.43	x	45.59	x	0.65	x	0.7	=	41.11	(76)
East	0.9x	3	X	1.8	x	24.49	x	0.65	X	0.7	=	41.7	(76)
East	0.9x	2	X	1.43	x	24.49	x	0.65	x	0.7	=	22.08	(76)
East	0.9x	3	x	1.8	x	16.15	x	0.65	x	0.7	=	27.5	(76)
East	0.9x	2	X	1.43	X	16.15	X	0.65	X	0.7	=	14.57	(76)
South	0.9x	0.77	x	1.93	x	46.75	x	0.65	x	0.7	=	56.9	(78)
South	0.9x	0.77	x	1.8	х	46.75	×	0.65	x	0.7	=	106.14	(78)
South	0.9x	0.77	x	1.43	X	46.75	X	0.65	x	0.7	=	63.24	(78)
South	0.9x	0.77	x	1.93	x	76.57	Х	0.65	x	0.7	=	93.19	(78)
South	0.9x	0.77	x	1.8	x	76 <mark>.57</mark>	X	0.65	x	0.7	=	173.83	(78)
South	0.9x	0.77	X	1.43	х	76.57	x	0.65	x	0.7	=	103.57	(78)
South	0.9x	0.77	X	1.93	x	97.53	x	0.65	X	0.7	=	118.71	(78)
South	0.9x	0.77	X	1.8	X	97.53	X	0.65	X	0.7	=	221.43	(78)
South	0.9x	0.77	X	1.43	x	97.53	x	0.65	X	0.7	=	131.93	(78)
South	0.9x	0.77	X	1.93	x	110.23	x	0.65	X	0.7	=	134.17	(78)
South	0.9x	0.77	X	1.8	x	110.23	X	0.65	X	0.7	=	250.26	(78)
South	0.9x	0.77	X	1.43	x	110.23	x	0.65	X	0.7	=	149.11	(78)
South	0.9x	0.77	X	1.93	x	114.87	x	0.65	X	0.7	=	139.81	(78)
South	0.9x	0.77	X	1.8	x	114.87	x	0.65	X	0.7	=	260.79	(78)
South	0.9x	0.77	X	1.43	x	114.87	x	0.65	X	0.7	=	155.39	(78)
South	0.9x	0.77	X	1.93	X	110.55	x	0.65	X	0.7	=	134.55	(78)
South	0.9x	0.77	X	1.8	X	110.55	x	0.65	X	0.7	=	250.97	(78)
South	0.9x	0.77	X	1.43	x	110.55	x	0.65	X	0.7	=	149.54	(78)
South	0.9x	0.77	x	1.93	x	108.01	x	0.65	x	0.7	=	131.46	(78)
South	0.9x	0.77	x	1.8	x	108.01	x	0.65	x	0.7	=	245.22	(78)
South	0.9x	0.77	x	1.43	x	108.01	x	0.65	x	0.7	=	146.11	(78)
South	0.9x	0.77	x	1.93	x	104.89	x	0.65	x	0.7	=	127.67	(78)
South	0.9x	0.77	X	1.8	X	104.89	X	0.65	X	0.7	=	238.14	(78)

South 0.9x					_		1		_				— (70)
		X	1.43	,		04.89	X	0.65	×	0.7	=	141.89	(78)
South 0.9x		X	1.93	,	× 1	01.89	X	0.65	×	0.7	_ =	124.01	(78)
South 0.9x	0.77	X	1.8	,	X 1	01.89	X	0.65	X	0.7	=	231.31	(78)
South 0.9x	0.77	X	1.43	,	X 1	01.89	X	0.65	X	0.7	=	137.82	(78)
South 0.9x	0.77	X	1.93		× 8	2.59	X	0.65	X	0.7	=	100.52	(78)
South 0.9x	0.77	X	1.8	,	x 8	2.59	X	0.65	X	0.7	=	187.49	(78)
South 0.9x	0.77	X	1.43	,	x 8	2.59	X	0.65	X	0.7	=	111.71	(78)
South 0.9x	0.77	Х	1.93	,	× 5	5.42	x	0.65	X	0.7	=	67.45	(78)
South 0.9x	0.77	X	1.8	,	x 5	5.42	x	0.65	X	0.7	=	125.81	(78)
South 0.9x	0.77	X	1.43	,	x 5	5.42	х	0.65	X	0.7	=	74.96	(78)
South 0.9x	0.77	x	1.93	,	x	40.4	x	0.65	×	0.7	_ =	49.17	(78)
South 0.9x	0.77	X	1.8	,	x	40.4	х	0.65	×	0.7	=	91.71	(78)
South 0.9x	0.77	X	1.43	,	x	40.4	x	0.65	×	0.7	=	54.65	(78)
Rooflights 0.9x	1	X	1.2	,	x	26	x	0.65	×	0.7	_ =	12.78	(82)
Rooflights 0.9x	1	X	1.2	,	x 🗀	54	x	0.65	×	0.7	=	26.54	(82)
Rooflights 0.9x	1	x	1.2	 ,	, <u> </u>	96	x	0.65	T x	0.7	=	47.17	(82)
Rooflights 0.9x	1	x	1.2	,	, <u> </u>	150	X	0.65	×	0.7	= =	73.71	(82)
Rooflights 0.9x	1	x	1.2	,	<u> </u>	192	Х	0.65	Х	0.7	=	94.35	(82)
Rooflights 0.9x	1	X	1.2	=	x .	200	X	0.65	X	0.7	=	98.28	(82)
Rooflights 0.9x		X	1.2	-	-	189	×	0.65	X	0.7	╡ -	92.87	(82)
Rooflights 0.9x	1	X	1.2	,		157	X	0.65	x	0.7	_	77.15	(82)
Rooflights 0.9x		T x	1.2		-	115	X	0.65	×	0.7	╡ .	56.51	(82)
Rooflights 0.9x		X	1.2	+	x ===	66	X	0.65	x	0.7	= =	32.43	(82)
Rooflights 0.9x		X	1.2	\dashv	x	33]]	0.65	x	0.7	= =	16.22	(82)
Rooflights 0.9x		X	1.2		x	21]]	0.65	x	0.7	= =	10.32	(82)
0 5.5	· ·]	0.00		0.1		10.02	(02)
Solar gains ir	n watts ica	lculated	I for each	month			(83)m	ı = Sum(74)m .	(82)m				
(83)m= 316.94	1 1	770.82			1135.87	1090.39		<u> </u>	611.68	381.19	270.19]	(83)
Total gains –	internal a	nd solai	(84)m = (73)m +	· (83)m	, watts					ı	ı	
(84)m= 978.15	1207.2	1410.47	1594.97 1	707.45	1587.99	1522.7	1419	9.29 1301.28	1190.6	9 996.93	914.49		(84)
7. Mean inte	ernal temp	erature	(heating s	eason)								•	
Temperatur				· ·	g area i	from Tab	ole 9.	Th1 (°C)				21	(85)
Utilisation fa	_	•			_		,	()					(3.37
Jan	Ť	Mar	Apr	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec	1	
(86)m= 1	0.99	0.99	0.98	0.95	0.9	0.81	0.8		0.98	1	1		(86)
			<u> </u>					<u> </u>			<u> </u>	J	
Mean intern (87)m= 18.2	18.43	18.83		19.97	20.45	20.73	20.0		19.57	18.82	18.21	l	(87)
` ′	!		<u> </u>					<u> </u>	19.57	10.02	10.21		(01)
Temperatur				- 1		1	1			1		1	(00)
(88)m= 19.71	19.72	19.73	19.77	19.77	19.81	19.81	19.	81 19.79	19.77	19.76	19.74		(88)
Utilisation fa	ctor for ga	ains for	rest of dwe	elling, h	12,m (se	e Table	9a)					1	
(89)m= 1	0.99	0.99	0.97	0.93	0.85	0.7	0.7	75 0.92	0.98	0.99	1		(89)
Mean intern	al tempera	ature in	the rest of	dwellir	ng T2 (f	ollow ste	eps 3	to 7 in Tabl	e 9c)				

(90)m= 17.16	17.39	17.8	18.4	18.95	19.44	19.68	19.65	19.26	18.57	17.81	17.19		(90)
								1	fLA = Livin	g area ÷ (4	4) =	0.31	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m= 17.48	17.71	18.11	18.71	19.26	19.75	20.01	19.97	19.57	18.87	18.12	17.51		(92)
Apply adjustr	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	re appro	opriate				
(93)m= 18.08	18.31	18.71	19.31	19.86	20.35	20.61	20.57	20.17	19.47	18.72	18.11		(93)
8. Space hea	iting requ	uirement											
Set Ti to the			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	L		<u> </u>	Iviay	Jun	Jui	Aug	Sep	Oct	Nov	Dec		
(94)m= 1	0.99	0.98	0.97	0.93	0.88	0.78	0.82	0.93	0.98	0.99	1		(94)
Useful gains,													` ,
(95)m= 973.57	1196.77	1387.6		1592.75	1393.06	1192.41	1161.74	1207.74	1162.5	989.42	911.06		(95)
Monthly aver	age exte	rnal tem					<u> </u>		l	<u> </u>			
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W =	∟ =[(39)m∶	x [(93)m	– (96)m	1		<u> </u>		
(97)m= 6270	·	5485.38		3534.85			1747	<u> </u>	3841.88	5089.96	6167.41		(97)
Space heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
		3048.75			0	0	0	0	1993.46		3910.72		
							Tota	per year	(kWh/year) = Sum(9	8) _{15,912} =	22712.66	(98)
Space heatin	a require	ement in	kWh/m²	2/vear								128.64	– (99)
Space Heatin	9 . 0 9 4												
0		ata Indi					minus 6	Y ID	_			120.04	
9a. Energy red		nts – Indi			ystems i	ncluding	micro-C	CHP)				120.04	
Sp <mark>ace h</mark> eatir	ng:		ividu al h	eating s				CHP)	۰				
Space heating Fraction of space	ng: bace hea	at from s	ividual h	eating sy					i			0	(201)
Space heating Fraction of space of spac	ng: Dace head	at from so at from m	econdary	eating sy y/supple em(s)		system	(202) = 1 ·	- (201) =	(2021)			0	(201)
Space heating Fraction of space Fraction of to	ng: pace hea pace hea tal heati	at from so at from m	econdary nain syst	eating sy/supple em(s) stem 1		system		- (201) =	(203)] =			0 1 1	(201) (202) (204)
Space heating Fraction of space Fraction of to Efficiency of the space	ng: pace hea pace hea tal heati main spa	at from sat from many from the case heat	econdary nain systemain sy	eating sy/supple em(s) stem 1	mentary	system	(202) = 1 ·	- (201) =	(203)] =			0	(201) (202) (204)
Space heating Fraction of space Fraction of to	ng: pace hea pace hea tal heati main spa	at from sat from many from the case heat	econdary nain systemain sy	eating sy/supple em(s) stem 1	mentary	system	(202) = 1 ·	- (201) =	(203)] =			0 1 1	
Space heating Fraction of space Fraction of to Efficiency of the space	ng: pace hea pace hea tal heati main spa	at from sat from many from the case heat	econdary nain systemain sy	eating sy/supple em(s) stem 1	mentary	system	(202) = 1 ·	- (201) =	(203)] =	Nov	Dec	0 1 1 61	(201) (202) (204) (206) (208)
Space heating Fraction of space Fraction of to Efficiency of Efficiency of Space Heating Fraction of the Efficiency of Space Heating Fraction of Spa	ng: pace hea pace hea tal heati main spa seconda Feb	at from so at from m ng from d ace heati ary/supple Mar	econdary nain syst main syst ing syste ementary	eating sy/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov	Dec	0 1 1 61 0	(201) (202) (204) (206) (208)
Space heating Fraction of space heating Fraction of to Efficiency of Efficiency of Space heating	ng: pace hea pace hea tal heati main spa seconda Feb	at from so at from m ng from a ace heati ry/supplo Mar ement (c	econdary nain syst main syst ing syste ementary	eating sy/supple em(s) stem 1 em 1 y heating May d above	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		1		0 1 1 61 0	(201) (202) (204) (206) (208)
Space heating Fraction of space heating Fraction of to Efficiency of Efficiency of Space heating	pace head bace head tal heati main space secondar Feb g require 3268.85	at from so at from mace heating/supplement (comment (comment)	econdary nain systemain systemain systementary Apralculated	eating sylvy/supple em(s) stem 1 em 1 y heating May d above;	mentary g system Jun	system n, % Jul	(202) = 1 · (204) = (2	- (201) = 02) × [1 -	Oct			0 1 1 61 0	(201) (202) (204) (206) (208) ar
Space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating 3940.54 (211)m = {[(98)	pace head bace head tal heati main space secondar Feb g require 3268.85	at from so at from many from the ace heatings/supplement (control of the supplement ry nain systemain systemain systementary Apralculated	eating sy/supple em(s) stem 1 em 1 May d above; 1444.93	g system Jun 0	system n, % Jul	(202) = 1 · (204) = (2	- (201) = 02) × [1 -	Oct 1993.46	2952.38		0 1 1 61 0	(201) (202) (204) (206) (208) ar	
Space heating Fraction of space heating and Space heating and spac	pace head pace head tal heating main space secondary Feb grequire 3268.85	at from so at from many from the ace heatings/supplement (control of the supplement ry nain systemain systementary Apr	eating sy/supple em(s) stem 1 em 1 May d above; 1444.93	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug 0	- (201) = 02) × [1 - Sep 0	Oct 1993.46	2952.38 4839.98	3910.72 6411.02	0 1 1 61 0	(201) (202) (204) (206) (208) ar	
Space heating Fraction of space heating and Space heating and spac	pace head pace head tall heating main space secondar Feb grequire 3268.85 m x (20) 5358.77	at from so at from many from acce heating ary/supplement (company supplement) (company supple	econdary nain systemain systementary Apr calculated 2153.02 00 ÷ (20 3529.54	eating sy/supple em(s) stem 1 y heating May d above; 1444.93 06) 2368.73	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2 Aug 0	- (201) = 02) × [1 - Sep 0	Oct 1993.46	2952.38 4839.98	3910.72 6411.02	0 1 1 61 0 kWh/yea	(201) (202) (204) (206) (208) ar
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Property Details: Flat 3

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

Floor 0 40.62 m^2 3.2 m Floor 1 110.03 m^2 2.65 m

Living area: 69.89 m² (fraction 0.464)

Front of dwelling faces: Unspecified

Opening types:

RFI2

Nan	ne: Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			W <mark>ood</mark>
W1	Manufacturer	Windows	low-E, En = 0.2, h	<mark>ard </mark> coat No	Wood
W2	Manufactur <mark>er</mark>	Windows	low-E, $En = 0.2$, h	<mark>ard </mark> coat No	
W3	Manufacturer	Windows	low-E, $En = 0.2$, h	ard coat No	
W4	Manufacturer	Windows	low-E, $En = 0.2$, h	ard coat No	
w5	Manufacturer	Windows	low-E, $En = 0.2$, h	ard coat No	
RF1	Manufacturer	Roof Windows	low-E, $En = 0.2$, h	ard coat No	PVC-U
RFI2	Manufacturer	Roof Windows	low-E, $En = 0.2$, h	ard coat No	PVC-U

Name:	Gap:	Frame Factor	r: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
W1	16mm or more	0.7	0.65	4.5	1.86	3
W2	16mm or more	0.7	0.65	4.5	0.75	4
W3	16mm or more	0.7	0.65	4.5	1.2	2
W4	16mm or more	0.7	0.85	4.5	1.2	2
w5	16mm or more	0.7	0.85	4.5	8.4	1
RF1	16mm or more	0.7	0.65	4.5	2.49	1

0.65

4.5

3.35

1

0.7

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D1		corridor		1	2.1
W1		External wall GF	South	1.161	1.6
W2		External FF	South	1	0.75
W3		External FF	West	1	1.2
W4		External FF	North	1	1.2
w5		External FF	East	4	2.1
RF1		Flat roof 2	Horizontal	1.868	1.331
RFI2		Flat roof 2	Horizontal	1.83	1.83

16mm or more

Overshading: More than average U-value: Curtain wall: Gross area: Openings: Net area: Ru value: Kappa: Type: **External Elements** 5.58 0.45 0 External wall GF 26.056 20.48 False N/A corridor GF 21.14 0 21.14 0.25 0.9 False N/A External FF 80.03 16.2 63.83 0.45 0 False N/A flat roof 1 110.03 0 110.03 0.2 0 N/A **Internal Elements** Party Elements 48.104 N/A party GF Party wall FF 22.83 N/A No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges: Pressure test: No (Assumed) Natural ventilation (extract fans) Ventilation: 1 (main: 0, secondary: 0, other: 1) Number of chimneys: Number of open flues: Number of fans: 4 Number of passive stacks: 0 Number of sides sheltered: 2 15 Pressure test: Boiler systems with radiators or underfloor heating Main heating system: Gas boilers and oil boilers Fuel: mains gas Info Source: SAP Tables SAP Table: 115 Wall mounted Systems with radiators Design flow temperature: Unknown Open Boiler interlock: Yes No time or thermostatic control of room temperature Main heating Control: Control code: 2101 Secondary heating system: None From main heating system Water heating: Water code: 901 Fuel: mains gas Hot water cylinder Cylinder volume: 250 litres Cylinder insulation: Factory 15 mm Primary pipework insulation: False Cylinderstat: False Cylinder in heated space: False Solar panel: False

Others

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Low rise urban / suburban

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



		User Details:				
Assessor Name: Software Name:	Stroma FSAP 2012	Stroma Nu Software V		Versio	n: 1.0.1.24	
	Р	roperty Address: Flat	:3			
Address :						
1. Overall dwelling dimens	ions:					
		Area(m²)	Av. Height(m)	_	Volume(m³)	_
Ground floor		40.62 (1a)	x 3.2	(2a) =	129.98	(3a)
First floor		110.03 (1b)	x 2.65	(2b) =	291.58	(3b)
Total floor area TFA = (1a)+	+(1b)+(1c)+(1d)+(1e)+(1r	150.65 (4)		_		_
Dwelling volume		(3a)-	+(3b)+(3c)+(3d)+(3e)+	.(3n) =	421.56	(5)
2. Ventilation rate:						
	main secondar heating heating	y other	total		m³ per hour	
Number of chimneys	0 + 0	+ 1 =	1 X	40 =	40	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 2	20 =	0	(6b)
Number of intermittent fans			4 ×	10 =	40	(7a)
Number of passive vents			0 x	10 =	0	(7b)
Number of flueless gas fires	s		0 x 4	40 =	0	(7c)
	(1)				anges per ho	_
	, flues and fans = (6a)+(6b)+(7 n carried out or is intended, proceed			÷ (5) =	0.19	(8)
Number of storeys in the	dwelling (ns)				0	(9)
Additional infiltration				-1]x0.1 =	0	(10)
	5 for steel or timber frame or	•			0	(11)
deducting areas of openings	ent, use the value corresponding to); if equal user 0.35	tne greater wall area (atte	er			
	or, enter 0.2 (unsealed) or 0.	1 (sealed), else ente	r 0	Γ	0	(12)
If no draught lobby, enter	0.05, else enter 0			Ī	0	(13)
Percentage of windows a	and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11)	+ (12) + (13) + (15) =	Ī	0	(16)
Air permeability value, q5	60, expressed in cubic metre	s per hour per squar	e metre of envelope	area	15	(17)
If based on air permeability	value, then $(18) = [(17) \div 20] + (8)$	3), otherwise $(18) = (16)$		Ī	0.94	(18)
Air permeability value applies if	a pressurisation test has been don	e or a degree air permeab	oility is being used	_		_
Number of sides sheltered		(00)			2	(19)
Shelter factor		(20) = 1 - [0.075]		Ī	0.85	(20)
Infiltration rate incorporating		$(21) = (18) \times (20)$)) =		0.8	(21)
Infiltration rate modified for		1 1	<u> </u>			
Jan Feb M	ar Apr May Jun	Jul Aug S	ep Oct Nov	Dec		
Monthly average wind spee	ed from Table 7					

4.3

3.8

3.8

3.7

4.3

4.5

4.7

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Λ diuete	d infiltr	ation rat	a (allowi	na for el	aoltor an	d wind s	rnood) –	(21a) x	(22a)m	-	-	-		
Aujuste [1.02	1	0.98	0.88	0.86	0.76	0.76	0.74	0.8	0.86	0.9	0.94		
			change i	rate for t	he appli	cable ca	se	<u> </u>						
		al ventila												0 (23
			0 11		, ,	, ,	. `	N5)) , othe	,) = (23a)				0 (23
			•	•	_			n Table 4h		21.) (001) [4 (00 <u>)</u>		0 (23
a) If I (24a)m=	oalance	d mecha	anicai ve	ntilation	with he	at recove	ery (MV	HR) (24a	$\frac{1}{1} = \frac{2}{2}$	2b)m + (0	23b) × [1 – (23c) 0	÷ 100] 	(24
L			_			<u> </u>		I			<u> </u>	0		(24
(24b)m=	0	0	o 0	0	0	0	0	0 0	0	0	0	0		(24
L						<u> </u>		on from o						(= .
•					-	•		c) = (22k)		.5 × (23b	o)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If i	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilati	on from I	oft	•				
	<u> </u>	n = 1, the	<u> </u>				24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=		1	0.98	0.89	0.87	0.79	0.79	0.77	0.82	0.87	0.9	0.94		(24
Effec	tive air	change	rate - en	ter (24a) or (24b	or (24)	c) or (2/	ld) in how	k (25)					
r					i ì	<u> </u>	<u> </u>		` /					(05)
(25)m=	1.02	1	0.98	0.89	0.87	0.79	0.79	0.77	0.82	0.87	0.9	0.94		(25
(25)m=	1.02	1		0.89	0.87	<u> </u>	<u> </u>		` /	0.87	0.9	0.94		(25)
(25)m= [3. Hea	1.02	1 s and he	0.98 eat loss p	0.89 Daramet Openin	0.87 er:	0.79	0.79	0.77 U-valu	0.82 ue	AXU		k-value		AXk
(25)m= [3. Hea ELEM	1.02	1 s and he	0.98 eat loss p	0.89	0.87 er:	0.79 Net Ar A ,r	0.79 eea m²	0.77 U-valı W/m2	0.82 ue eK	A X U (W/I				A X k kJ/K
3. Head ELEM Doors	1.02	s and he Gros area	0.98 eat loss p	0.89 Daramet Openin	0.87 er:	0.79 Net Ar A ,r	0.79	U-valı W/m2	0.82	A X U (W/l		k-value		A X k kJ/K (26
3. Head ELEM Doors Window	1.02 at losse: IENT vs Type	s and he Gros area	0.98 eat loss p	0.89 Daramet Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86	0.79 rea m² x1	U-valu W/m2 2 /[1/(4.5)+	0.82 ue eK = 0.04] =	A X U (W/I 4.2 7.09		k-value		A X k kJ/K (26
3. Head ELEM Doors Window Window	1.02 at losse ENT vs Type vs Type	s and he Gros area	0.98 eat loss p	0.89 Daramet Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75	0.79 ea m² x1 x1	U-valu W/m2 2 /[1/(4.5)+	0.82 UUE UK = 0.04] = 0.04] =	A X U (W/I 4.2 7.09 2.86		k-value		A X k kJ/K (26 (27
3. Head ELEM Doors Window Window Window	1.02 at losse. ENT vs Type vs Type vs Type	s and he Gros area	0.98 eat loss p	0.89 Daramet Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75	0.79 rea m² x1 x1	U-vali W/m2 2 /[1/(4.5)+ /[1/(4.5)+	0.82 0.04] = 0.04] = 0.04] =	A X U (W/I 4.2 7.09 2.86 4.58		k-value		A X k kJ/K (26 (27 (27
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(26)...(30) + (32) =

Fabric heat loss, $W/K = S (A \times U)$

173.79

(33)

Heat capacity Cm = S	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass parame	,	P = Cm -	: TFA) ir	n kJ/m²K				tive Value:	, , ,		250	(35)
For design assessments w	`		,			ecisely the				able 1f	250	(00)
can be used instead of a de	etailed calc	ulation.			,	·						
Thermal bridges : S (I	x Y) cal	culated (using Ap	pendix I	<						36.78	(36)
if details of thermal bridging	g are not kn	own (36) =	= 0.15 x (3	1)								
Total fabric heat loss							, ,	(36) =			210.57	(37)
Ventilation heat loss of		l monthly	y 1	·			(38)m	$= 0.33 \times ($	25)m x (5)		1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 141.69 138.91	136.16	123.26	120.85	109.61	109.61	107.53	113.94	120.85	125.73	130.84]	(38)
Heat transfer coefficie	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m= 352.25 349.48	346.73	333.83	331.42	320.18	320.18	318.1	324.51	331.42	336.3	341.4		
Ugat laga parameter /	Ш. D\ \ \ / / /	/m2l/						Average =		12 /12=	333.82	(39)
Heat loss parameter ($(40)m = 2.34 2.32$	2.3	2.22	2.2	2.13	2.13	2.11	2.15	= (39)m ÷	2.23	2.27	1	
(40)m= 2.34 2.32	2.3	2.22	2.2	2.13	2.13	2.11		Average =			2.22	(40)
Number of days in mo	onth (Tab	le 1a)					,	average =	Sum(40)1.	12 / 12=	2.22	(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 heating ene	ray regui	irement								kWh/y	ear	
A												
Assumed occupancy,		[4 ove	(0 0000)40 v /T[-)2)] . O (2012 v /	FFA 40		94		(42)
if $TFA > 13.9$, $N = 1$		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		94		(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w	+ 1.76 x ater usaç	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		9)	94 3.91]	(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average	+ 1.76 x ater usage hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed	(25 x N)	+ 36		9)			, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x ater usage that water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, l	ay Vd,av welling is not and co	erage = designed a ld)	(25 x N) to achieve	+ 36 a water us	se ta <u>rget o</u> i	9) 103	3.91		, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x ater usage hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed i ld)	(25 x N) to achieve	+ 36		9)			, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per	+ 1.76 x ater usage hot water person per Mar r day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fa	ay Vd,av Iwelling is not and co	erage = designed (id) Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us	ose target of	9) 10: Nov	3.91 Dec		, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x ater usage hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us Sep	Oct	9) 10: Nov 110.15	Dec 114.3		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per	ater usage hot water person per Mar r day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fa 97.68	y Vd,av lwelling is not and co Jun ctor from 1	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep	Oct 105.99 Total = Sui	Nov 110.15 m(44) ₁₁₂ =	Dec 114.3	1246.93	, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water	ater usage hot water person per Mar 105.99	ge in litre usage by a day (all w Apr ach month 101.83	es per da 5% if the 6% vater use, if 1% 1% 1% 1% 1% 1% 1% 1%	y Vd,av lwelling is not and co Jun ctor from 1 93.52	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep 101.83	Oct 105.99 Fotal = Suith (see Ta	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1	Dec 114.3 c, 1d)	1246.93	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15	ater usage hot water person per Mar r day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fa 97.68	y Vd,av lwelling is not and co Jun ctor from 1	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep 101.83 0 kWh/mor 118.83	Oct 105.99 Fotal = Sur 138.49	Nov 110.15 m(44) ₁₁₂ = 15bles 1b, 1	Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water	ater usage hot water person per Mar 105.99 152.98	Apr Apr 101.83 culated me 133.37	es per da 5% if the coater use, I May Vd,m = fa 97.68 ponthly = 4.	Jun ctor from 1 93.52	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43	+ 36 a water us Sep 101.83 0 kWh/mor 118.83	Oct 105.99 Fotal = Suith (see Ta	Nov 110.15 m(44) ₁₁₂ = 15bles 1b, 1	Dec 114.3 c, 1d) 164.16	1246.93	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25	ater usage hot water person per Mar 105.99 152.98	Apr Apr 101.83 culated me 133.37	es per da 5% if the coater use, I May Vd,m = fa 97.68 ponthly = 4.	Jun ctor from 1 93.52	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43	+ 36 a water us Sep 101.83 0 kWh/mor 118.83	Oct 105.99 Fotal = Sur 138.49	Nov 110.15 m(44) ₁₁₂ = 15bles 1b, 1	Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss:	ater usage hot water person per Mar 105.99 152.98 152.98	ge in litre usage by a day (all we have month) 101.83 culated month 133.37 of use (not) 20.01	es per da 5% if the covered use, I May Vd,m = fa 97.68	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43	erage = designed and dolor desig	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43 boxes (46) 17.61	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ =	3.91 Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24	ater usage hot water person per Mar 105.99 152.98 152.98	ge in litre usage by a day (all we have month) 101.83 culated month 133.37 of use (not) 20.01	es per da 5% if the covered use, I May Vd,m = fa 97.68	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43	erage = designed and dolor desig	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43 boxes (46) 17.61	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres If community heating	ater usage hot water person per Mar 105.99 152.98 152.95 including and no tage hot water person per day for each 152.98 152.98	Apr Apr 101.83 culated mo 133.37 for use (no	es per da 5% if the o rater use, I May Vd,m = fa 97.68 127.98 hot water 19.2 colar or W velling, e	Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage),	erage = designed (d) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = bles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres) If community heating of the community heating	ater usage hot water person per Mar 105.99 152.98 152.95 including and no tage hot water person per day for each 152.98 152.98	Apr Apr 101.83 culated mo 133.37 for use (no	es per da 5% if the o rater use, I May Vd,m = fa 97.68 127.98 hot water 19.2 colar or W velling, e	Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage),	erage = designed (d) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = bles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres If community heating of the water storage loss: Water storage loss:	ater usage hot water person per Mar 105.99 152.98 152.95 including and no tall hot water hot water and no tall hot water hot w	Apr Apr Ach month 101.83 culated me 133.37 of use (not) and any so ank in dw er (this in	es per da 5% if the o rater use, I May Vd,m = fa 97.68 127.98 hot water 19.2 plar or W relling, e	y Vd,av welling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage), 16.56 /WHRS nter 110 nstantar	erage = designed of ld) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = bles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46) (47)
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if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres If community heating) Otherwise if no stored Water storage loss: a) If manufacturer's of Temperature factor from	ater usage hot water person per Mar 105.99 105.99 152.98 152.95 1 including and no tall hot water person per mand no tall hot water person per mand no tall hot water person pers	Apr Apr Apr Ach month 101.83 culated mo 133.37 for use (no 20.01 ag any so ank in dw er (this in	es per da 5% if the o 5% if the o 70 may Vd,m = fa 97.68 97.68 127.98 19.2 plar or W 70 melling, e 10 melling, e 10 melling, e 10 melling, e 10 melling, e 10 melling, e	y Vd,av welling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage), 16.56 /WHRS nter 110 nstantar	erage = designed (d) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in neous con/day):	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47) pmbi boil	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82 ame vess ers) enter	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62 250		(43) (44) (45) (46) (47) (48) (49)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres) If community heating of the community heating of	ater usage hot water person per Mar 105.99 105.99 152.98 152.95 1 including and no tall hot water eclared lem Table or storage	Apr ach month 101.83 culated mo 133.37 of use (no 20.01 ng any so ank in dw er (this in oss facto 2b k Wh/ye	es per da 5% if the of water use, I May Vd,m = fa 97.68 97.68 onthly = 4. 127.98 o hot water 19.2 colar or Water velling, each of the color is known as a	y Vd,av welling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage), 16.56 /WHRS nter 110 nstantar	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82 ame vess ers) enter	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46) (47)

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.03 (51)
If community heating see section 4.3
Volume factor from Table 2a 0.78 (52) Temperature factor from Table 2b 0.78 (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 5.18$ (54) Enter (50) or (54) in (55)
(56)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 155.49 160.68 155.49 160.68 155.49 160.68 (56) If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H
(57)m= 160.68 145.13 160.68 155.49 160.68 155.49 160.68 155.49 160.68 155.49 160.68 (57)
Primary circuit loss (annual) from Table 3 Drimary circuit loss calculated for each month (F0)m. (F8) : 36F :: (41)m.
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)
(159)m= 128.38 115.95 128.38 124.24 128.38 41.92 43.31 43.31 41.92 128.38 124.24 128.38 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$
(62)m= 458.56 409.33 442.04 413.1 417.03 307.84 306.32 321.42 316.24 427.54 430.9 453.21 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Output from water heater
(64)m= 458.56 409.33 442.04 413.1 417.03 307.84 306.32 321.42 316.24 427.54 430.9 453.21
Output from water heater (annual) ₁₁₂ 4703.52 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]
(65)m= 159.06 142.06 153.57 143.74 145.25 70.25 68.68 73.7 73.04 148.75 149.65 157.28 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating
5. Internal gains (see Table 5 and 5a):
Metabolic gains (Table 5), Watts
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m= 176.11 176.11 176.11 176.11 176.11 176.11 176.11 176.11 176.11 176.11 176.11 176.11 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
(67)m= 71.61 63.6 51.73 39.16 29.27 24.71 26.7 34.71 46.59 59.15 69.04 73.6 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
(68)m= 479.45 484.42 471.88 445.19 411.5 379.84 358.68 353.71 366.24 392.93 426.63 458.29 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.55 55.55 55.55 55.55 55.55 55.55 55.55 (69)
Pumps and fans gains (Table 5a)
(70)m =
Losses e.g. evaporation (negative values) (Table 5)
(71)m =
Water heating gains (Table 5)
(72)m= 213.79 211.39 206.41 199.63 195.23 97.57 92.31 99.05 101.45 199.93 207.85 211.4 (72)

Total in	nternal	gains =					(66))m + (67)m	+ (68	3)m +	(69)m + (70)m +	(71)m + (72)	m		
(73)m=	879.1	873.67	844.27	798.24	750.26	6	16.37	591.94	601	.72	628.53	766.27	817.77	857.55	7	(73)
6. Sola	ar gain	s:														
Solar ga	ains are	calculated	using sol	ar flux fror	n Table 6	a and	d assoc	iated equa	tions	to co	nvert to the	e applic	able orientat	ion.		
Orienta		Access F Table 6d		Are: m²			Flu	ıx ble 6a		т.	g_ able 6b		FF Table 6c		Gains (W)	
N. d	-	Table ou							ı ı		able ob	-, .	Table 60		(۷۷)	
North	0.9x	1	х		.2	X		0.63	X		0.85	X	0.7	=	13.67	(74)
North	0.9x	1	×		.2	X	2	20.32	X		0.85	X	0.7	_ =	26.12	(74)
North	0.9x	1	×		.2	X	3	34.53	X		0.85	X	0.7	_ =	44.38	(74)
North	0.9x	1	х		.2	X		55.46	X		0.85	X	0.7	=	71.28	(74)
North	0.9x	1	×		.2	X		74.72	X		0.85	X	0.7	=	96.02	(74)
North	0.9x	1	×		.2	X		79.99	X		0.85	X	0.7	=	102.8	(74)
North	0.9x	1	х		.2	X	7	74.68	X		0.85	X	0.7	=	95.97	(74)
North	0.9x	1	×		.2	X		59.25	X		0.85	X	0.7	=	76.14	(74)
North	0.9x	1	х	1	.2	X		11.52	X		0.85	X	0.7	=	53.36	(74)
North	0.9x	1	×		.2	X	2	24.19	X		0.85	X	0.7	=	31.09	(74)
North	0.9x	1	×		.2	X	1	3.12	Х		0.85	Х	0.7		16.86	(74)
North	0.9x	1	×		.2	Х		8.86	X		0.85	Х	0.7	_	11.39	(74)
East	0.9x	1	×	8	.4	Х	1	9.64	X		0.85	Х	0.7	=	88.35	(76)
East	0.9x	1	X	8	3.4	X		88.42	X		0.85	Х	0.7	=	172.82	(76)
East	0.9x	1	X	8	.4	X	6	33.27	X		0.85	Х	0.7	_ =	284.62	(76)
East	0.9x	1	X	8	.4	×		92.28	Х		0.85	Х	0.7	=	4 <mark>15.09</mark>	(76)
East	0.9x	1	X	8	3.4	х	1	13.09	X		0.85	Х	0.7	=	5 <mark>08.71</mark>	(76)
East	0.9x	1	х	8	.4	X	1	15.77	X		0.85	X	0.7	=	520.76	(76)
East	0.9x	1	х	8	3.4	X	1	10.22	X		0.85	X	0.7	=	495.78	(76)
East	0.9x	1	Х	8	3.4	X	9	94.68	X		0.85	X	0.7	=	425.87	(76)
East	0.9x	1	х	8	3.4	X	7	73.59	X		0.85	X	0.7	=	331.02	(76)
East	0.9x	1	х	8	3.4	X		15.59	X		0.85	x	0.7	=	205.07	(76)
East	0.9x	1	х	8	3.4	x	2	24.49	X		0.85	X	0.7	=	110.16	(76)
East	0.9x	1	X	8	3.4	X	1	6.15	X		0.85	X	0.7	=	72.65	(76)
South	0.9x	1	х	1	.86	x		16.75	X		0.65	x	0.7	=	106.83	(78)
South	0.9x	1	Х	0	.75	X	4	16.75	x		0.65	x	0.7	=	57.43	(78)
South	0.9x	1	Х	1	.86	X	7	6.57	X		0.65	x	0.7	=	174.96	(78)
South	0.9x	1	Х	0	.75	X	7	6.57	x		0.65	x	0.7	=	94.06	(78)
South	0.9x	1	х	1	.86	x	9	7.53	x		0.65	x	0.7	=	222.87	(78)
South	0.9x	1	Х	0	.75	x	9	97.53	x		0.65	x	0.7	=	119.82	(78)
South	0.9x	1	×	1	.86	X	1	10.23	x		0.65	x	0.7		251.89	(78)
South	0.9x	1	×	0	.75	X	1	10.23	x		0.65	×	0.7		135.42	(78)
South	0.9x	1	х	1	.86	X	1	14.87	x		0.65	x	0.7	=	262.48	(78)
South	0.9x	1	x	0	.75	X	1	14.87	x		0.65	×	0.7	=	141.12	(78)
									•			_ '				

			_		_		_				_		_
South	0.9x	1	X	1.86	X	110.55	X	0.65	X	0.7	=	252.6	(78)
South	0.9x	1	X	0.75	x	110.55	x	0.65	x	0.7	=	135.81	(78)
South	0.9x	1	X	1.86	X	108.01	X	0.65	X	0.7	=	246.81	(78)
South	0.9x	1	X	0.75	X	108.01	X	0.65	x	0.7	=	132.69	(78)
South	0.9x	1	X	1.86	X	104.89	X	0.65	X	0.7	=	239.69	(78)
South	0.9x	1	X	0.75	x	104.89	x	0.65	x	0.7	=	128.86	(78)
South	0.9x	1	X	1.86	x	101.89	x	0.65	x	0.7] =	232.81	(78)
South	0.9x	1	X	0.75	x	101.89	x	0.65	x	0.7	=	125.17	(78)
South	0.9x	1	X	1.86	X	82.59	X	0.65	x	0.7	=	188.71	(78)
South	0.9x	1	X	0.75	x	82.59	x	0.65	x	0.7	=	101.46	(78)
South	0.9x	1	X	1.86	X	55.42	X	0.65	X	0.7	=	126.63	(78)
South	0.9x	1	X	0.75	X	55.42	x	0.65	X	0.7	=	68.08	(78)
South	0.9x	1	X	1.86	x	40.4	x	0.65	x	0.7	=	92.31	(78)
South	0.9x	1	X	0.75	X	40.4	x	0.65	x	0.7	=	49.63	(78)
West	0.9x	1	X	1.2	x	19.64	X	0.65	x	0.7	=	19.3	(80)
West	0.9x	1	X	1.2	x	38.42	x	0.65	x	0.7	=	37.76	(80)
West	0.9x	1	X	1.2	x	63.27	x	0.65	x	0.7	=	62.18	(80)
West	0.9x	1	X	1.2	X	92.28	Х	0.65	X	0.7	=	90.69	(80)
West	0.9x	1	x	1.2	x	113.09	x	0.65	x	0.7	=	111.15	(80)
West	0.9x	1	X	1.2	x	115.77] ×	0.65	x	0.7] =	113.78	(80)
West	0.9x	1	x	1.2	x	110.22	x	0.65	x	0.7	=	108.32	(80)
West	0.9x	1	x	1.2	x	94.68	Х	0.65	x	0.7	=	93.05	(80)
West	0.9x	1	X	1.2	x	73.59	X	0.65	x	0.7	=	72.32	(80)
West	0.9x	1	x	1.2	х	45.59	x	0.65	x	0.7	=	44.81	(80)
West	0.9x	1	X	1.2	x	24.49	x	0.65	x	0.7	=	24.07	(80)
West	0.9x	1	X	1.2	x	16.15	x	0.65	x	0.7] =	15.87	(80)
Rooflight	ts 0.9x	1	X	2.49	x	26	x	0.65	x	0.7] =	26.51	(82)
Rooflight	ts 0.9x	1	X	3.35	x	26	x	0.65	x	0.7	=	35.67	(82)
Rooflight	ts 0.9x	1	X	2.49	x	54	x	0.65	x	0.7	=	55.06	(82)
Rooflight	ts 0.9x	1	x	3.35	x	54	x	0.65	x	0.7	=	74.08	(82)
Rooflight	ts _{0.9x}	1	X	2.49	x	96	x	0.65	x	0.7	=	97.89	(82)
Rooflight	ts _{0.9x}	1	X	3.35	x	96	x	0.65	x	0.7	=	131.7	(82)
Rooflight	ts 0.9x	1	X	2.49	x	150	x	0.65	x	0.7	=	152.95	(82)
Rooflight	ts _{0.9x}	1	X	3.35	x	150	x	0.65	x	0.7	=	205.77	(82)
Rooflight	ts _{0.9x}	1	X	2.49	x	192	x	0.65	x	0.7	=	195.77	(82)
Rooflight	ts _{0.9x}	1	X	3.35	x	192	x	0.65	x	0.7] =	263.39	(82)
Rooflight	s 0.9x	1	x	2.49	x	200	x	0.65	x	0.7] =	203.93	(82)
Rooflight	s 0.9x	1	x	3.35	x	200	x	0.65	x	0.7	j =	274.36	(82)
Rooflight	s _{0.9x}	1	x	2.49	×	189	x	0.65	x	0.7] =	192.71	(82)
Rooflight	s 0.9x	1	x	3.35	x	189	x	0.65	x	0.7] =	259.27	(82)
Rooflight	s 0.9x	1	x	2.49	x	157	x	0.65	x	0.7	j =	160.09	(82)
	-		_		-		-				-		_

Rooflights _{0.9x}	1	X	3.3	35	x [157		x	0.65	x	0.7	=	215.38	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	115		x	0.65	x	0.7	=	117.26	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	115		x	0.65	x	0.7	=	157.76	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	66		x	0.65	x	0.7	=	67.3	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	66		x	0.65	x	0.7	=	90.54	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	33		x	0.65	x	0.7	=	33.65	(82)
Rooflights 0.9x	1	X	3.3	35	x	33		x	0.65	x	0.7	=	45.27	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	21		x	0.65	x	0.7	=	21.41	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	21		x	0.65	x	0.7	=	28.81	(82)
Solar gains in wa	atts, cal	lculated	for eacl	h month				(83)m =	Sum(74)m .	(82)m				
(83)m= 347.76 6	34.86	963.45	1323.1	1578.65	160	04.04 1531	.57	1339.0	7 1089.7	728.97	424.71	292.08		(83)
Total gains - inte	ernal ar	nd solar	(84)m =	= (73)m -	+ (8	3)m , watt	ts							
(84)m= 1226.86 1	508.53	1807.72	2121.34	2328.91	222	20.41 2123	3.51	1940.7	9 1718.23	1495.23	1242.48	1149.62		(84)
7. Mean interna	al tempe	erature	(heating	season)									
Temperature du	uring he	eating p	eriods ir	n the livii	ng a	area from	Tab	le 9, 1	h1 (°C)				21	(85)
Utilisation facto	•	•			_				, ,					
Jan	Feb	Mar	Apr	May	Ė.	Jun Ju	Ť	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99	0.97	0.93	0.85	0.	.73 0.5	9	0.65	0.85	0.96	0.99	0.99		(86)
Mean internal to	empera	ture in l	living are	2a T1 (fc	llov	w stens 3 t	to 7	in Tal	ole 9c)					
	18.87	19.31	19.92	20.42		0.77 20.		20.89		19.94	19.2	18.62		(87)
	ا م ماند،				مردام	allin ar fra								
Temperature du (88)m= 19.83	19.84	19.85	19.89	19.9		9.94 19.9		19.94		19.9	19.88	19.87	1	(88)
							\vdash		10.02	10.0	10.00	10.07		(33)
Utilisation facto						$\overline{}$	\neg		0.70	0.04			1	(00)
(89)m= 0.99	0.98	0.96	0.91	0.81	0.	.65 0.4	7	0.53	0.79	0.94	0.98	0.99		(89)
Mean internal to	empera	ture in t	the rest	of dwelli	ng ⁻	T2 (follow	ste	ps 3 to	7 in Tabl	e 9c)			1	
(90)m= 17.65	17.92	18.36	18.99	19.47	19	9.8 19.	9	19.89		19.02	18.28	17.69		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.46	(91)
Mean internal te	empera	ture (fo	r the wh	ole dwe	lling	j) = fLA ×	T1 -	+ (1 –	fLA) × T2					
(92)m= 18.1	18.36	18.8	19.42	19.91	20).25 20.3	37	20.36	20.08	19.45	18.71	18.12		(92)
Apply adjustme	nt to th	e mean	interna	temper	atur	e from Ta	ble	4e, w	nere appro	priate			•	
(93)m= 18.7	18.96	19.4	20.02	20.51	20).85 20.9	97	20.96	20.68	20.05	19.31	18.72		(93)
8. Space heating	ng requi	irement												
Set Ti to the me			•		ed a	at step 11	of	Table	9b, so tha	t Ti,m=(76)m an	d re-cald	culate	
the utilisation fa	Feb					Jun Ju		۸.,,	Sep	Oct	Nov	Dec	1	
Jan Utilisation facto		Mar	Apr	May		Jun Ju	11	Aug	I Sep	Oct	INOV	Dec		
	0.98	0.96	0.92	0.83	0.	.72 0.5	9	0.64	0.83	0.94	0.98	0.99		(94)
Useful gains, hr		!				1 313					1			, ,
(95)m= 1213.26 14		`	<u> </u>		159	98.39 1246	3.37	1244.6	1433.54	1412.58	1220.33	1139.25		(95)
Monthly averag	e exter	nal tem	perature	from Ta	able				ı		1	<u> </u>	1	
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6 16.	6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for	or mea	n intern	al tempe	erature,	Lm	, W =[(39))m >	k [(93)	m- (96)m]	•	•	_	
(97)m= 5070.75 4	914.07	4473.78	3712.45	2919.91	200	01.68 1400).41	1449.2	2 2136.27	3132.34	4106.2	4957.23		(97)
<u> </u>					-	•			•	-	•	-	•	

Space heating requiremen	-		ı	ı	- ` ` 	ì	í - `	r			
(98)m= 2869.98 2309.13 2037	.29 1274.89	727.09	0	0	O Tota	0	1279.5		2840.57	15416.28	(98)
Canan hanting requiremen	4 : Is\A/In/:	26.00=			Tota	i per year	(KWII/yeai	r) = Sum(9	O) _{15,912} = [╡``
Space heating requiremen									L	102.33	(99)
9a. Energy requirements – Space heating:	ndividual I	neating s	ystems i	ncluding	micro-C	SHP)					
Fraction of space heat from	n seconda	ry/supple	mentary	system						0	(201
Fraction of space heat from	n main sys	tem(s)			(202) = 1 -	- (201) =			[1	(202
Fraction of total heating from	m main sy	stem 1			(204) = (2	02) x [1 –	(203)] =		[1	(204
Efficiency of main space h	eating sys	em 1							[61	(206
Efficiency of secondary/su	oplementa	ry heatin	g systen	n, %						0	(208
Jan Feb Ma	ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requiremen	<u> </u>	1	1	ı	1		ı	ı			
2869.98 2309.13 2037		<u> </u>	0	0	0	0	1279.5	2077.83	2840.57		
$(211)m = \{[(98)m \times (204)] \}$ $4704.88 3785.46 3339$		T .	0	0	0	0	2007.54	3406.27	4656.68		(211
4704.88 3785.46 3339	.63 2069.98	1191.94						211) _{15.1012}		25272.59	(211
Space heating fuel (second	dary) kWh	/month						715,1012	L	20212.00	
= $\{[(98)m \times (201)]\} \times 100 \div$	-	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,									
(215)m= 0 0 0	0	0	0	0	0	0	0	0	0		
					Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215
Wat <mark>er he</mark> ating											
Output from water heater (c		417.03	307.84	306.32	321.42	316.24	427.54	430.9	453.21		
Efficiency of water heater		1	l				l			51	(216
(217)m= 59.4 59.25 58.9	4 58.21	56.93	51	51	51	51	58.14	59.01	59.4		(217
Fuel for water heating, kWh											
(219) m = (64) m x $100 \div (2)$ (219)m = 772.04 690.85 $749.$		732.51	603.61	600.63	630.23	620.08	735.3	730.18	763.01		
,		1 -	<u> </u>			I = Sum(2				8338.13	(219
Annual totals							k'	Wh/year		kWh/yea	
Space heating fuel used, m	ain system	1							[25272.59	
Water heating fuel used									[8338.13	
Electricity for pumps, fans a	nd electric	keep-ho	t						_		_
central heating pump:									156		(230
boiler with a fan-assisted f	ue								45		(230
Total electricity for the abov	e, kWh/ye	ar			sum	of (230a).	(230g) =			201	(231
Electricity for lighting									[505.86	(232)
10a. Fuel costs - individua	heating s	vstems:							_		

Fuel

kWh/year

Fuel Price

(Table 12)

Fuel Cost

£/year

Space heating - main system 1	(211) x	3.48 × 0.01 =	879.49	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 × 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	290.17	(247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	26.51	(249)
(if off-peak tariff, list each of (230a) to (230g) s		· · ·		_
Energy for lighting	(232)	13.19 × 0.01 =	66.72	(250)
Additional standing charges (Table 12)			120	(251)
Appendix Q items: repeat lines (253) and (254	•			_
	(247) + (250)(254) =		1382.89	(255)
11a. SAP rating - individual heating systems				
Energy cost deflator (Table 12)			0.42	(256)
znorgy cook lactor (zer)	(256)] ÷ [(4) + 45.0] =		2.97	(257)
SAP rating (Section 12)			58.59	(258)
12a. CO2 emissions – Individual heating syst	ems including micro-CHP			
	Energy	Emission factor	Emissions	
	k\/\h/voar	ka CO2/k\//h	ka CO2/vo	o r
Space heating (main system 1)	kWh/year	kg CO2/kWh	kg CO2/yea	_
Space heating (main system 1)	(211) x	0.216	5458.88	(261)
Space heating (secondary)	(211) x (215) x	0.216 =	5458.88	(261)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216 = 0.519 = 0.216 =	5458.88	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 = 0.519 = 0.216 =	5458.88 0 1801.04 7259.92	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x	0.216 = 0.519 = 0.519 =	5458.88 0 1801.04 7259.92 104.32	(261) (263) (264) (265) (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ort (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 =	5458.88 0 1801.04 7259.92 104.32 262.54	(261) (263) (264) (265) (267) (268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = um of (265)(271) =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78	(261) (263) (264) (265) (267) (268) (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m²	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63	(261) (263) (264) (265) (267) (268) (272) (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = um of (265)(271) =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78	(261) (263) (264) (265) (267) (268) (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m²	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = um of (265)(271) =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63	(261) (263) (264) (265) (267) (268) (272) (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (232) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.72) ÷ (4) = Primary	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63 49 P. Energy	(261) (263) (264) (265) (267) (268) (272) (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.72) ÷ (4) =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63	(261) (263) (264) (265) (267) (268) (272) (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x Su (2 Energy kWh/year	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.72) ÷ (4) = Primary factor	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63 49 P. Energy kWh/year	(261) (263) (264) (265) (267) (268) (272) (273) (274)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = ot (231) x (232) x SL (2 Energy kWh/year (211) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.72) ÷ (4) = Primary factor 1.22 =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63 49 P. Energy kWh/year 30832.56	(261) (263) (264) (265) (267) (268) (272) (273) (274)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1) Space heating (secondary)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = or or or or or or or or or or or or or	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 1.72) ÷ (4) = Primary factor 1.22 = 3.07 = 1.22 =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63 49 P. Energy kWh/year 30832.56 0	(261) (263) (264) (265) (267) (268) (272) (273) (274) (261) (263)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1) Space heating (secondary) Energy for water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) = of (231) x (232) x (232) x Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = of (264) =	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 1.72) ÷ (4) = Primary factor 1.22 = 3.07 = 1.22 =	5458.88 0 1801.04 7259.92 104.32 262.54 7626.78 50.63 49 P. Energy kWh/year 30832.56 0 10172.52	(261) (263) (264) (265) (267) (268) (272) (273) (274) (261) (263) (264)

(232) x

sum of (265)...(271) =

Electricity for lighting

'Total Primary Energy

1553.01

43175.16

(268)

(272)

Primary energy kWh/m²/year

 $(272) \div (4) =$

286.59

(273)

		Hear Datailar			
		User Details:			
Assessor Name:	0. 5045 0040	Stroma Nu			
Software Name:	Stroma FSAP 2012	Software \	0.0.0	Version: 1.0.1.24	
	Pi	roperty Address: Flat	3		
Address :					
1. Overall dwelling dimens	ions:				
0 10		Area(m²)	Av. Height(m)	Volume(m	<u> </u>
Ground floor		40.62 (1a)	x 3.2	2a) = 129.98	(3a)
First floor		110.03 (1b)	x 2.65	2b) = 291.58	(3b)
Total floor area TFA = (1a)+	+(1b)+(1c)+(1d)+(1e)+(1n	150.65 (4)			
Dwelling volume		(3a)+	(3b)+(3c)+(3d)+(3e)+(3	3n) = 421.56	(5)
2. Ventilation rate:					
	main secondar heating heating	y other	total	m³ per ho	ur
Number of chimneys	0 + 0	+ 1 =	1 x 40	= 40	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20	= 0	(6b)
Number of intermittent fans			4 x 10	= 40	(7a)
Number of passive vents			0 × 10	= 0	(7b)
Number of flueless gas fires	3		0 x 40	= 0	(7c)
				Air changes per h	our
Infiltration due to chimneys	flues and fans = $(6a)+(6b)+(7a)$	a)+(7h)+(7c) =			
	n carried out or is intended, proceed			(5) = 0.19	(8)
Number of storeys in the	dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]	x0.1 = 0	(10)
Structural infiltration: 0.25	for steel or timber frame or	0.35 for masonry cor	struction	0	(11)
	ent, use the value corresponding to	the greater wall area (after	r		
deducting areas of openings	or, enter 0.2 (unsealed) or 0.	1 (sealed) else enter	0	0	(12)
If no draught lobby, enter	,	1 (dealed), cloc effici		0	(13)
• • • • • • • • • • • • • • • • • • • •	nd doors draught stripped				(14)
Window infiltration	ina adors araagin sirippea	0.25 - [0.2 x (14)	÷ 1001 =	0	
Infiltration rate			+ (12) + (13) + (15) =	0	(15)
	0, expressed in cubic metre			0	(16)
	value, then $(18) = [(17) \div 20] + (8)$		mene or envelope a		(17)
	a pressurisation test has been don		ility is heina used	0.94	(18)
Number of sides sheltered	a pressurisation test has been don	e or a degree an permeasi	ity is being asca	2	(19)
Shelter factor		(20) = 1 - [0.075	x (19)] =	0.85	(20)
Infiltration rate incorporating	shelter factor	$(21) = (18) \times (20)$		0.85	(21)
Infiltration rate modified for				0.0	(/
Jan Feb M		Jul Aug Se	p Oct Nov	Dec	
		34. / tag 36	F 301 1407		
Monthly average wind spee	u nom rable /				

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Facto	or (22a)m =	(22)m ÷	4										
(22a)m= 1.2	27 1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted in	filtration ra	te (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
1.0	1	0.98	0.88	0.86	0.76	0.76	0.74	0.8	0.86	0.9	0.94		
Calculate e	<i>ettective air</i> nical ventil	•	rate for t	he appli	cable ca	ise							0 (
	air heat pump		endix N, (2	3b) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)				0 (
If balanced	with heat rec	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					0 (
a) If balaı	nced mech	anical ve	entilation	with hea	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [′	1 – (23c)	÷ 100])`
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
b) If balar	nced mech	anical ve	entilation	without	heat red	covery (N	MV) (24b)m = (22	2b)m + (23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
,	le house ex 2b)m < 0.5			•	•				5 v (22h	,)			
(24c)m= 0	-	0	0	0	0	0	0) = (221	0	0	0	0		(
	ral ventilat												`
,	2b)m = 1, th				•				0.5]				
(24d)m= 1.0)2 1	0.98	0.89	0.87	0.79	0.79	0.77	0.82	0.87	0.9	0.94		()
Effective	air change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
		rate - er 0.98	nter (24a 0.89) or (24b 0.87	o) or (24 0.79	c) or (24 0.79	d) in box	0.82	0.87	0.9	0.94		(:
	02 1	0.98	0.89	0.87	<u> </u>	· `		<u>`</u>	0.87	0.9	0.94		(
(25)m= 1.0 3. Heat los	o2 1 sses and h	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79	0.79 ea	0.77 U-val	0.82 ue	AXU		k-value		ΑXk
(25)m= 1.0 3. Heat los ELEMEN	o2 1 sses and h	0.98	0.89	0.87 er:	0.79 Net Ar A ,r	0.79	U-vali W/m2	0.82 ue 2K	A X U (W/I				A X k kJ/K
3. Heat los ELEMEN Doors	sses and h	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r	0.79	U-valu W/m2	0.82	A X U (W/l		k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty	sses and h	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r 2.1	0.79 rea m² x1	U-valu W/m2 2 /[1/(4.5)+	0.82 ue kK = 0.04] = [A X U (W/I 4.2 7.09		k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty	sses and hard area area area area area area area a	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75	0.79 rea m² x1 x1	U-vali W/m2 2 /[1/(4.5)+	0.82 ue ek 0.04] = [0.04] = [A X U (W/I 4.2 7.09 2.86		k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty	sses and hards	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75	0.79 rea m² x1 x1	U-vali W/m2 2 /[1/(4.5)+ /[1/(4.5)+	0.82 0.04] = [0.04] = [0.04] = [A X U (W/I 4.2 7.09 2.86 4.58		k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty Windows Ty	sses and h T Groarea Type 1 Type 2 Type 3 Type 4	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2	0.79 rea m² x1 x1 x1	U-valu W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.82 0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/l 4.2 7.09 2.86 4.58		k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty Windows Ty Windows Ty Windows Ty	sses and h T Groarea Type 1 Type 2 Type 3 Type 4 Type 5	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4	0.79 rea m² x1 x1 x1 x1	U-valu W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/l 4.2 7.09 2.86 4.58 32.03	<) 	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty Windows Ty Windows Ty Rooflights T	sses and hards area area area area area area area are	0.98 eat loss p	0.89 paramete Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49	0.79 rea m² x1 x1 x1 x1 x1	U-vali W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/l 4.2 7.09 2.86 4.58 32.03 11.205	<)	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty Windows Ty Windows Ty Rooflights T	sses and hard area area area area area area area a	0.98 eat loss page 1 (m²)	0.89 Openin	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35	0.79 rea m² x1 x1 x1 x1 x1 x1	U-vali W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/I 4.2 7.09 2.86 4.58 4.58 32.03 11.205	<)	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty Windows Ty Rooflights T	sses and hard size of the state	0.98 eat loss page 1 (m²)	0.89 Openin m	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5) + /[1/(4.5) +	0.82 0.04] = [0.04] = [A X U (W/l 4.2 7.09 2.86 4.58 32.03 11.205 15.075 9.21	<)	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty	1 Sses and h 1 Groarea 1 Sype 1 1 Sype 2 1 Sype 3 1 Sype 4 1 Sype 5 1 Type 1 1 Type 2 1 26 2 21	0.98 eat loss ss (m²)	0.89 Openin m 5.58	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-value W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = [0.04]	A X U (W/l 4.2 7.09 2.86 4.58 4.58 32.03 11.205 15.075 9.21 4.31	<)	k-value		A X k kJ/K
3. Heat os ELEMEN Doors Windows Ty Windows	1 Sses and h 1 Groarea 1 Sype 1 1 Sype 2 1 Sype 3 1 Sype 4 1 Sype 5 1 Type 1 1 Type 2 1 26. 1 26. 1 3 80.	0.98 eat loss ss (m²)	0.89 Openin m 5.58 0 16.2	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x	U-value W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.45 0.2	0.82 0.82 0.04] = [0.04] = [A X U (W/I 4.2 7.09 2.86 4.58 4.58 32.03 11.205 15.075 9.21 4.31 28.72	<)	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows	sses and h T Gro area Type 1 Type 2 Type 5 Type 1 Type 2 1 26 2 21 3 80 110	0.98 eat loss ss (m²)	0.89 Openin m 5.58	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-value W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = [0.04]	A X U (W/l 4.2 7.09 2.86 4.58 4.58 32.03 11.205 15.075 9.21 4.31	<)	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows	sses and h T Gro area Type 1 Type 2 Type 5 Type 1 Type 2 1 26 2 21 3 80 110	0.98 eat loss ss (m²)	0.89 Openin m 5.58 0 16.2	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83 110.0 245.2	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-vali W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5) + /[1/(4.5) + 0.45 0.2	0.82 0.82 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= [= [= [A X U (W/I 4.2 7.09 2.86 4.58 32.03 11.205 15.075 9.21 4.31 28.72 22.01	<)	k-value		A X k kJ/K
3. Heat los ELEMEN Doors Windows Ty Windows Ty Windows Ty Windows Ty Windows Ty Rooflights T Rooflights T Walls Type Walls Type Walls Type Roof	sses and h T Gro area Type 1 Type 2 Type 5 Type 1 Type 2 1 26 2 21 3 80 110	0.98 eat loss ss (m²)	0.89 Openin m 5.58 0 16.2	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-value W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.45 0.2	0.82 0.82 0.04] = [0.04] = [A X U (W/I 4.2 7.09 2.86 4.58 4.58 32.03 11.205 15.075 9.21 4.31 28.72	<)	k-value		A X k kJ/K

(26)...(30) + (32) =

Fabric heat loss, $W/K = S (A \times U)$

173.79

(33)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Heat capacity Cm :	= S(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
For design assessments where the details of the construction are not known precisely the indicative values of 7MP in Table 11 can be used instead of a detailed calculated using Appendix K if details of thermal bridging are not known (28) = 0.15 x (31) Total fabric hoat loss Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated monthly Ventillation heat loss calculated with the properties of the properties	Thermal mass para	meter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
## details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly ## Control and Peb Mar Apr May Jun Jul Aug Sep Oct Nov Dec ## Sep Sep	· ·			constructi	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		`
## details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly ## Control and Peb Mar Apr May Jun Jul Aug Sep Oct Nov Dec ## Sep Sep	Thermal bridges: S	S (L x Y) cal	culated i	using Ap	pendix I	<						36.78	(36)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	_	` '			•								`` ′
Same	Total fabric heat los	SS	. ,		,			(33) +	(36) =			210.57	(37)
Heat transfer coefficient, W/K (39)m = (37) + (38)m (38) (38) (39)m = (37) + (38)m (39)m = (39)	Ventilation heat los	s calculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)			
Heat transfer coefficient, W/K (39)m = (37) + (38)m (38) (38) (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m + (4) (40)m = (39)m + (40)m + (30)m	Jan Fe	eb Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec]	
Assumed occupancy N If TFA > 13.9, N = 1 + 1.76 x 1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA ≥ 13.9, N = 1 + 1.76 x I - exp(-0.000349 x (delime subset usage in litres per day for each month Vd.m = factor from Table 1c x (43) If I = Sum(44) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres in litres per day for each month Vd.m = factor from Table 1c x (43) Image in litres in litres in litres per day for				,		-	⊢ <u> </u>		120.85		130.84		(38)
Average = Sum(39)a/12= 333.82 (39)	Heat transfer coeffi	cient, W/K				Į.	Į.	(39)m	= (37) + (3	38)m		ı	
Heat loss parameter (HLP), W/m²K (40)m= 2.34 2.32 2.3 2.22 2.2 2.13 2.13 2.13 2.11 2.15 2.2 2.23 2.27 Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(39)m= 352.25 349	48 346.73	333.83	331.42	320.18	320.18	318.1	324.51	331.42	336.3	341.4		
A	Heat loss paramete	er (HLP), W	/m²K						•	` '	12 /12=	333.82	(39)
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		``		2.2	2.13	2.13	2.11	2.15	2.2	2.23	2.27]	
Sep Oct Nov Dec					ļ	<u> </u>	<u> </u>	<u>!</u>	Average =	Sum(40) ₁ .	12 /12=	2.22	(40)
4. Water heating energy requirement: **Notice heating energy requirement** **Notice heating energy requirement** **Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 × [1 - exp(-0.000349 × (TFA -13.9)2]] + 0.0013 × (TFA -13.9) **If TFA \$\frac{1}{2}\$ 13.9, N = 1 + 1.76 × [1 - exp(-0.000349 × (TFA -13.9)2]] + 0.0013 × (TFA -13.9) **If TFA \$\frac{1}{2}\$ 13.9, N = 1 **Annual average hot water usage in litres per day Vd, average = (25 × N) + 36 **Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day (all water use, hot and cold) **Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c × (43) **(44)m= 114.3 110.15 105.99 101.83 97.68 93.52 93.52 97.68 101.83 105.99 110.15 114.3 **Total = Sum(44)	Number of days in	month (Tab	le 1a)										
4. Water heating energy requirement: Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA ≥ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to archieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43) (44)m= 114.3 110.15 105.99 101.83 97.68 93.52 93.52 97.68 101.83 105.99 110.15 114.3 Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 169.51 148.25 152.98 133.37 127.98 110.43 102.33 117.43 118.83 138.49 151.17 164.16 Total = Sum(44)v = 1634.92 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 25.43 22.24 22.95 20.01 19.2 16.56 15.35 17.61 17.82 20.77 22.68 24.62 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 250 (50)	Jan Fe	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36													
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Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) x (49) = 250 (50)	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if Instantaneous water if the Ins	t water usage hot water per person per person per to per day for each per used - calculater used - cal	ge in litre usage by a r day (all we have ach month 101.83 local action	es per da 5% if the orater use, I May Vd,m = fa 97.68	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43 boxes (46) 17.61	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) x (49) = 250 (48)	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if TFA £ 14.3	t water usage hot water per person per per per person per per person per per per per per per per per per per	ge in litre usage by a r day (all w Apr ach month 101.83 culated mo 133.37 for use (no 20.01 ang any so	es per da 5% if the off ater use, I May Vd,m = far 97.68 onthly = 4. 127.98 o hot water 19.2	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage),	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43 boxes (46) 17.61 within sa	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) x (49) = 250 (48)	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if Instantaneous water for the storage loss if TFA £ 13.9, N if TFA £ 14.9, N if Instantaneous water for the storage loss if TFA £ 13.9, N if TFA £ 14.9, N if Instantaneous water for the storage loss if TFA £ 13.9, N if TFA £ 1	t water usage hot water per person per person per to per day for each per	ge in litre usage by a r day (all w Apr ach month 101.83 loculated month 133.37 loculated month 20.01 long any so ank in dw	es per da 5% if the of 5% if the of 65% if the of May Vd,m = factor 97.68 97.68 127.98 19.2 plar or Water velling, e	Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage),	erage = designed to lid) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77 Sel	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
Energy lost from water storage, kWh/year $(48) \times (49) = 250$ (50)	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if TFA £ 14.3	t water usage hot water over person person person person person person person person day for each of the boundary of the bound	ge in litre usage by a r day (all w Apr ach month 101.83 loculated month 133.37 loculated month 20.01 long any so ank in dw	es per da 5% if the of 5% if the of 6% if the of May Vd,m = factor 97.68 97.68 127.98 19.2 plar or Water velling, e	Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage),	erage = designed to lid) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if TFA £ 14.3	t water usage hot water over person person person person person person day for each of the person day	ge in litre usage by a r day (all was ach month ach month ach ach ach ach ach ach ach ach ach ac	es per da 5% if the off 5% if the off 6% if the off May Vd,m = factor 97.68 onthly = 4. 127.98 o hot water 19.2 olar or Water velling, each	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage), 16.56 /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46) (47)
	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if TFA £ 12.0, N if TFA £ 14.3, N if TFA	t water usage hot water over person p	Apr ach month 101.83 culated mo 133.37 for use (no 20.01 and in dw er (this in	es per da 5% if the off 5% if the off 6% if the off May Vd,m = factor 97.68 onthly = 4. 127.98 o hot water 19.2 olar or Water velling, each	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage), 16.56 /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46) (47)
	if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N if TFA £ 14.9, N if TFA £ 14.3	t water usage hot water over person p	ge in litre usage by a day (all was Apr ach month 101.83 deulated me 20.01 and ank in dwar (this in oss factors 2b	es per da 5% if the of 5% if the of 5% if the of 97.68 97.68 97.68 127.98 o hot water 19.2 color or Water relling, eacludes in	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage), 16.56 /WHRS nter 110	erage = designed to lid) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage Ditres in neous con/day):	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47) ombi boil	+ 36 a water us Sep 101.83 118.83 10 (61) 17.82 ame vess ers) enter	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	94 3.91 Dec 114.3 c, 1d) 164.16 24.62 250		(43) (44) (45) (46) (47) (48) (49)

Hot water storage loss factor from Table 2	2 (kWh/litre/day))			.03	1	(51)
If community heating see section 4.3	2 (KVVII/IIII 0/ ddy)	,		0.	.03		(01)
Volume factor from Table 2a				0.	78		(52)
Temperature factor from Table 2b				0.	78		(53)
Energy lost from water storage, kWh/year	r	(47) x (51) x (52) x (53) =	5.	18		(54)
Enter (50) or (54) in (55)				5.	18		(55)
Water storage loss calculated for each me	onth	((56)m = 0)	(55) × (41)m				
` '		160.68	155.49 160.68	155.49	160.68		(56)
If cylinder contains dedicated solar storage, (57)m =	= (56)m x [(50) – (H1	11)] ÷ (50), else (5	7)m = (56)m where	(H11) is fro	m Append	lix H	
(57)m= 160.68 145.13 160.68 155.49 1	160.68 155.49 1	160.68	155.49 160.68	155.49	160.68		(57)
Primary circuit loss (annual) from Table 3	3				0		(58)
Primary circuit loss calculated for each m	ionth (59)m = (58)	8) ÷ 365 × (41))m				
(modified by factor from Table H5 if the			 	ostat)		Ī	
(59)m= 128.38 115.95 128.38 124.24 1	128.38 41.92	43.31 43.31	41.92 128.38	124.24	128.38		(59)
Combi loss calculated for each month (61	$1)m = (60) \div 365$	5 × (41)m					
(61)m= 0 0 0 0	0 0	0 0	0 0	0	0		(61)
Total heat required for water heating calc	ulated for each r	month (62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	Ì
(62)m= 458.56 409.33 442.04 413.1 4	117.03 307.84 3	306.32 321.42	316.24 427.54	430.9	453.21		(62)
Solar DHW input calculated using Appendix G or Ap	ppendix H (negative	quantity) (enter 'C	' if no solar co <mark>ntribu</mark>	tion to wate	er heating)		
(add additional lines if FGHRS and/or WV	WHRS applies, s	see Appendix (3)				
(63)m = 0 0 0 0	0 0	0 0	0 0	0	0		(63)
Output from water heater							
(64)m= 458.56 409.33 442.04 413.1 4	307.84	306.32 321.42	316.24 427.54	430.9	453.21		_
		Out	out from water heat	er (annual) ₁	12	4703.52	(64)
Heat gains from water heating, kWh/mon	th 0.25 ′ [0.85 ×	(45)m + (61)n	n] + 0.8 x [(46)m	+ (57)m	+ (59)m]	
(65)m= 159.06 142.06 153.57 143.74 1	145.25 70.25	68.68 73.7	73.04 148.75	149.65	157.28		(65)
include (57)m in calculation of (65)m or	nly if cylinder is i	in the dwelling	or hot water is	rom com	munity h	eating	
5. Internal gains (see Table 5 and 5a):							
Metabolic gains (Table 5), Watts							
Jan Feb Mar Apr	May Jun	Jul Aug	Sep Oct	Nov	Dec		
(66)m= 146.76 146.76 146.76 1	146.76 146.76 1	146.76 146.76	146.76 146.76	146.76	146.76		(66)
Lighting gains (calculated in Appendix L,	equation L9 or L	_9a), also see	Table 5			•	
(67)m= 28.99 25.75 20.94 15.85	11.85 10.01	10.81 14.05	18.86 23.95	27.95	29.8		(67)
Appliances gains (calculated in Appendix	L, equation L13	3 or L13a), also	see Table 5	•			
(68)m= 321.23 324.56 316.16 298.28 2	275.71 254.49 2	240.32 236.98	245.38 263.27	285.84	307.06		(68)
Cooking gains (calculated in Appendix L,	equation L15 or	r L15a), also s	ee Table 5				
(69)m= 37.68 37.68 37.68 37.68 3	37.68 37.68	37.68 37.68	37.68 37.68	37.68	37.68		(69)
Pumps and fans gains (Table 5a)		<u> </u>	!		ļ.	l	
(70)m= 0 0 0 0	0 0	0 0	0 0	0	0		(70)
Losses e.g. evaporation (negative values	s) (Table 5)	I	I I	1	ļ.		
		117.41 -117.41	-117.41 -117.41	-117.41	-117.41		(71)
Water heating gains (Table 5)	1 1		<u> </u>	1	<u>I</u>	1	
	195.23 97.57	92.31 99.05	101.45 199.93	207.85	211.4		(72)
		I	<u> </u>	1		ı	•

Total ir	nternal	l gains =						(66)m + (67)m	+ (68	3)m +	(69)m + (70)m +	(71)m + (72)	m		
(73)m=	631.04	628.73	610.5	4	580.79	549.82	4	29.1	410.46	417	.12	432.72	554.17	588.67	615.28		(73)
6. Sola	ar gain	s:															
_			_	olar	flux from T	able 6a	and			tions	to co	nvert to the	e applic	able orientat	ion.		
Orienta		Access F Table 6d	actor		Area m²			Flu Ta	ıx ble 6a		T	g_ able 6b		FF Table 6c		ains (W)	
North	0.9x	0.77		X	1.2		X	,	10.63	x		0.85	x	0.7	=	10.52	(74)
North	0.9x	0.77		X	1.2		X	2	20.32	x		0.85	x	0.7	=	20.11	(74)
North	0.9x	0.77		X	1.2		X	(34.53	x		0.85	x	0.7	=	34.17	(74)
North	0.9x	0.77		X	1.2		X	į	55.46	x		0.85	x	0.7	=	54.89	(74)
North	0.9x	0.77		X	1.2		X	-	74.72	x		0.85	x	0.7	=	73.94	(74)
North	0.9x	0.77		X	1.2		X	-	79.99	x		0.85	x	0.7	=	79.15	(74)
North	0.9x	0.77		X	1.2		X	-	74.68	x		0.85	x	0.7	=	73.9	(74)
North	0.9x	0.77		X	1.2		X	į	59.25	x		0.85	x	0.7	=	58.63	(74)
North	0.9x	0.77		X	1.2		X	4	11.52	x		0.85	x	0.7	=	41.08	(74)
North	0.9x	0.77		X	1.2		X	2	24.19	x		0.85	x	0.7	=	23.94	(74)
North	0.9x	0.77		X	1.2		X	,	13.12	X		0.85	Х	0.7	=	12.98	(74)
North	0.9x	0.77		X	1.2		х		8.86	x		0.85	х	0.7	=	8.77	(74)
East	0.9x	1		X	8.4		Х		19.64	×		0.85	x	0.7	=	68.03	(76)
East	0.9x	1		X	8.4		X	(38.42	x		0.85	x	0.7	=	133.07	(76)
East	0.9x	1		X	8.4		X	(63.27	×		0.85	x	0.7	=	219.15	(76)
East	0.9x	1		X	8.4		x	Ś	92.28	Х		0.85	x	0.7	=	319.62	(76)
East	0.9x	1		X	8.4		Х	1	13.09	x		0.85	x	0.7	=	391.71	(76)
East	0.9x	1		X	8.4		X	1	15.77	x		0.85	х	0.7	=	400.98	(76)
East	0.9x	1		X	8.4		X	1	10.22	x		0.85	x	0.7	=	381.75	(76)
East	0.9x	1		X	8.4		X	(94.68	x		0.85	x	0.7	=	327.92	(76)
East	0.9x	1		X	8.4		X	-	73.59	X		0.85	X	0.7	=	254.88	(76)
East	0.9x	1		X	8.4		X	4	15.59	x		0.85	x	0.7	=	157.9	(76)
East	0.9x	1		X	8.4		X	2	24.49	X		0.85	x	0.7	=	84.82	(76)
East	0.9x	1		X	8.4		X		16.15	X		0.85	X	0.7	=	55.94	(76)
South	0.9x	0.77		X	1.86	5	X		46.75	X		0.65	x	0.7	=	82.26	(78)
South	0.9x	0.77		X	0.75		X		46.75	X		0.65	x	0.7	=	44.22	(78)
South	0.9x	0.77		X	1.86	5	X	-	76.57	X		0.65	x	0.7	=	134.72	(78)
South	0.9x	0.77		X	0.75	5	X	-	76.57	X		0.65	x	0.7	=	72.43	(78)
South	0.9x	0.77		X	1.86	5	X	(97.53	X		0.65	x	0.7	=	171.61	(78)
South	0.9x	0.77		X	0.75		X		97.53	X		0.65	X	0.7	=	92.26	(78)
South	0.9x	0.77		X	1.86		X	1	10.23	x		0.65	x	0.7	=	193.95	(78)
South	0.9x	0.77		X	0.75	5	X	1	10.23	x		0.65	x	0.7	=	104.28	(78)
South	0.9x	0.77		X	1.86		X	1	14.87	x		0.65	x	0.7	=	202.11	(78)
South	0.9x	0.77		X	0.75	;	X	1	14.87	x		0.65	×	0.7	=	108.66	(78)

South	0.9x	0.77	x	1.86	X	110.55	x	0.65	x	0.7	=	194.5	(78)
South	0.9x	0.77	x	0.75	x	110.55	x	0.65	x	0.7	=	104.57	(78)
South	0.9x	0.77	X	1.86	X	108.01	x	0.65	x	0.7	=	190.04	(78)
South	0.9x	0.77	x	0.75	X	108.01	x	0.65	x	0.7	=	102.17	(78)
South	0.9x	0.77	x	1.86	x	104.89	x	0.65	x	0.7	=	184.56	(78)
South	0.9x	0.77	X	0.75	X	104.89	x	0.65	x	0.7	=	99.22	(78)
South	0.9x	0.77	X	1.86	X	101.89	x	0.65	x	0.7	=	179.26	(78)
South	0.9x	0.77	X	0.75	X	101.89	x	0.65	X	0.7	=	96.38	(78)
South	0.9x	0.77	x	1.86	X	82.59	x	0.65	X	0.7	=	145.31	(78)
South	0.9x	0.77	X	0.75	X	82.59	X	0.65	X	0.7] =	78.12	(78)
South	0.9x	0.77	x	1.86	X	55.42	x	0.65	x	0.7	=	97.5	(78)
South	0.9x	0.77	X	0.75	X	55.42	X	0.65	x	0.7	=	52.42	(78)
South	0.9x	0.77	x	1.86	X	40.4	x	0.65	x	0.7	=	71.08	(78)
South	0.9x	0.77	х	0.75	X	40.4	X	0.65	X	0.7	=	38.21	(78)
West	0.9x	0.77	x	1.2	X	19.64	X	0.65	X	0.7	=	14.86	(80)
West	0.9x	0.77	X	1.2	X	38.42	X	0.65	X	0.7	=	29.07	(80)
West	0.9x	0.77	х	1.2	X	63.27	X	0.65	X	0.7	=	47.88	(80)
West	0.9x	0.77	X	1.2	X	92.28	Х	0.65	X	0.7	=	69.83	(80)
West	0.9x	0.77	X	1.2	Х	113.09	x	0.65	X	0.7	=	85.58	(80)
West	0.9x	0.77	X	1.2	X	115.77	×	0.65	X	0.7	=	87.61	(80)
West	0.9x	0.77	X	1.2	X	110.22	X	0.65	X	0.7	=	83.41	(80)
West	0.9x	0.77	X	1.2	×	94.68	Х	0.65	X	0.7	=	71.65	(80)
West	0.9x	0.77	X	1.2	X	73.59	Х	0.65	X	0.7	=	55.69	(80)
West	0.9x	0.77	X	1.2	Х	45.59	X	0.65	X	0.7	=	34.5	(80)
West	0.9x	0.77	X	1.2	X	24.49	X	0.65	X	0.7	=	18.53	(80)
West	0.9x	0.77	X	1.2	X	16.15	X	0.65	X	0.7	=	12.22	(80)
Rooflight		1	X	2.49	X	26	X	0.65	X	0.7	=	26.51	(82)
Rooflight	<u> </u>	1	X	3.35	X	26	X	0.65	X	0.7	=	35.67	(82)
Rooflight	<u> </u>	1	X	2.49	X	54	X	0.65	X	0.7	=	55.06	(82)
Rooflight		1	X	3.35	X	54	X	0.65	X	0.7	=	74.08	(82)
Rooflight	<u> </u>	1	X	2.49	X	96	X	0.65	X	0.7	=	97.89	(82)
Rooflight		1	X	3.35	X	96	X	0.65	X	0.7	=	131.7	(82)
Rooflight		1	X	2.49	X	150	X	0.65	X	0.7	=	152.95	(82)
Rooflight	<u> </u>	1	X	3.35	X	150	X	0.65	X	0.7	=	205.77	(82)
Rooflight		1	X	2.49	X	192	X	0.65	X	0.7	=	195.77	(82)
Rooflight	L	1	X	3.35	X	192	X	0.65	X	0.7	=	263.39	(82)
Rooflight	<u> </u>	1	X	2.49	X	200	X	0.65	X	0.7	=	203.93	(82)
Rooflight		1	X	3.35	X	200	X	0.65	X	0.7	=	274.36	(82)
Rooflight		1	X	2.49	X	189	X	0.65	X	0.7	=	192.71	(82)
Rooflight		1	X	3.35	X	189	X	0.65	X	0.7	=	259.27	(82)
Rooflight	IS 0.9x	1	X	2.49	X	157	X	0.65	X	0.7	=	160.09	(82)

Rooflights _{0.9x} 1	X	3.35	5	x	157	X		0.65	X	0.7	=	215.38	(82)
Rooflights _{0.9x} 1	x	2.49	9	x	115	x		0.65	x	0.7	=	117.26	(82)
Rooflights _{0.9x} 1	x	3.35	5	x	115	x		0.65	x	0.7		157.76	(82)
Rooflights 0.9x 1	x	2.49	9	x	66	x		0.65	x	0.7	=	67.3	(82)
Rooflights _{0.9x} 1	x	3.3	5	x	66	x		0.65	x	0.7		90.54	(82)
Rooflights 0.9x 1	x	2.49	9	x	33	X		0.65	x	0.7	=	33.65	(82)
Rooflights 0.9x 1	x	3.35	5	x	33	x		0.65	x	0.7	=	45.27	(82)
Rooflights _{0.9x} 1	x	2.49	9	x	21	x		0.65	x	0.7		21.41	(82)
Rooflights _{0.9x} 1	x	3.35	5	x	21	x		0.65	x	0.7		28.81	(82)
	•										<u>-</u>		_
Solar gains in watts, calcula	ated	for each	month			(83)m	n = Su	m(74)m .	(82)m				
(83)m= 282.07 518.55 794.	66	1101.29	1321.17	1345.	12 1283.27	1117	7.44	902.32	597.61	345.18	236.45		(83)
Total gains – internal and s	olar	(84)m =	(73)m -	+ (83)	m , watts		•			!		1	
(84)m= 913.12 1147.28 1409	5.2	1682.09	1870.99	1774.	22 1693.73	1534	4.56	1335.04	1151.78	933.85	851.73		(84)
7. Mean internal temperate	ıre (heating	season')									
Temperature during heatir	`	Ŭ	,		a from Tal	hle 9	Th1	(°C)				21	(85)
Utilisation factor for gains	٠.			•		oic o	,	(0)				21	(00)
	ar		May	Jui		I	ug	Sep	Oct	Nov	Dec		
(86)m= 1 0.99 0.9	_	Apr 0.96	0.9	0.81		0.7		0.91	0.98	0.99	1		(86)
									0.50	0.00			(00)
Mean internal temperature	_				-i			<u> </u>				1	(07)
(87)m= 18.45 18.69 19.1	12	19.73	20.27	20.6	8 20.87	20.	.83	20.46	19.79	19.05	18.47		(87)
Temperature during heatir	ig pe	eriods in	rest of	dwelli	ng from Ta	able 9	9, Th	2 (°C)					
(88)m= 19.83 19.84 19.8	35	19.89	19.9	19.9	19.94	19.	.94	19.92	19.9	19.88	19.87		(88)
Utilisation factor for gains	for re	est of dw	velling, I	n2,m	(s <mark>ee Ta</mark> ble	9a)							
(89)m= 1 0.99 0.9	8	0.95	0.88	0.75	0.57	0.6	63	0.87	0.97	0.99	1		(89)
Mean internal temperature	in th	ne rest c	of dwelli	na T2	(follow ste	ens 3		in Tabl	e 9c)			•	
(90)m= 17.49 17.74 18.5	$\overline{}$	18.81	19.33	19.7	`	19.		19.54	18.87	18.13	17.54		(90)
` '		<u> </u>				-		f	LA = Livin	g area ÷ (4	1 4) =	0.46	(91)
												0.10	`
Mean internal temperature	ŤТ					T `			10.0			1	(00)
(92)m= 17.94 18.18 18.0		19.24	19.77	20.1		20.		19.97	19.3	18.56	17.97		(92)
Apply adjustment to the m						 	_		•	10.40	40.57	1	(02)
(93)m= 18.54 18.78 19.3		19.84	20.37	20.7	7 20.94	20.	.91	20.57	19.9	19.16	18.57		(93)
8. Space heating requirem					-1 44 -6	T	L - OL	11	· T' /	70)		la (a	
Set Ti to the mean internathe utilisation factor for gain		•		ed at	step 11 of	rabi	ie 9b	, so tha	t II,m=(76)m an	d re-cald	culate	
	ar T	Apr	May	Jui	n Jul	А	ug	Sep	Oct	Nov	Dec		
Utilisation factor for gains,			ividy	- Oui	1 001		ug [ОСР	000	1101			
(94)m= 0.99 0.99 0.9	-	0.95	0.89	0.8	0.68	0.7	74 T	0.9	0.97	0.99	1		(94)
Useful gains, hmGm , W =											<u> </u>		
(95)m= 908.45 1135.59 1374	<u> </u>	<u> </u>		1419.	26 1153.11	1128	8.38	1197.02	1117.16	925.95	848.31		(95)
Monthly average external										<u> </u>	I	Į	•
(96)m= 4.3 4.9 6.5	- i	8.9	11.7	14.6		16	5.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean in			rature, l	_m , V	V =[(39)m	x [(9:	3)m–	 - (96)m	1	!	<u>I</u>	I	
		3651.68		1976		T		2098.63	3080.73	4054.2	4905.47		(97)
<u> </u>		-		1	!	-						•	

Space heating requirement fo	r each m	onth, kV	Vh/mon	th = 0.02	24 x [(97)m – (95	5)m] x (4 ⁻	1)m			
(98)m= 3055.53 2497.38 2257.29	1480.3	900.54	0	0	0	0	1460.89	·	3018.52		
		•		•	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	16922.8	(98)
Space heating requirement in	kWh/m²/	year							Ī	112.33	(99)
9a. Energy requirements – Indi	vidual he	eating sy	⁄stems i	ncluding	micro-C	CHP)			_		
Space heating:									г		7
Fraction of space heat from s	•		mentary	-		(004)			Į	0	(201)
Fraction of space heat from m	•	• •			(202) = 1	,	(202)]		Į	1 	(202)
Fraction of total heating from	•				(204) = (2	02) x [1 –	(203)] =		ļ	1	(204)
Efficiency of main space heat			. ovetom	. 0/					Ĺ	61	(206)
Efficiency of secondary/supple	· ·	-		1	Ι	0	0.1	NI.		0	(208)
Jan Feb Mar Space heating requirement (c	Apr alculated	May Labove)	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
3055.53 2497.38 2257.29	1480.3	900.54	0	0	0	0	1460.89	2252.34	3018.52		
(211) m = {[(98)m x (204)] } x 1	00 ÷ (206	 6)		<u>I</u>	!	!	!		<u>!</u>		(211)
5009.07 4094.07 3700.48	2426.72	1476.3	0	0	0	0	2394.91		4948.4		_
					Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	27742.29	(211)
Space heating fuel (secondar		nonth									
$= \{[(98)m \times (201)]\} \times 100 \div (200)$ $(215)m = 0 $	0	0	0	0	0	0	0	0	0		
						ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(215)
Water heating									L		_
Output from water heater (calc			207.04	00000	004.40	242.24	107.54	400.0	450.04		
458.56 409.33 442.04 Efficiency of water heater	413.1	417.03	307.84	306.32	321.42	316.24	427.54	430.9	453.21	E 1	(216)
(217)m= 59.48 59.36 59.1	58.5	57.44	<u> </u>	51	51	51	58.41	59.14	59.48	51	(217)
Fuel for water heating, kWh/mo	onth										, ,
(219) m = (64) m x $100 \div (217)$	m	700.00	222.24				700	700.00	704.00		
(219)m= 770.97 689.56 747.92	706.19	726.08	603.61	600.63	630.23	620.08 Il = Sum(2	732 19a) =	728.63	761.99	8317.87	(219)
Annual totals					. 0.0	• • • • • • • • • • • • • • • • • •		Wh/year		kWh/year	
Space heating fuel used, main	system 1	l						, , , , oa	ſ	27742.29	7
Water heating fuel used									Ī	8317.87	i i
Electricity for pumps, fans and	electric k	eep-hot							L		_
central heating pump:		•							156		(230c)
boiler with a fan-assisted flue									45		(230e)
Total electricity for the above, I	(\/\h/\/⊵ar				sum	of (230a)	(230g) =			201	(231)
-	wiii yeai				00/11	(_000)	(3)		L r		╡
Electricity for lighting	-11								L	512	(232)
12a. CO2 emissions – Individ	ualheatir	ng syste	ms incli	lding mi	cro-CHF						

Energy

kWh/year

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	5992.34	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	1796.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7789	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	104.32	(267)
Electricity for lighting	(232) x	0.519	=	265.73	(268)
Total CO2, kg/year	sum o	of (265)(271) =		8159.04	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		54.16	(273)
El rating (section 14)				46	(274)

Appendix B - Step Two - 'Be Lean' Output Document and Energy Report Figures

SAP Input

Property Details: Flat 6

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

 Basement floor
 103.39 m²
 3.1 m

 Floor 1
 110.92 m²
 2.6 m

Living area: 50.2 m² (fraction 0.234)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
D1		Manufactur <mark>e</mark> r	Solid			W <mark>ood</mark>
W1		Manufacturer	Windows	low-E, En = 0.2, hard coa	t No	
W2		SAP 2012	Windows	Single-glazed	No	
W3		SAP 2012	Windows	Single-glazed	No	
W4		SAP 2012	Windows	Single-glazed	No	
RF1		Manufacturer	Roof Windows	low-F $En = 0.2$ hard coa	t No	PVC-II

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
W1	16mm or more	0.7	0.65	1.5	1.43	2
W2		0.7	0.65	4.5	3.13	2
W3		0.7	0.85	4.5	2.5	1
W4		0.7	0.65	4.5	3.13	2
RF1	16mm or more	0.7	0.65	1.5	3.6	1

Name: D1	Type-Name:	Location: corridor	Orient:	Width: 1	Height: 2.1
W1		Basement wall	North	0.95	1.5
W2		External wall	North	1.25	2.5
W3		External wall	West	1	2.5
W4		External wall	North	1.25	2.5
RF1		flat roof	Horizontal	4.5	0.8

Overshading: More than average

Opaque Elements

Type: External Element	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
Basement wall	64.17	2.86	61.31	0.15	0	False	N/A
External wall	62.4	15.02	47.38	0.85	0	False	N/A
corridor	33.67	2.1	31.57	0.2	0.9	False	N/A

Stroma FSAP 2012 Version: 1.0.1.24 (SAP 9.92) - http://www.stroma.com

SAP Input

flat roof 7.68 3.6 4.08 0.15 0 N/A Basement floor 103.39 0.17 N/A

Internal Elements

Party Elements

party wall Basement 53.32 N/A party ff 39.78 N/A

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: No (Assumed)

Ventilation: Natural ventilation (extract fans)

Number of chimneys: 0
Number of open flues: 0
Number of fans: 3
Number of passive stacks: 0
Number of sides sheltered: 4
Pressure test: 15

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers - mains gas, heat fraction 1, efficiency 91

Piping>=1991, pre-insulated, low temp, variable flow

Main heating Control

Main heating Control: Charging system linked to use of community heating, programmer and at least two room thermosta

Control code: 2312

Secondary heating system:

Secondary heating system: None

Space cooling system:

Space cooling system: Split/multiple systems

Tested data to EN 14511: Brand/Model: TBC

EER: 3.5

Compressor control: Systems with On/Off control

Cooled area: 140 (fraction 0.653)

Water heating:

Water heating: From main heating system

Water code: 901

Fuel :heat from boilers - mains gas

Hot water cylinder Cylinder volume: 250 litres Cylinder insulation: Jacket 35 mm

Primary pipework insulation: True

Cylinderstat: True

Cylinder in heated space: True

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

SAP Input

Photovoltaics: None Assess Zero Carbon Home: No



		Hear Bataile				
		User Details:				
Assessor Name:	Ctroma FCAD 2040	Stroma N		\/avaia	4 0 4 04	
Software Name:	Stroma FSAP 2012	roperty Address: Fla	Version:	versio	n: 1.0.1.24	
Address :	г	Toperty Address. Fi	at 0			
1. Overall dwelling dimer	nsions:					
5		Area(m²)	Av. Height(ı	n)	Volume(m³))
Basement		103.39 (1a)) x 3.1	(2a) =	320.51	(3a)
Ground floor		110.92 (1b)) x 2.6	(2b) =	288.39	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1ı	1) 214.31 (4)				
Dwelling volume		(3a	a)+(3b)+(3c)+(3d)+(3e)	+(3n) =	608.9	(5)
2. Ventilation rate:						
	main secondar heating heating	ry other	total		m³ per hour	r
Number of chimneys		+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent fan	us		3	x 10 =	30	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fire	es		0	x 40 =	0	(7c)
				Air ch	anges per ho	ur
	s, flues and fans = $(6a)+(6b)+(7a)$		30	÷ (5) =	0.05	(8)
Number of storeys in the	en carried out or is intended, procee e dwelling (ns)	d to (17), otherwise conti	nue from (9) to (16)		0	(9)
Additional infiltration	c awelling (113)			[(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame or	0.35 for masonry c		[(0) 1]x0.1 =	0	(11)
	esent, use the value corresponding to	•			0	
deducting areas of opening		4 (analad) alaa ant	a. 0			٦
•	oor, enter 0.2 (unsealed) or 0	.1 (sealed), else ent	er u		0	(12)
If no draught lobby, enter	and doors draught stripped				0	(13)
Window infiltration	and doors draught stripped	0.25 - [0.2 x (1	4) ÷ 1001 =		0	(14)
Infiltration rate			1) + (12) + (13) + (15) :	=	0	(15)
	q50, expressed in cubic metre				0	(17)
•	Ty value, then $(18) = [(17) \div 20] + (18)$		ino mono or enver	po area	0.8	(18)
·	if a pressurisation test has been do		ability is being used		0.0	(10)
Number of sides sheltered		ŭ ,	, 0		4	(19)
Shelter factor		(20) = 1 - [0.0]	75 x (19)] =		0.7	(20)
Infiltration rate incorporation	ng shelter factor	$(21) = (18) \times (21)$	20) =		0.56	(21)
Infiltration rate modified fo	r monthly wind speed			'	•	_
Jan Feb I	Mar Apr May Jun	Jul Aug	Sep Oct No	ov Dec		
	·					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.71	0.7	0.69	0.62	0.6	0.53	0.53	0.52	0.56	0.6	0.63	0.66]	
Calculate effe		•	rate for t	he appli	cable ca	ise	!		!	!	!		
If mechanic			andiv N (2	3h) - (23s	a) v Emy (4	aguation (I	N5)) other	nwisa (23h	n) – (23a)			0	(23a)
If balanced wit		0		, ,	,	. `	,, .	,) = (23a)			0	(23b)
a) If balance		•	•	_		,			2h\m + (23h) √ [·	1 _ (23c)	0 1001	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	coverv (N	иV) (24b)m = (22	2b)m + (1 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h	nouse ex	tract ven	tilation o	or positiv	re input v	ventilatio	on from o	utside		ļ.		J	
,	m < 0.5 >			•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r	ventilation								0.5]				
(24d)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(24d)
Effective air	change	rate - er	iter (24a) or (2 <mark>4</mark> b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(25)
3. Heat losse	es and he	eat loss r	paramete	er:								_	
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9	ΑΧk
	area	(m²)	m) ²	A ,r	m²	W/m2	K	(W/I	()	kJ/m²-	K	kJ/K
Doo <mark>rs</mark>					$\overline{}$				(0 0 / 1	')	110/111	•	
				1	2.1	×	2	=	4.2		10/111		(26)
Windows Type					1.43		<u>2</u> /[1/(1.5)+	=	`		NO/III		(26) (27)
Windows Type	e 2					x1		0.04] =	4.2		10/111		` '
• • • • • • • • • • • • • • • • • • • •	e 2				1.43	x1	/[1/(1.5)+	0.04] = [0.04] = [4.2		10/111		(27)
Windows Type	e 2 e 3				1.43	x1 x1 x1	/[1/(1.5)+ /[1/(4.5)+	0.04] = [0.04] = [0.04] = [4.2 2.02 11.94		Kom		(27) (27)
Windows Type	e 2 e 3				1.43 3.13 2.5	x1 x1 x1 x1 x1	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{vmatrix} 0.04 \\ $	4.2 2.02 11.94 9.53		No.		(27) (27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3				1.43 3.13 2.5 3.13	x1 x1 x1 x1 x1 x1 x1	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{vmatrix} 0.04 \\ $	4.2 2.02 11.94 9.53 11.94		NO/III		(27) (27) (27) (27)
Windows Type Windows Type Windows Type Rooflights	e 2 e 3	17	2.86	3	1.43 3.13 2.5 3.13 3.6	x1 x1 x1 x1 x1 x1 9 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{vmatrix} 0.04 \\ $	4.2 2.02 11.94 9.53 11.94 5.4				(27) (27) (27) (27) (27b)
Windows Type Windows Type Windows Type Rooflights Floor	e 2 e 3 e 4		2.86	=	1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) +	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [4.2 2.02 11.94 9.53 11.94 5.4 17.576;				(27) (27) (27) (27) (27b)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	e 2 e 3 e 4	4		=	1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ 	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= = [4.2 2.02 11.94 9.53 11.94 5.4 17.5763				(27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	e 2 e 3 e 4 64.1	67	15.02	=	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= = [= = [4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27				(27) (27) (27) (27) (27b) (28) (29) (29)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4 64.1 62. 33.6 7.6	4 87 8	15.03	=	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15 0.85	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= [= = [= = [4.2 2.02 11.94 9.53 11.94 5.4 17.576; 9.2 40.27 5.35				(27) (27) (27) (27) (27b) (28) (29) (29) (29)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof	e 2 e 3 e 4 64.1 62. 33.6 7.6	4 87 8	15.03	=	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15 0.85	0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= [= = [= = [4.2 2.02 11.94 9.53 11.94 5.4 17.576; 9.2 40.27 5.35				(27) (27) (27) (27) (27b) (28) (29) (29) (29)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	e 2 e 3 e 4 64.1 62. 33.6 7.6	4 87 8	15.03	=	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57 4.08	x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x x1	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.85 0.17	= 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= 0.04] = [= = [= = [= = [4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61				(27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall	e 2 e 3 e 4 64.1 62. 33.6 7.6 elements	4 67 8 s, m ²	15.02 2.1 3.6	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57 4.08 271.3 53.32 39.78 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15 0.85 0.17 0	= 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= 0.04] = [= [4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61				(27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and	64.1 62. 33.6 7.6 elements	4 8 8, m ² ows, use e	15.02 2.1 3.6 ffective with ternal wall	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57 4.08 271.3 53.32 39.78 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15 0.85 0.17 0	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [= [= [= [= [/[(1/U-value)]	4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61				(27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and ** include the are	e 2 e 3 e 4 64.1 62. 33.6 7.6 elements d roof wind as on both	8 s, m² ows, use e sides of interest of the sides of the	15.02 2.1 3.6 ffective with ternal wall	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57 4.08 271.3 53.32 39.78 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ 0.17 0.15 0.85 0.17 0.15 0 0 g formula 1	$ \begin{vmatrix} $	4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61	3 [paragraph		(27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and ** include the are Fabric heat los	e 2 e 3 e 4 64.1 62. 7.6 elements d roof wind as on both ss, W/K: Cm = S(8 s, m² lows, use e sides of in = S (A x (A x k)	15.02 2.1 3.6 ffective with ternal walk	indow U-va	1.43 3.13 2.5 3.13 3.6 103.3 61.31 47.38 31.57 4.08 271.3 53.32 39.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ 0.17 0.15 0.85 0.17 0.15 0 0 g formula 1	= [0.04] = [4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61 0 0	3 [] [] [] [] [] [] [] [] [] []	paragraph	143.63	(27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31) (32) (32)

can be used instead Thermal bridge				usina An	nendix k	<						40.7	(36)
if details of therma	,	,			•	•						40.7	(00)
Total fabric he	at loss							(33) +	(36) =			184.33	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 151.59	149.61	147.66	138.52	136.81	128.85	128.85	127.38	131.92	136.81	140.27	143.89		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		•	
(39)m= 335.92	333.93	331.99	322.85	321.14	313.18	313.18	311.7	316.24	321.14	324.6	328.21		_
Heat loss para	meter (F	HLP), W/	m²K						Average = = (39)m ÷	` '	12 /12=	322.84	(39)
(40)m= 1.57	1.56	1.55	1.51	1.5	1.46	1.46	1.45	1.48	1.5	1.51	1.53		_
Number of day	s in mor	nth (Tabl	le 1a)						Average =	Sum(40) ₁	12 /12=	1.51	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ener	gy requi	rement:								kWh/ye	ear:	
Assumed occu								· - · ·			02		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
Ann <mark>ual av</mark> erag	e hot wa										5.94		(43)
Redu <mark>ce the</mark> annua not more that 125					_	7	to achieve	a water us	se target o	f			
Jan	Feb	Mar			Jun	Jul	Aug	Con	Oct	Nov	Doo		
Hot water usage ii			Apr ach month	Vd,m = fa			Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 116.53	112.29	108.06	103.82	99.58	95.34	95.34	99.58	103.82	108.06	112.29	116.53		
, ,						<u> </u>	<u> </u>		rotal = Su	<u>I</u> m(44) ₁₁₂ =	<u> </u>	1271.25	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 172.81	151.14	155.97	135.98	130.47	112.59	104.33	119.72	121.15	141.19	154.12	167.36		_
If instantaneous w	ıatar haatii	na at noint	of use (no	hot water	r storaga)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	=	1666.81	(45)
(46)m= 25.92	22.67	23.39	20.4	19.57	16.89	15.65	17.96	18.17	21.18	23.12	25.1		(46)
Water storage	l .	23.39	20.4	19.57	10.09	15.05	17.90	10.17	21.10	23.12	25.1		(40)
Storage volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		250		(47)
If community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)					•	
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		aclared l	nee facto	or is kno	wn (k\//h	J(day).					0	1	(48)
Temperature fa) 13 KHO	vvii (icvvi	ı, day).					0		(49)
Energy lost fro				ear			(48) x (49)) =			50		(50)
b) If manufact					or is not		(10) X (10)	, –			30		(50)
Hot water stora	-			e 2 (kWl	h/litre/da	ay)				0.	04		(51)
If community had Volume factor	_		on 4.3								70	1	(52)
Temperature factor			2b							-	.78 .6		(52) (53)
,											-	1	(- - /

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	4.91	(54)
Enter (50) or (54) in (55)	((50) (55) (44)	4.91	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$, ,	•
(56)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26		147.35 152.26	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	50), else (57)m = (56)m where ((H11) is from Append	IX H
(57)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26	152.26 147.35 152.26	147.35 152.26	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month $(59)m = (58) \div 300$	` '		
(modified by factor from Table H5 if there is solar water hea	, , , , , , , , , , , , , , , , , , , 	, , , , , , , , , , , , , , , , , , , 	l ()
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) \div 365 × (4	1)m		
(61)m= 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each month	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 348.33 309.68 331.49 305.84 305.99 282.45 279.89	295.24 291.01 316.71	323.98 342.88	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	ity) (enter '0' if no solar contribut	ion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater			
(64)m= 348.33 309.68 331.49 305.84 305.99 282.45 279.89	295.24 291.01 316.71	323.98 342.88	
	Output from water heate	r (annual) ₁₁₂	3733.44 (64)
Heat gains from water heating, kWh/month 0.25 / [0.85 × (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m	1
		(/ /	-
(65)m= 197.88 177.08 192.28 181.1 183.8 173.32 175.1		187.13 196.06	(65)
(65)m= 197.88 177.08 192.28 181.1 183.8 173.32 175.11 include (57)m in calculation of (65)m only if cylinder is in the	180.22 176.17 187.36	187.13 196.06	(65)
include (57)m in calculation of (65)m only if cylinder is in the	180.22 176.17 187.36	187.13 196.06	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	180.22 176.17 187.36	187.13 196.06	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	180.22 176.17 187.36 dwelling or hot water is fi	187.13 196.06	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	180.22 176.17 187.36 dwelling or hot water is find the Aug Sep Oct	187.13 196.06 rom community h	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	180.22 176.17 187.36 dwelling or hot water is for the state of the sta	187.13 196.06 rom community h	neating (65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	180.22 176.17 187.36 dwelling or hot water is for the state of the sta	187.13 196.06 rom community h	neating (65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85	187.13 196.06 rom community h Nov Dec 181.23 181.23	(65) neating (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct 3 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5	187.13 196.06 rom community h Nov Dec 181.23 181.23 92.03 98.1	(65) neating (66) (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct 3 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27	187.13 196.06 rom community h Nov Dec 181.23 181.23	(65) neating (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5	187.13 196.06 rom community h Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49	(65) heating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct 3 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27	187.13 196.06 rom community h Nov Dec 181.23 181.23 92.03 98.1	(65) neating (66) (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Aug Sep Oct	187.13 196.06 om community h Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49 56.14 56.14	(65) neating (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the second	Aug Sep Oct 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5	187.13 196.06 rom community h Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49	(65) heating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct 3 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14	Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49 56.14 56.14 0 0	(65) neating (66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct 3 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14	187.13 196.06 om community h Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49 56.14 56.14	(65) neating (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct Aug Sep Oct	187.13	(65) heating (66) (67) (68) (69) (70) (71)
include (57)m in calculation of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (66)m. Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Jul (66)m= 181.23	Aug Sep Oct 3 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0 0 2 -120.82 -120.82 -120.82	Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49 56.14 56.14 0 0 -120.82 -120.82 259.9 263.53	(65) neating (66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (65)m only if cylinder is in the first section of (66)m. Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Jul (66)m= 181.23	Aug Sep Oct Aug Sep Oct 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0 2 -120.82 -120.82 -120.82 3 242.24 244.68 251.83 m + (68)m + (69)m + (70)m	Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49 56.14 56.14 0 0 -120.82 -120.82 259.9 263.53 (1)m + (72)m	(65) peating (66) (67) (68) (69) (70) (71) (72)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 181.23 18	Aug Sep Oct Aug Sep Oct 181.23 181.23 181.23 also see Table 5 46.27 62.1 78.85 13a), also see Table 5 423.32 438.33 470.27 a), also see Table 5 56.14 56.14 56.14 0 0 0 2 -120.82 -120.82 -120.82 3 242.24 244.68 251.83 m + (68)m + (69)m + (70)m	Nov Dec 181.23 181.23 92.03 98.1 510.59 548.49 56.14 56.14 0 0 -120.82 -120.82 259.9 263.53	(65) heating (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.

North	Orientatio	n:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	North	0.9x	0.3	X	1.43	x	10.63	x	0.65	x	0.7	=	3.74	(74)
North	North	0.9x	1	X	3.13	x	10.63	x	0.65	x	0.7] =	27.26	(74)
North	North	0.9x	1	X	3.13	x	10.63	x	0.65	x	0.7	=	27.26	(74)
North	North	0.9x	0.3	X	1.43	x	20.32	x	0.65	x	0.7	=	7.14	(74)
North	North	0.9x	1	X	3.13	х	20.32	X	0.65	x	0.7	=	52.09	(74)
North	North	0.9x	1	X	3.13	x	20.32	x	0.65	x	0.7	=	52.09	(74)
North	North	0.9x	0.3	X	1.43	x	34.53	x	0.65	x	0.7	=	12.13	(74)
North	North	0.9x	1	X	3.13	x	34.53	X	0.65	x	0.7	=	88.52	(74)
North	North	0.9x	1	X	3.13	x	34.53	x	0.65	x	0.7	=	88.52	(74)
North	North	0.9x	0.3	X	1.43	x	55.46	X	0.65	x	0.7	=	19.49	(74)
North	North	0.9x	1	X	3.13	X	55.46	X	0.65	X	0.7	=	142.18	(74)
North	North	0.9x	1	X	3.13	X	55.46	X	0.65	x	0.7	=	142.18	(74)
North	North	0.9x	0.3	X	1.43	X	74.72	X	0.65	X	0.7	=	26.25	(74)
North	North	0.9x	1	X	3.13	X	74.72	X	0.65	X	0.7	=	191.53	(74)
North	North	0.9x	1	X	3.13	x	74.72	x	0.65	x	0.7	=	191.53	(74)
North	North	0.9x	0.3	X	1.43	X	79.99	Х	0.65	X	0.7	=	28.1	(74)
North	North	0.9x	1	X	3.13	х	79.99	х	0.65	x	0.7	-	205.04	(74)
North	North	0.9x	1	X	3.13	х	79.99	x	0.65	x	0.7	=	205.04	(74)
North	North	0.9x	0.3	X	1.43	X	74.68	x	0.65	x	0.7	=	26.24	(74)
North	North	0.9x	1	X	3.13	x	74.68	х	0.65	x	0.7	=	191.43	(74)
North	North	0.9x	1	X	3.13	x	74.68	X	0.65	x	0.7	=	191.43	(74)
North	North (0.9x	0.3	X	1.43	х	59.25	X	0.65	x	0.7	=	20.82	(74)
North	North	0.9x	1	X	3.13	X	59.25	X	0.65	x	0.7	=	151.88	(74)
North	North	0.9x	1	X	3.13	X	59.25	X	0.65	X	0.7	=	151.88	(74)
North		0.9x	0.3	X	1.43	X	41.52	X	0.65	X	0.7	=	14.59	(74)
North 0.9x 0.3 x 1.43 x 24.19 x 0.65 x 0.7 = 8.5 (74) North 0.9x 1 x 3.13 x 24.19 x 0.65 x 0.7 = 62.01 (74) North 0.9x 1 x 3.13 x 24.19 x 0.65 x 0.7 = 62.01 (74) North 0.9x 0.3 x 1.43 x 13.12 x 0.65 x 0.7 = 62.01 (74) North 0.9x 1 x 3.13 x 13.12 x 0.65 x 0.7 = 4.61 (74) North 0.9x 1 x 3.13 x 13.12 x 0.65 x 0.7 = 33.63 (74) North 0.9x 1 x 3.13 x 13.12 x 0.65 x 0.7 = 33.63 (74) North 0.9x 0.3 x 1.43 x 8.86 x 0.65 x 0.7 = 33.63 (74) North 0.9x 0.3 x 1.43 x 8.86 x 0.65 x 0.7 = 31.11 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 14.2 (80) West 0.9x 0.54 x 2.5 x 19.64 x 0.85 x 0.7 = 14.2 (80) West 0.9x 0.54 x 2.5 x 38.42 x 0.85 x 0.7 = 27.78 (80)		0.9x	1	X	3.13	X	41.52	X	0.65	X	0.7	=	106.43	(74)
North		0.9x	1	X	3.13	X	41.52	X	0.65	X	0.7	=	106.43	(74)
North 0.9x 1	North	0.9x	0.3	X	1.43	X	24.19	X	0.65	X	0.7	=	8.5	(74)
North		0.9x	1	X	3.13	x	24.19	X	0.65	X	0.7	=	62.01	(74)
North 0.9x 1 x 3.13 x 13.12 x 0.65 x 0.7 = 33.63 (74) North 0.9x 1 x 3.13 x 13.12 x 0.65 x 0.7 = 33.63 (74) North 0.9x 0.3 x 1.43 x 8.86 x 0.65 x 0.7 = 3.11 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) West 0.9x 0.54 x 2.5 x 19.64 x 0.85 x 0.7 = 27.78 (80) West 0.9x 0.54 x 2.5 x 38.42 x		0.9x	1	X	3.13	X	24.19	X	0.65	X	0.7	=	62.01	(74)
North		0.9x	0.3	X	1.43	X	13.12	X	0.65	X	0.7	=	4.61	(74)
North 0.9x 0.3 x 1.43 x 8.86 x 0.65 x 0.7 = 3.11 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) West 0.9x 0.54 x 2.5 x 19.64 x 0.85 x 0.7 = 14.2 (80) West 0.9x 0.54 x 2.5 x 38.42 x 0.85 x 0.7 = 27.78 (80)		0.9x	1	X	3.13	X	13.12	X	0.65	X	0.7	=	33.63	(74)
North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) West 0.9x 0.54 x 2.5 x 19.64 x 0.85 x 0.7 = 14.2 (80) West 0.9x 0.54 x 2.5 x 38.42 x 0.85 x 0.7 = 27.78 (80)	North	0.9x	1	X	3.13	X	13.12	X	0.65	X	0.7	=	33.63	(74)
North 0.9x 1 x 3.13 x 8.86 x 0.65 x 0.7 = 22.72 (74) West 0.9x 0.54 x 2.5 x 19.64 x 0.85 x 0.7 = 14.2 (80) West 0.9x 0.54 x 2.5 x 38.42 x 0.85 x 0.7 = 27.78 (80)	North	0.9x	0.3	X	1.43	X	8.86	X	0.65	X	0.7	=	3.11	(74)
West 0.9x 0.54 x 2.5 x 19.64 x 0.85 x 0.7 = 14.2 (80) West 0.9x 0.54 x 2.5 x 38.42 x 0.85 x 0.7 = 27.78 (80)	North	0.9x	1	X	3.13	x	8.86	X	0.65	X	0.7	=	22.72	(74)
West 0.9x 0.54 x 2.5 x 38.42 x 0.85 x 0.7 = 27.78 (80)		0.9x	1	X	3.13	x	8.86	x	0.65	x	0.7	=	22.72	(74)
	West	0.9x	0.54	X	2.5	x	19.64	x	0.85	x	0.7	=	14.2	(80)
West 0.9x 0.54 x 2.5 x 63.27 x 0.85 x 0.7 = 45.74 (80)		0.9x	0.54	X	2.5	x	38.42	x	0.85	x	0.7	=	27.78	(80)
	West	0.9x	0.54	X	2.5	X	63.27	X	0.85	X	0.7	=	45.74	(80)

		_		,		,		_				_
West 0.9x	0.54	×	2.5	X	92.28	X	0.85	X	0.7	=	66.71	(80)
West 0.9x	0.54	X	2.5	X	113.09	X	0.85	X	0.7	=	81.76	(80)
West 0.9x	0.54	X	2.5	X	115.77	X	0.85	X	0.7	=	83.69	(80)
West 0.9x	0.54	X	2.5	X	110.22	X	0.85	X	0.7	=	79.68	(80)
West 0.9x	0.54	X	2.5	X	94.68	X	0.85	X	0.7	=	68.44	(80)
West 0.9x	0.54	X	2.5	X	73.59	X	0.85	X	0.7	=	53.2	(80)
West 0.9x	0.54	X	2.5	X	45.59	x	0.85	x	0.7	=	32.96	(80)
West 0.9x	0.54	X	2.5	x	24.49	x	0.85	X	0.7	=	17.7	(80)
West 0.9x	0.54	X	2.5	x	16.15	X	0.85	X	0.7	=	11.68	(80)
Rooflights 0.9x	1	x	3.6	x	26	x	0.65	x	0.7	=	38.33	(82)
Rooflights 0.9x	1	x	3.6	x	54	x	0.65	x	0.7	=	79.61	(82)
Rooflights 0.9x	1	×	3.6	×	96	x	0.65	x	0.7	-	141.52	(82)
Rooflights 0.9x	1	×	3.6	x	150	x	0.65	x	0.7	=	221.13	(82)
Rooflights 0.9x	1	×	3.6	x	192	x	0.65	x	0.7	=	283.05	(82)
Rooflights 0.9x	1	×	3.6	x	200	x	0.65	х	0.7	=	294.84	(82)
Rooflights 0.9x	1	x	3.6	x	189	x	0.65	x	0.7	=	278.62	(82)
Rooflights 0.9x	1	×	3.6	x	157	x	0.65	х	0.7	=	231.45	(82)
Rooflights 0.9x	1	x	3.6	X	115	Х	0.65	Х	0.7		169.53	(82)
Rooflights 0.9x	1	X	3.6	x	66	x	0.65	х	0.7		97.3	(82)
Rooflights 0.9x	1	x	3.6	х	33	j x	0.65	х	0.7	=	48.65	(82)
Rooflights _{0.9x}	1	X	3.6	x	21	x	0.65	X	0.7	=	30.96	(82)
						_						
Solar gains in	watts, calcu	ılated	for each mon	th		(83)m	n = Sum(74)m .	(82)m				
(83)m= 110.78	218.71 37	6.43	591.69 774.1	2 8	16.72 767.4	624	.46 450.17	262.7	7 138.21	91.2		(83)
Total gains –	internal and	solar	(84)m = (73) r	n + (83)m , watts							
(84)m= 1162.56	1263.32 13	85.13	1544.78 1669.	22 10	661.53 1584.18	1452	2.84 1311.83	1180.2	7 1117.29	1117.87		(84)
7. Mean inte	rnal tempera	ature ((heating seas	on)								
Temperature	during heat	ing p	eriods in the I	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation fac	ctor for gains	s for l	iving area, h1	m (s	ee Table 9a)					'		
Jan	Feb I	Mar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	1	0.99 0.96		0.87 0.75	0.	8 0.95	0.99	1	1		(86)
Mean interna	al temperatu	re in I	iving area T1	(follo	w steps 3 to 7	7 in T	able 9c)		-	-		
(87)m= 19.19		9.6	20.02 20.43	Ì	20.77 20.92	20.		20.11	19.6	19.2		(87)
Temperature	during heat	ina n	erinds in rest	of dw	elling from Ta	hle (Th2 (°C)				l	
(88)m= 19.64	 	9.65	19.68 19.69		19.72 19.72	19.		19.69	19.68	19.66		(88)
` '	 		ļ	!		Q-\						
$\begin{array}{c c} \text{Utilisation factors} \\ \text{(89)m=} & 1 \end{array}$.99	0.98 0.93	_	m (see Table 0.79 0.58	9a) 0.6	5 0.9	0.99	1	1		(89)
	 	!	ļ .	!						'		(00)
	 			Ť	T2 (follow ste	-			1		I	(00)
(90)m= 17.26	17.45	7.86	18.5 19.08	3 '	19.54 19.68	19.		18.63		17.29		(90)
							f	LA = Li\	ring area ÷ (4	+) =	0.23	(91)
Mean interna	al tomporatu	ro (fo	r the whole du	مزالص	α) – fl Δ \checkmark T1	 /1	_ fl Δ\ √ T2					

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

(92)m= 17.71	17.89	18.27	18.85	19.4	19.83	19.97	19.95	19.65	18.97	18.29	17.74		(92)
Apply adjust	ment to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate	<u>!</u>			
(93)m= 17.71	17.89	18.27	18.85	19.4	19.83	19.97	19.95	19.65	18.97	18.29	17.74		(93)
8. Space hea	ating req	uirement									•		
Set Ti to the the utilisation					ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	1:										
(94)m= 1	0.99	0.99	0.97	0.92	0.8	0.62	0.69	0.9	0.98	0.99	1		(94)
Useful gains			ŕ								1		
` '	1256.63					982.23	995.75	1183.56	1157.1	1110.8	1114.62		(95)
Monthly ave	 		. 		ì		<u> </u>		<u> </u>				
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	1							- 			1,,,,,,,,		(07)
(97)m= 4504.22		3906.8	3213.34			1056.37	<u> </u>	1753.97	<u> </u>	3632.58	4442.43		(97)
Space heating (98)m= 2489.23	Ť	1886.82		10ntn, K	vvn/mon	$\ln = 0.02$	24 X [(97)m - (95 0	ŕ	1)m 1815.68	2475.89		
(98)m= 2489.23	2071	1000.02	1231.33	090.41					<u> </u>	<u> </u>	<u> </u>	12000 45	(98)
							1013	al per year	(kvvn/year	r) = Sum(9	18)15,912 =	13800.45	= ' '
Space heating	ng requir	ement in	kWh/m²	/year								64.39	(99)
8c. Space co	poling red	uiremer	nt										
Calculated for	or June,	July and	August.	See Tal	ble 10b								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rat	1								r e				(400)
(100)m= 0	0	0	0	0	2943.87	2317.52	2368.95	0	0	0	0		(100)
Utilisation fa					0.55	0.04	0.50		0				(101)
(101)m= 0	0	0	(4.00)	0	0.55	0.64	0.59	0	0	0	0		(101)
Useful loss, (102)m= 0	nmLm (v	Vatts) = 0	(100)m x	(101)m	1	1493.61	1400 22	0	0	0	0		(102)
							l		U	U			(102)
Gains (solar (103)m= 0	gains ca	0 0	0 арріі	0		1625.29	1487	0	0	0	0		(103)
Space coolir					ļ.						ļ	v (11)m	(100)
set (104)m to					iwening,	COMMINA	Jus (KVI	/// = 0.0.	27 X [(10) <i>)</i>	102)111] 2	X (4 1)111	
(104)m= 0	0	0	0	0	0	0	0	0	0	0	0		
	•	•			•	•		Total	= Sum(104)	=	0	(104)
Cooled fraction	n							f C =	cooled	area ÷ (4	4) =	0.65	(105)
Intermittency	factor (Ta	able 10b)		,						,	1	
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
0				(404)	(405)	(400)	_	Tota	l = Sum((104)	=	0	(106)
Space cooling	' 			<u> </u>			T	1 0					
(107)m= 0	0	0	0	0	0	0	0	0 Total	0 - Sum/	0	0		(407)
									= Sum(107)	=	0	(107)
Space cooling	g require	ment in k	‹Wh/m²/չ	/ear				(107)	(4) =			0	(108)
9b. Energy re				Ĭ									
9b. Energy re This part is us Fraction of sp	sed for sp	ace hea	iting, spa	ace cool	ing or wa	ater heat				unity scł	neme.	0	(301)

				_
Fraction of space heat from community	system 1 - (301) =		1	(302)
The community scheme may obtain heat from set includes boilers, heat pumps, geothermal and was Fraction of heat from Community boilers	ste heat from power stations. See App		the latter	(303a)
Fraction of total space heat from Comm		(302) x (303a) =	1	(304a)
Factor for control and charging method	•		1	(305)
Distribution loss factor (Table 12c) for call	. , , , , , , , , , , , , , , , , , , ,	during dyotom	1.05	(306)
Space heating	online in the control of the control		kWh/year	
Annual space heating requirement			13800.45	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	14490.47	(307a)
Efficiency of secondary/supplementary	heating system in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from second	dary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating				_
Annual water heating requirement			3733.44	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	3920.11	(310a)
Electricity used for heat distribution	0.0	11 × [(307a)(307e) + (310a)(310e)] =	184.11	(313)
Cooling System Energy Efficiency Ratio			4.38	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra		e	0	_](330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	 ☐(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	0	 ☐(331)
Energy for lighting (calculated in Appen			674.28	☐ (332)
10b. Fuel costs – Community heating	·			
	Fuel	Fuel Price	Fuel Cost	
	kWh/year	(Table 12)	£/year	
Space heating from CHP	(307a) x	4.24 x 0.01 =	614.4	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	166.21	(342a)
		Fuel Price		
Pumps and fans	(331)	13.19 x 0.01 =	0	(349)
Energy for lighting	(332)	13.19 x 0.01 =	88.94	(350)
Additional standing charges (Table 12)			120	(351)
Total energy cost	= (340a)(342e) + (345)(354) =		989.55	(355)
11b. SAP rating - Community heating	scheme			
Energy cost deflator (Table 12)			0.42	(356)

 $[(355) \times (356)] \div [(4) + 45.0] =$ Energy cost factor (ECF) (357)1.6 SAP rating (section12) (358)77.64 12b. CO2 Emissions – Community heating scheme **Emission factor Emissions Energy** kWh/year ka CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)0 4369.98 Electrical energy for heat distribution [(313) x 0.52 95.55 (372)Total CO2 associated with community systems (363)...(366) + (368)...(372)4465.54 (373)CO2 associated with space heating (secondary) (374)(309) x0 0 CO2 associated with water from immersion heater or instantaneous heater (312) x (375)0.22 0 Total CO2 associated with space and water heating (373) + (374) + (375) =(376)4465.54 CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 (378)CO2 associated with electricity for lighting (332))) x (379)0.52 349.95 sum of (376)...(382) =Total CO2, kg/year 4815.49 (383)**Dwelling CO2 Emission Rate** $(383) \div (4) =$ (384)22.47 El rating (section 14) (385)75.12 13b. Primary Energy – Community heating scheme P.Energy **Energy Primary** kWh/year factor kWh/year Energy from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) (367a) 91 Energy associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)0 24682.32 Electrical energy for heat distribution [(313) x 565.2 (372)Total Energy associated with community systems (363)...(366) + (368)...(372)(373)25247.53 if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) (373)25247.53 Energy associated with space heating (secondary) (309) x 0 0 (374)Energy associated with water from immersion heater or instantaneous heater(312) x 1.22 (375)0 Total Energy associated with space and water heating (373) + (374) + (375) =25247.53 (376)Energy associated with space cooling (315) x(377)3.07 0 Energy associated with electricity for pumps and fans within dwelling (378)(331)) x3.07 0 Energy associated with electricity for lighting (332))) x (379)3.07 2070.05 sum of (376)...(382) =Total Primary Energy, kWh/year (383)27317.57

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.1.24 Property Address: Flat 6 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) **Basement** 103.39 (1a) x (2a) =320.51 (3a) 3.1 Ground floor (2b) (1b) x (3b) 110.92 2.6 288.39 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)214.31 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 608.9 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)3 30 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c) 0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.05 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)15 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.8 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.7 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.56 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4

4.3

4.5

4.7

4.9

4.4

4.3

3.8

3.8

3.7

5

(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 rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.71	0.7	0.69	0.62	0.6	0.53	0.53	0.52	0.56	0.6	0.63	0.66]	
Calculate effe		•	rate for t	he appli	cable ca	ise	!	!	!	!	!		(co.).
If mechanica		-	andiv N (2	13h) - (23a	a) v Emy (aguation (N5N othe	rwica (23h	n) = (23a)			0	(23a)
If balanced with		0		, ,	,	. `	,, .	,) = (23a)			0	(23b)
a) If balance		•	•	_		,		,	2h\m + (23h) √ [·	1 _ (23c)	0 ÷ 1001	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	coverv (ľ	л ИV) (24b)m = (22	2b)m + (1 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h	nouse ex	tract ven	tilation o	or positiv	e input	ventilatio	on from o	outside		!		J	
if (22b)r	n < 0.5 >	< (23b), t	hen (24	c) = (23b); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r		on or when (24d)							0.5]				
(24d)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (2 <mark>4</mark>	d) in box	(25)					
(25)m= 0.75	0.74	0.73	0.69	0.68	0.64	0.64	0.63	0.66	0.68	0.7	0.72		(25)
3. Heat losse	es and he	eat loss r	paramet	er.					_				
ELEMENT	Gros		Openin		NIat Au				_			_	A 3/ I
			Opcilli	ıyə 🔻	Net Ar	ea	U-val	ue	A X U		k-value	9	AXk
	area	(m²)	m	_	A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		kJ/K
Doors		(m²)		_		m² x	W/m2 2	= =		<) 			
Windows Type	e 1	(m²)		_	A ,r	m ² x	W/m2	= =	(W/I	<) 			kJ/K
Windows Type	e 1 e 2	(m²)		_	A ,r	m ² x	W/m2 2	0.04] =	4.2	<) 			kJ/K (26)
Windows Type	e 1 e 2	(m²)		_	A ,r 2.1 1.43	m ² x x1 x1	W/m2 2 /[1/(1.5)+	0.04] = 0.04] =	4.2 2.02	<) 			kJ/K (26) (27)
Windows Type	e 1 e 2 e 3	(m²)		_	A ,r 2.1 1.43 3.13	x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	4.2 2.02 11.94	K)			kJ/K (26) (27) (27)
Windows Type Windows Type Windows Type	e 1 e 2 e 3	(m²)		_	A ,r 2.1 1.43 3.13 2.5	x1 x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 2.02 11.94 9.53	<) 			kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	e 1 e 2 e 3	(m²)		_	A ,r 2.1 1.43 3.13 2.5 3.13	x1 x1 x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 2.02 11.94 9.53 11.94				kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Rooflights	e 1 e 2 e 3			ņ ²	A ,r 2.1 1.43 3.13 2.5 3.13 3.6	x1 x1 x1 x1 9 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 2.02 11.94 9.53 11.94 5.4				kJ/K (26) (27) (27) (27) (27) (27b)
Windows Type Windows Type Windows Type Windows Type Rooflights	e 1 e 2 e 3 e 4	17	m	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 y1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.576;				(26) (27) (27) (27) (27) (27b) (28)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	e 1 e 2 e 3 e 4	17 4	2.86	3	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3	x1 x1 x1 x1 y2 x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	9.53 11.94 9.53 11.94 5.4 17.5763				(26) (27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	e 1 e 2 e 3 e 4	17 4 67	2.86 15.00	5 2	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.17 0.15 0.85	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3	64. 62. 33.6 7.6	17 4 67 8	2.86 15.00 2.1	5 2	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.5	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ 0.17 0.15 0.85 0.17	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.576; 9.2 40.27 5.35				(26) (27) (27) (27) (27) (27b) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof	64. 62. 33.6 7.6	17 4 67 8	2.86 15.00 2.1	5 2	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.57 4.08	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ 0.17 0.15 0.85 0.17	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.576; 9.2 40.27 5.35				(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	64. 62. 33.6 7.6	17 4 67 8	2.86 15.00 2.1	5 2	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 47.38 271.3	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.17 0.15 0.85 0.17	0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61				(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall	64.7 62. 33.6 7.6 elements	17 4 67 8 s, m ²	2.86 15.0 2.1 3.6	indow U-ve	A ,r 2.1 1.43 3.13 3.13 2.5 3.13 3.6 103.3 47.38 47.38 271.3 53.32 39.78 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.17 0.15 0.85 0.17 0.15	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61		kJ/m²-		(26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and	64.7 62. 33.6 7.6 81 roof wind as on both	17 4 67 8 s, m ² lows, use e	2.86 15.0 2.1 3.6	indow U-ve	A ,r 2.1 1.43 3.13 3.13 2.5 3.13 3.6 103.3 47.38 47.38 271.3 53.32 39.78 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.17 0.15 0.85 0.17 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61		kJ/m²-		(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and ** include the area	64.76 62. 33.6 7.6 8 roof wind as on both	17 4 67 8 5, m ² dows, use e	2.86 15.0 2.1 3.6	indow U-ve	A ,r 2.1 1.43 3.13 3.13 2.5 3.13 3.6 103.3 47.38 47.38 271.3 53.32 39.78 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.17 0.15 0.85 0.17 0.15 0 0 g formula 1	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.5763 9.2 40.27 5.35 0.61	3 [kJ/m²-l	K	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall *for windows and ** include the area Fabric heat los	64.76 62. 33.6 7.6 8 elements	17 4 67 8 8 6, m ² lows, use e 1 sides of in = S (A x (A x k)	2.86 15.0; 2.1 3.6 affective winternal wall	indow U-va	A ,r 2.1 1.43 3.13 2.5 3.13 3.6 103.3 61.3 47.38 31.5 4.08 271.3 53.32 39.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2 /[1/(1.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ 0.17 0.15 0.85 0.17 0.15 0 0 g formula 1	0.04] = 0.04]	(W/I 4.2 2.02 11.94 9.53 11.94 5.4 17.576; 9.2 40.27 5.35 0.61 0 0	3 [] [] [] [] [] [] [] [] [] []	kJ/m²-l	143.63	(26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (31) (32) (32)

aan ha waad inata	ad of a do	tailed solo	ulation										
can be used instead Thermal bridge				usina An	pendix I	<						40.7	(36)
if details of therma	`	,		Ο.	•	•						40.7	(00)
Total fabric he	at loss							(33) +	(36) =			184.33	(37)
Ventilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 151.59	149.61	147.66	138.52	136.81	128.85	128.85	127.38	131.92	136.81	140.27	143.89		(38)
Heat transfer of	coefficier	nt, W/K		_				(39)m	= (37) + (3	38)m			
(39)m= 335.92	333.93	331.99	322.85	321.14	313.18	313.18	311.7	316.24	321.14	324.6	328.21		_
Heat loss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷		12 /12=	322.84	(39)
(40)m= 1.57	1.56	1.55	1.51	1.5	1.46	1.46	1.45	1.48	1.5	1.51	1.53		
Number of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.51	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
				•	•	•	•	•		•	•		
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu											.02		(42)
if <mark>TFA > 13.9</mark> if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)	_		
Annual average		ater usad	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		10:	5.94		(43)
Redu <mark>ce the</mark> annua	al averag <mark>e</mark>	hot water	usage by	5% if the a	welling is	designed i			se target o				(- /
not more that 125													
Jan Hot water usage ii	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 116.53	112.29	108.06	103.82	99.58	95.34	95.34	99.58	103.82	108.06	112.29	116.53		
(44)111= 110.33	112.29	100.00	103.02	99.00	90.04	90.04	99.50		Total = Su	<u> </u>	110.55	1271.25	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,	c, 1d)	121 112	`
(45)m= 172.81	151.14	155.97	135.98	130.47	112.59	104.33	119.72	121.15	141.19	154.12	167.36		
			. ,		, ,				Total = Su	m(45) ₁₁₂ =	=	1666.81	(45)
If instantaneous w												ı	(15)
(46)m= 25.92 Water storage	22.67	23.39	20.4	19.57	16.89	15.65	17.96	18.17	21.18	23.12	25.1		(46)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		250		(47)
If community h	` ,		•			•							
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage			(- /1 \ \ /1	. / .1 \						l	
a) If manufact				or is kno	wn (kvvr	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost fro b) If manufact		storage	, kvvn/ye	ear			(48) x (49)			1 2	50		(50)
Hot water stora	urer's de	eclared o	ylinder l	oss fact	or is not	known:	(40) X (40)) =			30		, ,
			-				(40) X (43)) =			04		(51)
If community h	age loss leating s	factor fr ee secti	om Tabl				(40) X (43)) =		0.	04		(51)
	age loss eating s from Ta	factor fr ee section ble 2a	om Tabl on 4.3				(40) X (40)) =		0.			

	54) 55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	55)
	56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	,
(57)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26 147.35 152.26 147.35 152.26 (5	57)
Primary circuit loss (annual) from Table 3	58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 23.26 (50)m=	59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 348.33 309.68 331.49 305.84 305.99 282.45 279.85 295.24 291.01 316.71 323.98 342.88	62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 (6	63)
Output from water heater	
(64)m= 348.33 309.68 331.49 305.84 305.99 282.45 279.85 295.24 291.01 316.71 323.98 342.88	
Output from water heater (annual) ₁₁₂ 3733.44	64)
Heat gains from water heating, kWh/month 0.25° [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 197.88 177.08 192.28 181.1 183.8 173.32 175.11 180.22 176.17 187.36 187.13 196.06	65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 151.03 151.03 151.03 151.03 151.03 151.03 151.03 151.03 151.03 151.03 151.03 (66)m= 151.03 151.03 151.03 151.03 151.03 151.03 151.03 151.03 151.03	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	66)
	66)
(67)m= 39.2 34.82 28.32 21.44 16.02 13.53 14.62 19 25.5 32.38 37.8 40.29	66) 67)
(67)m= 39.2 34.82 28.32 21.44 16.02 13.53 14.62 19 25.5 32.38 37.8 40.29 (67)m= 39.2 34.82 28.32 21.44 16.02 13.53 14.62 19 25.5 32.38 37.8 40.29	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	67) 68)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	67) 68)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	67) 68) 69) 70)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	67) 68) 69) 70)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	668) 669) 770)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 384.45 388.44 378.39 356.98 329.97 304.58 287.61 283.62 293.68 315.08 342.1 367.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 38.1 38.1 38.1 38.1 38.1 38.1 38.1 38.1	668) 669) 770)

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

Orientat	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.3	x	1.43	x	10.63	x	0.65	x	0.7	=	3.74	(74)
North	0.9x	0.77	x	3.13	x	10.63	х	0.65	x	0.7	=	20.99	(74)
North	0.9x	0.77	x	3.13	x	10.63	х	0.65	x	0.7	=	20.99	(74)
North	0.9x	0.3	x	1.43	x	20.32	x	0.65	x	0.7	=	7.14	(74)
North	0.9x	0.77	х	3.13	x	20.32	х	0.65	x	0.7	=	40.11	(74)
North	0.9x	0.77	x	3.13	x	20.32	x	0.65	x	0.7	=	40.11	(74)
North	0.9x	0.3	x	1.43	x	34.53	x	0.65	x	0.7	=	12.13	(74)
North	0.9x	0.77	x	3.13	x	34.53	x	0.65	x	0.7	=	68.16	(74)
North	0.9x	0.77	x	3.13	x	34.53	x	0.65	x	0.7	=	68.16	(74)
North	0.9x	0.3	x	1.43	x	55.46	x	0.65	x	0.7	=	19.49	(74)
North	0.9x	0.77	x	3.13	x	55.46	x	0.65	x	0.7	=	109.48	(74)
North	0.9x	0.77	x	3.13	x	55.46	x	0.65	x	0.7	=	109.48	(74)
North	0.9x	0.3	x	1.43	x	74.72	x	0.65	x	0.7	=	26.25	(74)
North	0.9x	0.77	x	3.13	x	74.72	x	0.65	x	0.7	=	147.48	(74)
North	0.9x	0.77	x	3.13	x	74.72	x	0.65	x	0.7	=	147.48	(74)
North	0.9x	0.3	X	1.43	X	79.99	X	0.65	X	0.7	=	28.1	(74)
North	0.9x	0.77	x	3.13	x	79.99	x	0.65	x	0.7	=	157.88	(74)
North	0.9x	0.77	x	3.13	х	79.99	x	0.65	x	0.7	=	157.88	(74)
North	0.9x	0.3	x	1.43	x	74.68	x	0.65	x	0.7	=	26.24	(74)
North	0.9x	0.77	x	3.13	x	74.68	х	0.65	x	0.7	=	147.4	(74)
North	0.9x	0.77	x	3.13	x	74.68	x	0.65	x	0.7	=	147.4	(74)
North	0.9x	0.3	x	1.43	x	59.25	x	0.65	x	0.7	=	20.82	(74)
North	0.9x	0.77	x	3.13	x	59.25	X	0.65	x	0.7	=	116.94	(74)
North	0.9x	0.77	x	3.13	x	59.25	X	0.65	x	0.7	=	116.94	(74)
North	0.9x	0.3	x	1.43	x	41.52	X	0.65	X	0.7	=	14.59	(74)
North	0.9x	0.77	x	3.13	x	41.52	X	0.65	x	0.7	=	81.95	(74)
North	0.9x	0.77	x	3.13	x	41.52	X	0.65	X	0.7	=	81.95	(74)
North	0.9x	0.3	x	1.43	x	24.19	X	0.65	X	0.7	=	8.5	(74)
North	0.9x	0.77	x	3.13	x	24.19	x	0.65	X	0.7	=	47.75	(74)
North	0.9x	0.77	x	3.13	X	24.19	X	0.65	X	0.7	=	47.75	(74)
North	0.9x	0.3	x	1.43	x	13.12	x	0.65	X	0.7	=	4.61	(74)
North	0.9x	0.77	x	3.13	x	13.12	x	0.65	x	0.7	=	25.89	(74)
North	0.9x	0.77	x	3.13	x	13.12	X	0.65	X	0.7	=	25.89	(74)
North	0.9x	0.3	x	1.43	x	8.86	X	0.65	X	0.7	=	3.11	(74)
North	0.9x	0.77	x	3.13	x	8.86	x	0.65	x	0.7	=	17.5	(74)
North	0.9x	0.77	X	3.13	x	8.86	x	0.65	x	0.7	=	17.5	(74)
West	0.9x	0.54	x	2.5	x	19.64	x	0.85	x	0.7	=	14.2	(80)
West	0.9x	0.54	x	2.5	x	38.42	x	0.85	x	0.7	=	27.78	(80)
West	0.9x	0.54	X	2.5	×	63.27	×	0.85	X	0.7	=	45.74	(80)

		_				,						_
West 0.9x	0.54	X	2.5	X	92.28	X	0.85	X	0.7	=	66.71	(80)
West 0.9x	0.54	X	2.5	X	113.09	Х	0.85	X	0.7	=	81.76	(80)
West 0.9x	0.54	X	2.5	X	115.77	X	0.85	X	0.7	=	83.69	(80)
West 0.9x	0.54	X	2.5	X	110.22	X	0.85	X	0.7	=	79.68	(80)
West 0.9x	0.54	X	2.5	X	94.68	X	0.85	x	0.7	=	68.44	(80)
West 0.9x	0.54	X	2.5	X	73.59	X	0.85	x	0.7	=	53.2	(80)
West 0.9x	0.54	X	2.5	X	45.59	X	0.85	x	0.7	=	32.96	(80)
West 0.9x	0.54	X	2.5	X	24.49	x	0.85	x	0.7	=	17.7	(80)
West 0.9x	0.54	X	2.5	x	16.15	X	0.85	x	0.7	=	11.68	(80)
Rooflights 0.9x	1	X	3.6	X	26	X	0.65	x	0.7	=	38.33	(82)
Rooflights 0.9x	1	X	3.6	X	54	х	0.65	x	0.7	=	79.61	(82)
Rooflights 0.9x	1	X	3.6	x	96	x	0.65	x	0.7	=	141.52	(82)
Rooflights 0.9x	1	X	3.6	x	150	x	0.65	x	0.7	=	221.13	(82)
Rooflights 0.9x	1	X	3.6	x	192	x	0.65	x	0.7	=	283.05	(82)
Rooflights 0.9x	1	X	3.6	x	200	x	0.65	x	0.7	=	294.84	(82)
Rooflights 0.9x	1	X	3.6	x	189	x	0.65	x	0.7	=	278.62	(82)
Rooflights 0.9x	1	X	3.6	x	157	x	0.65	x	0.7	<u> </u>	231.45	(82)
Rooflights 0.9x	1	X	3.6	X	115	Х	0.65	Х	0.7		169.53	(82)
Rooflights 0.9x	1	X	3.6	x	66	x	0.65	x	0.7	_	97.3	(82)
Rooflights _{0.9x}	1	X	3.6	х	33	×	0.65	x	0.7	<u> </u>	48.65	(82)
Rooflights _{0.9x}	1	X	3.6	x	21	x	0.65	х	0.7	=	30.96	(82)
Solar gains in	watts, calcu	lated	for each mon	th		(83)m	ı = Sum(74)m .	(82)m				
(83)m= 98.24	194.74 33	5.71	526 .29 686.0	1 7	722.4 679.34	554	401.22	234.25	122.75	80.74		(83)
Total gains –	internal and	solar	(84)m = (73) n	n + (83)m , watts							
(84)m= 856.17	949.83 106	89.16	1224.55 1347.3	36 13	349.54 1285.24	1167	7.77 1033.39	901.85	830.85	820.36		(84)
7. Mean inte	rnal tempera	ture ((heating seaso	on)								
Temperature	during heat	ing p	eriods in the li	ving	area from Tal	ole 9	Th1 (°C)				21	(85)
Utilisation fac	ctor for gains	for l	iving area, h1,	m (s	ee Table 9a)							
Jan	Feb N	Иar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	1	0.99 0.98		0.93 0.83	0.8	0.98	1	1	1		(86)
Mean interna	al temperatur	e in I	iving area T1	(follo	w steps 3 to 7	7 in T	able 9c)					
(87)m= 19.06	19.19 19	9.47	19.89 20.31	7	20.69 20.87	20.	83 20.51	19.99	19.49	19.08		(87)
Temperature	during heat	ina p	eriods in rest of	of dv	elling from Ta	able 9). Th2 (°C)		•		•	
(88)m= 19.64		0.65	19.68 19.69		19.72 19.72	19.		19.69	19.68	19.66		(88)
Litilication for	eter for gains	forr	est of dwelling	<u> </u>	m (soo Tablo	02/						
(89)m= 1		1	0.99 0.96		0.87 0.68	0.7	6 0.95	0.99	1	1		(89)
	<u> </u>								1 .		l	` '
	 	re in t	the rest of dwe	Ť	12 (follow ste	ps 3		e 9c) 18.47	17.72	17.11		(90)
(90)m= 17.07	17.27	.00	10.32 10.92		19.00	L 19.			ring area ÷ (4	L	0.23	(90)
								_, . — LIV	ig aroa - (•	., –	0.23	(31)
Moan interna	d temperatur	o (fo	r the whole du	االمر	α) – fl Δ \sim T1	1 1	_ fl Δ\ ∨ T2					

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

92)m= 17.54	17.72	18.1	18.69	19.25	19.74	19.94	19.91	19.53	18.83	18.13	17.57	1	(92)
Apply adjust		Į		l		l					1	l	, ,
93)m= 17.54	17.72	18.1	18.69	19.25	19.74	19.94	19.91	19.53	18.83	18.13	17.57		(93
8. Space he	ating reg	uirement		l	l	l							
Set Ti to the the utilisation	mean in	ternal ter	mperatui		ned at sto	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		l	<u> </u>		1	1	19	1				l	
4)m= 1	1	1	0.99	0.96	0.87	0.72	0.78	0.95	0.99	1	1		(94
 Useful gains	, hmGm	, W = (94	4)m x (84	4)m						<u> </u>		l	
5)m= 855.14	1	1064.49	ŕ	1290.32	1174.94	920.36	910.81	979.03	894.49	829.15	819.57		(95
Monthly ave	rage exte	ernal tem	perature	e from Ta	able 8					l		J	
6)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96
Heat loss ra	te for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			J	
7)m= 4447.73	3 4281.14	3849.89	3159.16	2424.52	1611.07	1046.56	1094.24	1716.98	2641.59	3581.33	4388.45		(97
Space heati	ng requir	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		J	
98)m= 2672.89	2239.9	2072.34	1404.39	843.84	0	0	0	0	1299.84	1981.57	2655.24		
	•	•				•	Tota	l per year	(kWh/yeaı	r) = Sum(9	08) _{15,912} =	15170	(98
Space heati	na requir	ement in	kWh/m²	²/vear								70.79	(99
				/your								70.70	
Bc. Space co				0 7	1.401				-	_			
Calculated for Jan	or June, . Feb	July and Mar		See Tal	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Heat loss ra			Apr										
00)m= 0	0	0	0	0	2943.87			0	0	0	0	1	(10
Utilisation fa												i	`
01)m= 0	0	0	0	0	0.54	0.63	0.58	0	0	0	0		(10
Useful loss,	hml m (V	Vatts) = ((100)m x	(101)m									,
02)m= 0	0	0	0	0	1	1467.47	1377.81	0	0	0	0		(10
Gains (solar	gains ca	I Iculated	l for appli	cable w				10)		<u> </u>			
03)m= 0	0	0	0	0	1664.94	<u> </u>	1457.86	0	0	0	0		(10
Space coolii	na reauire	ement fo	r month.	whole o	l	continu	ous (kW	/h) = 0.0	L 24 x [(1()3)m – (102)m 1	x (41)m	
set (1 <u>04)m t</u>	•					_			• • • • • • • • • • • • • • • • • • • •	, ,			
04)m= 0	0	0	0	0	0	0	0	0	0	0	0		
								Total	= Sum(104)	=	0	(10
ooled fraction								f C =	cooled	area ÷ (4) =	0.65	(10
ntermittency	- `	1	i								1	 	
06)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
				(404)	(405)	(400)		Tota	l = Sum((104)	=	0	(10
pace cooling		1	1	`	- ` 	- ` 	i e					I	
07)m= 0	0	0	0	0	0	0	0	0	0	0	0		— ,
									= Sum(1 . /)	=	0	(10
pace cooling	g require	ment in k	(Wh/m²/y	year				(107)	÷ (4) =			0	(10
b. Energy re	quiremer	nts – Cor	nmunity	heating	scheme)							
his part is us			• .		_		.	•		unity scl	neme.		
raction of sp	ace heat	from se	condary,	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(30

					7
Fraction of space heat from community system 1 – (301) =				1	(302)
The community scheme may obtain heat from several sources. The procedure includes boilers, heat pumps, geothermal and waste heat from power stations.	•	four other heat sour	es; the	latter	
Fraction of heat from Community boilers				1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =		1	(304a)
Factor for control and charging method (Table 4c(3)) for comm	unity heating system			1	(305)
Distribution loss factor (Table 12c) for community heating syste	em			1.05	(306)
Space heating				kWh/year	_
Annual space heating requirement				15170	╛
Space heat from Community boilers	(98) x (304a) x	$(305) \times (306) =$		15928.5	(307a)
Efficiency of secondary/supplementary heating system in % (free	om Table 4a or Apper	ndix E)		0	(308
Space heating requirement from secondary/supplementary sys	stem (98) x (301) x 1	100 ÷ (308) =		0	(309)
Water heating					_
Annual water heating requirement				3733.44	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =		3920.11	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	⁷ e) + (310a)(310e)] =	198.49	(313)
Cooling System Energy Efficiency Ratio				4.38	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)) =		0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			_		_ _
mechanical ventilation - balanced, extract or positive input from	outside			0	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L)				692.31	(332)
12b. CO2 Emissions – Community heating scheme			_		
	Energy kWh/year	Emission fac kg CO2/kWh		nissions ı CO2/year	
CO2 from other sources of space and water heating (not CHP)	•	3		, ,	
	ng two fuels repeat (363) to	(366) for the secon	d fuel	91	(367a)
CO2 associated with heat source 1 [(307b)-	+(310b)] x 100 ÷ (367b) x	0	=	4711.32	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	103.01	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	4814.33	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantan	eous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			4814.33	(376)
CO2 associated with electricity for pumps and fans within dwel	ling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting					7(070)
CO2 decodated with electricity for lighting	(332))) x	0.52	=	359.31	(379)

Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14) sum of (376)...(382) =

(383) ÷ (4) =

5173.64 (383) 24.14 (384) 73.26 (385)

Property Details: Flat 4

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015 Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

 Basement floor
 55.52 m²
 3.1 m

 Floor 1
 83.55 m²
 2.6 m

 Floor 2
 85.82 m²
 3.28 m

Living area: 41.96 m² (fraction 0.187)

Front of dwelling faces: Unspecified

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			Wood
W1	SAP 2012	Windows	Single-glazed	No	
W2	Manufacturer	Windows	Single-glazed	No	
W3	SAP 2012	Windows	Single-glazed	No	
W3	Manufacturer	Windows	low-E, $En = 0.2$, hard coat	No	
RF1	Manufacturer	Roof Windows	low-E, $En = 0.2$, hard coat	No	PVC-U

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
W1		0.7	0.85	4.5	1.5	3
W2		0.7	0.85	1.5	5	2
W3		0.7	0.85	4.5	1.8	2
W3	16mm or more	0.7	0.85	1.5	6.25	1

W3 RF1	16mm or more 16mm or more	0.7 0.7	0.85 0.65	1.5 1.5	6.25 3.45	1 1
Name:	Type-Name:	Location:	Orient:		Width:	Height:
D1	Type Name.	corridor	Orient.		1	2.1
W1		External wall GF	South		1	1.5
1440		E	N		•	0.5

W2 External wall GF 2 2.5 North W3 External wall North 1 1.8 W3 External wall GF West 2.5 2.5 RF1 flat roof Horizontal 2.3 1.5

Overshading: More than average

Opaque Elements

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa:

External Elements							
Basement wall	76.26	0	76.26	0.15	0	False	N/A
External wall GF	80.4	20.75	59.65	0.8	0	False	N/A
corridor GF	13.266	0	13.27	0.2	0.9	False	N/A
Coprridor FF	9.84	0	9.84	0.2	0.9	False	N/A
External FF	69.864	0	69.86	0.8	0	False	N/A
flat roof 1	6	0	6	0.15	0		N/A
Flat roof 2	28.23	0	28.23	0.15	0		N/A
flat roof 3	12.9	0	12.9	0.15	0		N/A
Basement floor	55.52			0.17			N/A
ground floor	28.03			0.2			N/A
Internal Elements							
Party Elements							
party wall Basement	24.18						N/A
party GF	43.684						N/A
Party wall FF	67.24						N/A

т	hermal	hride	100.
	псппа	Diluc	CS.

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Pressure test: No (Assumed)

Natural ventilation (extract fans) Ventilation: 1 (main: 0, secondary: 0, other: 1) Number of chimneys: Number of open flues:

Number of fans: Number of passive stacks: 0 Number of sides sheltered: 4 Pressure test: 15

Community heating schemes Main heating system:

Heat source: Community boilers heat from boilers - mains gas, heat fraction 1, efficiency 91

Piping>=1991, pre-insulated, low temp, variable flow

Charging system linked to use of community heating, programmer and at least two room thermosta Main heating Control:

Control code: 2312

Secondary heating system: None

Split/multiple systems Space cooling system:

> Tested data to EN 14511: Brand/Model: TBC

EER: 3.5

Compressor control: Systems with On/Off control

Cooled area: 140 (fraction 0.623)

Water heating: From main heating system

Water code: 901

Fuel :heat from boilers - mains gas

Hot water cylinder

Cylinder volume: 250 litres Cylinder insulation: Jacket 35 mm Primary pipework insulation: True

Cylinderstat: True

Cylinder in heated space: True

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

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



		User Details:				
Assessor Name: Software Name:	Stroma FSAP 2012	Stroma Nu Software V		Versio	n: 1.0.1.24	
	P	roperty Address: Flat 4	ļ.			
Address :						
1. Overall dwelling dime	nsions:					
Basement		Area(m²) 55.52 (1a) x	Av. Height(m)	(2a) =	Volume(m ³	(3a)
Ground floor		83.55 (1b) x	2.6	(2b) =	217.23	(3b)
First floor		85.82 (1c) x	3.28	(2c) =	281.49	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1r) 224.89 (4)				
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+	(3n) =	670.83	(5)
2. Ventilation rate:						
	main secondar heating heating	y other	total		m³ per hou	ır
Number of chimneys		+ 1 =	1	< 40 =	40	(6a)
Number of open flues	0 + 0	+ 0 =	0)	(20 =	0	(6b)
Number of intermittent fai	ns		4	(10 =	40	(7a)
Number of passive vents			0	< 10 =	0	(7b)
Number of flueless gas fin	res		0	< 40 =	0	(7c)
				Air ch	anges per ho	
Infiltration due to chimne	/s, flu <mark>es a</mark> nd fans = (6a)+(6b)+(7	a)+(7b)+(7c) -				_
	een carried out or is intended, proceed		80 from (9) to (16)	÷ (5) =	0.12	(8)
Number of storeys in th	ne dwelling (ns)				0	(9)
Additional infiltration			[(9	9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame or	0.35 for masonry cons	struction		0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding to	the greater wall area (after				
deducting areas of opening	loor, enter 0.2 (unsealed) or 0.	1 (sealed), else enter	0		0	(12)
If no draught lobby, ent	,	(),	-		0	(13)
•	and doors draught stripped				0	(14)
Window infiltration	and doors araagiit sanppou	0.25 - [0.2 x (14) -	÷ 100] =		0	(15)
Infiltration rate			(12) + (13) + (15) =		0	(16)
	q50, expressed in cubic metre			e area		(17)
•	ity value, then $(18) = [(17) \div 20] + (8)$		metre of envelop	o aroa	0.87	(18)
•	s if a pressurisation test has been don		tv is beina used		0.07	(10)
Number of sides sheltere			,,g		4	(19)
Shelter factor		$(20) = 1 - [0.075 \times$	(19)] =		0.7	(20)
Infiltration rate incorporat	ing shelter factor	(21) = (18) x (20)	=		0.61	(21)
Infiltration rate modified for	or monthly wind speed					
	Mar Apr May Jun	Jul Aug Ser	Oct Nov	Dec		
	eed from Table 7	1 0 1	1 1	1	ı	

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (22a)m = (22)m ÷	4									
(22a)m= 1.27 1.25 1.23		.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltration rate (allowi	na for shelt	er and wind	sneed) =	(21a) x (′22a\m	•		•	•	
0.78 0.76 0.75		.65 0.58	0.58	0.56	0.61	0.65	0.68	0.71		
Calculate effective air change	rate for the	applicable ca	ase	<u> </u>						
If mechanical ventilation:	and the NL (OOk)	(00-)	(° (A	(15\) - (b) (OO -)				0 (23a)
If exhaust air heat pump using Appe) = (23a)				0 (23b)
If balanced with heat recovery: effic	-	_				26\m . /	22h) [4	1 (22.5)		0 (23c)
a) If balanced mechanical ve		n neat recov	T 0	$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$	0	0	23D) x [0	- 100j	(24a)
b) If balanced mechanical ve								Ů		(= 12)
(24b)m = 0 0 0	0	0 0	0	0	0	0	0	0		(24b)
c) If whole house extract ver	ntilation or p	ositive input	ventilatio	on from o	utside					
if $(22b)m < 0.5 \times (23b)$, t	-	•				.5 × (23b)			
(24c)m = 0 0 0	0	0 0	0	0	0	0	0	0		(24c)
d) If natural ventilation or wh										
if $(22b)m = 1$, then $(24d)$		<u> </u>	 			_	0.70	0.70		(244)
(24d)m= 0.8 0.79 0.78		0.67	0.67	0.66	0.69	0.71	0.73	0.76		(24d)
Effective air change rate - er (25)m= 0.8 0.79 0.78		.71 0.67	0.67 or (24	0.66	0.69	0.71	0.73	0.76		(25)
		.71 0.07	0.07	0.00	0.03	0.71	0.73	0.70		(20)
3. Heat losses and heat loss										
ELEMENT Gross	Openings	Net A		U-valu W/m2l		A X U	()	k-value kJ/m²-l		A X k kJ/K
		Net Ai A ,i		U-valu W/m2l		A X U (W/F	<)	k-value kJ/m²-l		A X k kJ/K (26)
ELEMENT Gross area (m²)	Openings	Α,	m ² x	W/m2l	K =	(W/I	<) 			kJ/K
ELEMENT Gross area (m²) Doors	Openings	A ,,	x x1	W/m2l	0.04] =	4.2	<) 			kJ/K (26)
ELEMENT Gross area (m²) Doors Windows Type 1	Openings	A , l	x x1.	W/m2l 2 /[1/(4.5)+	0.04] =	4.2 5.72	<) 			kJ/K (26) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2	Openings	A , , 2.1 1.5 5	x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (0.04] = 0.04] = 0.04] =	4.2 5.72 7.08	<) 			kJ/K (26) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3	Openings	A , , 2.1 1.5 5 1.8	x1. x1. x1. x1. x1.	W/m2I 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(4.5)+ (0.04] = 0.04] = 0.04] = 0.04] =	(W/H 4.2 5.72 7.08 6.86	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Openings	A , 1 2.1 1.5 5 1.8 6.25	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2I 2 /[1/(4.5)+ (/[1/(4.5)+ (/[1/(4.5)+ (/[1/(4.5)+ (/[1/(1.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/N 4.2 5.72 7.08 6.86 8.84				(26) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights	Openings	A , , , , , , , , , , , , , , , , , , ,	x1. x1. x1. x1. x1. x2. x2. x	W/m2l 2 /[1/(4.5)+ + + + + + + + + + + + + + + + + + +	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175				kJ/K (26) (27) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1	Openings	A , l 2.1 1.5 5 1.8 6.25 3.45	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17	0.04] = 0.04]	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384				kJ/K (26) (27) (27) (27) (27) (27b)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2	Openings m ²	A , (2.1 1.5 5 1.8 6.25 3.45 55.55	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ + // /[1/(1.5)+ + // /[1/(1.5)+ + // /[1/(1.5)+ - // 0.17 0.2	0.04] = 0.04]	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606				kJ/K (26) (27) (27) (27) (27) (27b) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 76.26	Openings m ²	A , 1 2.1 1.5 5 1.8 6.25 3.45 55.55 28.03	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (0.17 0.2 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606				kJ/K (26) (27) (27) (27) (27) (27b) (28) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 76.26 Walls Type2	Openings m² 0 20.75	A , 1 2.1 1.5 5 1.8 6.25 3.45 55.5 28.00 76.20	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(4.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (0.17 0.2 0.15 0.8	0.04] = 0.04]	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72				kJ/K (26) (27) (27) (27) (27b) (28) (28) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type3	0 20.75	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17 0.2 0.15 0.8 0.17	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 9.84	0 20.75 0	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17 0.2 0.15 0.8 0.17	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = =	4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 Walls Type5 69.86	0 20.75 0 0	A , , , , , , , , , , , , , , , , , , ,	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25 1.67 55.89				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type4 Walls Type4 Son Son Son Sarea (m²) Walls Type 1 Walls Type 1 Walls Type 1 Walls Type 1 Walls Type 3 Walls Type 3 Walls Type 4 Walls Type 5 Son Son Sarea (m²) Son Sarea (m²) Son Sarea (m²) Son Sarea (m²) Windows Type 4 Son Son Son Son Sarea (m²) Walls Type 1 Son Son Son Sarea (m²) Walls Type 1 Son Son Son Son Sarea (m²) Walls Type 1 Son Son Son Son Son Son Son Son Son Son	0 20.75 0 0 0	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(4.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (0.17 0.2 0.15 0.8 0.17 0.17 0.8 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25 1.67 55.89				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Valls Type2 Walls Type2 Walls Type3 Walls Type3 Valls Type4 Valls Type4 Floor Type 1 Society 13.27 Walls Type5 Floor Type 1 Floor Type 2 Roof Type1 Floor Type 2 Floor Type 2 Floor Type 2 Floor Type 3 Floor Type 3 Floor Type 4 Floor Type 4 Floor Type 5 Floor Type 69.86 Floor Type 1 Floor Type 2 Floor Type 3 Floor Type 3 Floor Type 4 Floor Type	0 20.75 0 0 0 0	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17 0.2 0.15 0.8 0.17 0.17 0.8 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25 1.67 55.89 0.9				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (30) (30)

Party wall (32)24.18 0 Party wall (32)43.68 0 0 Party wall 67.24 O O (32)* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss, $W/K = S(A \times U)$ 204.05 (33)Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)58.42 if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) =(37)262.47 Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =177.31 174.72 172.19 160.27 158.05 147.67 147.67 145.75 151.67 158.05 162.55 167.27 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m 437.19 (39)m =439.77 434.65 422.74 420.51 410.14 410.14 408.22 414.14 420.51 425.02 429.73 Average = $Sum(39)_{1...12}/12=$ (39)422.73 Heat loss parameter (HLP), W/m²K (40)m = (39)m \div (4)1.96 1.82 1.82 (40)m =1.94 1.93 1.88 1.87 1.82 1.84 1.87 1.89 1.91 (40)Average = Sum(40)₁ ₂ /12= 1.88 Number of days in month (Table 1a) Jul Jan Feb Mar May Jun Sep Oct Apr Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)3.03 if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)106.26 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =116.89 112.64 108.39 104.14 99.89 95.64 99.89 104.14 108.39 112.64 116.89 (44)1275.17 Total = Sum(44)_{1 12} = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 173.35 151.61 156.45 136.39 130.87 112.93 104.65 120.09 121.52 141.62 154.59 (45)m =167.88 1671.95 (45)Total = $Sum(45)_{1...12}$ = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 22.74 23.47 20.46 19.63 16.94 15.7 18.01 18.23 21.24 23.19 25.18 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:				
a) If manufacturer's declared loss factor is known (kWh/day):		0	(48	8)
Temperature factor from Table 2b		0	(49	9)
Energy lost from water storage, kWh/year	$(48) \times (49) =$	250	(50	0)
b) If manufacturer's declared cylinder loss factor is not known	:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.04	(51	1)
If community heating see section 4.3 Volume factor from Table 2a		0.78	(52	2)
Temperature factor from Table 2b		0.78	(52	•
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	4.91] (54	•
Enter (50) or (54) in (55)	(,(,()	4.91	(55	•
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$,	,
(56)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26	5 152.26 147.35 152.26	147.35 152.26	(56	6)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m where	(H11) is from Append	lix H	
(57)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26	3 152.26 147.35 152.26	147.35 152.26	(57	7)
Primary circuit loss (annual) from Table 3		0	(58	8)
Primary circuit loss calculated for each month (59) m = $(58) \div (59)$ m	365 × (41)m		•	
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	ostat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59	9)
Combi loss calculated for each month (61)m = (60) \div 365 × (4	1)m/			
(61)m =	0 0 0	0 0	(61	1)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m	
(62)m= 348.87 310.15 331.97 306.25 306.4 282.79 280.1	7 295.61 291.38 317.14	324.45 343.4	(62	2)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	, ,	ti <mark>on to water heating</mark>)		
(add additional lines if FGHRS and/or WWHRS applies, see A	'i '' '		1	
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63	3)
Output from water heater		, ,	1	
(64)m= 348.87 310.15 331.97 306.25 306.4 282.79 280.1		324.45 343.4	1.	
	Output from water heate		3738.58 (64	4)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)		, ` ` , ` ` ` ` 	1	=\
(65)m= 198.06 177.24 192.44 181.24 183.93 173.44 175.2		187.29 196.24	(65	5)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is f	rom community h	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts	T . T . T .	1 1 -	1	
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	,,,	_,
(66)m= 182.06 182.06 182.06 182.06 182.06 182.06 182.06 182.06		182.06 182.06	(66	٥)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	 	T	1 (07	7 \
(67)m= 94.19 83.66 68.04 51.51 38.5 32.51 35.12		90.81 96.81	(67	7)
Appliances gains (calculated in Appendix L, equation L13 or L		1	1	۵)
(68)m= 588.25 594.35 578.97 546.22 504.89 466.03 440.06		523.44 562.29	(68	8)
Cooking gains (calculated in Appendix L, equation L15 or L15	i 	1	1	0)
(69)m= 56.24 56.24 56.24 56.24 56.24 56.24 56.24 56.24	56.24 56.24 56.24	56.24 56.24	(69	ਤ)
Pumps and fans gains (Table 5a)				
(70)m= 0 0 0 0 0 0 0		0 0	(70	2)

	g. evaporation (negat	ive value	es) (Tab	le :	5)							ı	
(71)m= -12	1.37 -121.37 -1	21.37	-121.37	-121.37	-12	21.37 -121.37	' -12 [°]	1.37	-121.37	-121.37	7 -121.37	-121.37		(71)
Water hea	ting gains (Tab	le 5)											•	
(72)m= 26	6.2 263.75 2	58.65	251.72	247.22	24	40.89 235.5	24	2.4	244.85	252.03	3 260.12	263.76		(72)
Total inte	rnal gains =	_				(66)m + (67)	m + (6	8)m +	+ (69)m + (1	70)m +	(71)m + (72)	m		
(73)m= 106	55.57 1058.68 10	22.58	966.38	907.54	85	56.35 827.63	838	3.96	872.41	928.86	991.3	1039.78		(73)
6. Solar o	gains:													
Solar gains	are calculated using	ng solar	flux from	Table 6a	and	associated equ	uations	to co	nvert to the	e applica		ion.		
Orientation	n: Access Fac Table 6d	tor	Area m²			Flux Table 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
North ().9x 1	x	5		x	10.63	X		0.85	x	0.7	=	56.94	(74)
North (0.9x 0.54	x	1.8	3	x	10.63	X		0.85	x	0.7	=	11.07	(74)
North ().9x 1	x	5		x	20.32	= x		0.85	x	0.7		108.82	(74)
North (0.9x 0.54	×	1.8	3	x	20.32	i x		0.85	×	0.7	-	21.15	(74)
North ().9x 1	×	5		x	34.53	T x		0.85	x	0.7	=	184.91	(74)
North (0.9x 0.54	x	1.8	3	x	34.53	X		0.85	x	0.7	=	35.95	(74)
North ().9x 1	×	5		X	55.46	X		0.85	Х	0.7		297.01	(74)
North (0.54	×	1.8		x	55.46	x		0.85	х	0.7		57.74	(74)
North ().9x	×	5		х	74.72	= x		0.85	х	0.7	=	400.1	(74)
North (0.54	×	1.8	3	x	74.72	\ x		0.85	х	0.7	=	77.78	(74)
North ().9x 1	x	5		x	79.99	= x		0.85	х	0.7	=	428.32	(74)
North (0.54	×	1.8	3	x	79.99	X		0.85	х	0.7	=	83.27	(74)
North ().9x 1	×	5		х	74.68	X		0.85	х	0.7	=	399.89	(74)
North (0.9x 0.54	x	1.8	3	X	74.68	X		0.85	X	0.7	=	77.74	(74)
North ().9x 1	x	5		x	59.25	X		0.85	x	0.7	=	317.26	(74)
North (0.54	x	1.8	3	x	59.25	X		0.85	x	0.7	=	61.68	(74)
North ().9x 1	x	5		x	41.52	X		0.85	x	0.7	-	222.32	(74)
North (0.54	x	1.8	3	x	41.52	X		0.85	x	0.7	=	43.22	(74)
North ().9x 1	×	5		x	24.19	X		0.85	x	0.7	=	129.53	(74)
North (0.54	x	1.8	3	x	24.19	X		0.85	x	0.7	=	25.18	(74)
North ().9x 1	x	5		x	13.12	X		0.85	x	0.7	=	70.25	(74)
North (0.54	x	1.8	3	x	13.12	= x		0.85	x	0.7	<u> </u>	13.66	(74)
North ().9x 1	x	5		x	8.86	X		0.85	x	0.7	=	47.47	(74)
North (0.54	x	1.8	3	x	8.86	X		0.85	x	0.7	=	9.23	(74)
South (0.3	×	1.5	5	x	46.75	X		0.85	x	0.7	=	33.8	(78)
South (0.9x 0.3	x	1.5	5	x	76.57	X		0.85	x	0.7	=	55.35	(78)
South (0.9x 0.3	X	1.5	5	x	97.53	X		0.85	x	0.7	=	70.51	(78)
South (0.9x 0.3	X	1.5	5	x	110.23	X		0.85	x	0.7	=	79.69	(78)
South (0.9x	X	1.5	5	x	114.87	X		0.85	x	0.7	=	83.04	(78)
South (0.9x	X	1.5	5	x	110.55	X		0.85	x	0.7	=	79.92	(78)

South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 78.08 South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 75.83 South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 73.66 South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 59.7 South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73	(78) (78) (78) (78) (78) (78) (78) (80) (80)
South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 73.66 South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 59.7 South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 63.27 x 0.85 x <td>(78) (78) (78) (78) (78) (80) (80)</td>	(78) (78) (78) (78) (78) (80) (80)
South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 59.7 South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(78) (78) (78) (80) (80)
South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 40.06 South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(78) (78) (80) (80)
South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 29.2 West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(78) (80) (80)
West 0.9x 1 x 6.25 x 19.64 x 0.85 x 0.7 = 65.73 West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(80)
West 0.9x 1 x 6.25 x 38.42 x 0.85 x 0.7 = 128.59 West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(80)
West 0.9x 1 x 6.25 x 63.27 x 0.85 x 0.7 = 211.77 West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	= ` `
West 0.9x 1 x 6.25 x 92.28 x 0.85 x 0.7 = 308.85	(80)
5.25	
	(80)
West 0.9x 1 x 6.25 x 113.09 x 0.85 x 0.7 = 378.51	(80)
West 0.9x 1 x 6.25 x 115.77 x 0.85 x 0.7 = 387.47	(80)
West 0.9x 1 x 6.25 x 110.22 x 0.85 x 0.7 = 368.89	(80)
West 0.9x 1 x 6.25 x 94.68 x 0.85 x 0.7 = 316.87	(80)
West 0.9x 1 x 6.25 x 73.59 x 0.85 x 0.7 = 246.29	(80)
West 0.9x 1 x 6.25 x 45.59 x 0.85 x 0.7 = 152.58	(80)
West 0.9x 1 x 6.25 x 24.49 x 0.85 x 0.7 = 81.96	(80)
West 0.9x 1 x 6.25 x 16.15 x 0.85 x 0.7 = 54.06	(80)
Rooflights 0.9x 1 x 3.45 x 26 x 0.65 x 0.7 = 36.73	(82)
Rooflights 0.9x 1 x 3.45 x 54 x 0.65 x 0.7 = 76.29	(82)
Rooflights 0.9x 1 x 3.45 x 96 x 0.65 x 0.7 = 135.63	(82)
Rooflights 0.9x 1 x 3.45 x 150 x 0.65 x 0.7 = 211.92	(82)
Rooflights 0.9x 1 x 3.45 x 192 x 0.65 x 0.7 = 271.25	(82)
Rooflights 0.9x 1 x 3.45 x 200 x 0.65 x 0.7 = 282.55	(82)
Rooflights 0.9x 1 x 3.45 x 189 x 0.65 x 0.7 = 267.01	(82)
Rooflights 0.9x 1 x 3.45 x 157 x 0.65 x 0.7 = 221.81	(82)
Rooflights 0.9x 1 x 3.45 x 115 x 0.65 x 0.7 = 162.47	(82)
Rooflights 0.9x 1 x 3.45 x 66 x 0.65 x 0.7 = 93.24	(82)
Rooflights 0.9x 1 x 3.45 x 33 x 0.65 x 0.7 = 46.62	(82)
Rooflights 0.9x 1 x 3.45 x 21 x 0.65 x 0.7 = 29.67	(82)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 204.28 390.2 638.76 955.21 1210.69 1261.53 1191.62 993.44 747.96 460.24 252.55 169.63	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 1269.84 1448.89 1661.34 1921.59 2118.22 2117.88 2019.25 1832.4 1620.37 1389.1 1243.85 1209.41	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 1 1 0.99 0.98 0.94 0.85 0.73 0.79 0.94 0.99 1 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 18.79 18.96 19.3 19.81 20.29 20.7 20.88 20.84 20.5 19.89 19.28 18.79	(87)
200 1000 1000 1000 1000	V /

· · · · · ·	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Th	12 (°C)					
= m(88)	19.36	19.37	19.38	19.41	19.42	19.45	19.45	19.46	19.44	19.42	19.41	19.39		(88)
l Itilisa	ation fac	tor for a	ains for i	rest of d	velling	h2 m (se	e Table	اــــــــــــــــــــــــــــــــــــ						
(89)m=	1	0.99	0.99	0.97	0.91	0.75	0.54	0.61	0.88	0.98	0.99	1		(89)
Moon	internel	tompor	oturo in :	the rest	of dwalli	na T2 /f/	ollow oto	ps 3 to 7	7 in Tabl	L 00)				
(90)m=	16.5	16.76	17.26	18.02	18.71	19.24	19.41	19.39	19.02	18.15	17.25	16.53		(90)
(30)111=	10.0	10.70	17.20	10.02	10.71	10.24	10.41	10.00		LA = Livin			0.19	(91)
											9 · · (' l	0.19	(01)
								+ (1 – fL						(2.2)
(92)m=	16.93	17.17	17.64	18.35	19	19.51	19.69	19.66	19.29	18.48	17.63	16.96		(92)
					· ·			4e, whe		. 				(00)
(93)m=	16.93	17.17	17.64	18.35	19	19.51	19.69	19.66	19.29	18.48	17.63	16.96		(93)
			uirement								>			
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9k	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
ine ui						lun	Jul	Διια	Sep	Oct	Nov	Dec		
 Itilies	Jan	Feb	Mar ains, hm	Apr	May	Jun	Jui	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.99	0.98	0.96	0.89	0.76	0.58	_0.64	0.87	0.97	0.99	1		(94)
			W = (94			0.70	0.50	0.04	0.07	0.57	0.55			(01)
	1263.03			1839.42		1609.09	1162.62	1178.7	1415.56	13/18 03	1232.98	1204.06		(95)
							1102.02	1178.7	1415.50	1346.93	1232.90	1204.00		(50)
(96)m=	4.3	4.9	rnal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
											7.1	4.2		(50)
	_	5364.52		_		2014.54		x [(93)m-		3311.89	4476.92	E 101 G1		(97)
												3461.01		(31)
)m] x (41		2400.5		
(96)111=	3192.96	2639.83	2388.53	1552.85	874.39	0	0	0	0	1460.44	2335.57	3182.5		(00)
								Tota	l per year	(kWh/year) = Sum(9)	8) _{15,912} =	17627.09	(98)
Space	e heating	g require	ement in	kWh/m²	/year								78.38	(99)
8c. Sp	pace co	oling req	uiremen	nt										
Calcu	lated for	r June, J	July and	August.	See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	loss rate	Lm (ca	lculated	using 25	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	3855.31	3035.03	3102.46	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.53	0.62	0.57	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	/4 0 4 \ 100									
			/	, 100/111 /	. (101)m									
(102)m=	0	0	0	0	0	2056	1879.84	1756.23	0	0	0	0		(102)
			0	0	0					0	0	0		(102)
	(solar (0	0	0	eather re		e Table		0	0	0		(102) (103)
Gains (103)m=	(solar o	gains cal	0 Iculated	0 for appli	0 cable we	eather re 2195.83	egion, se 2094.34	e Table 1901.23	10)	0	0	0	c (41)m	
Gains (103)m=	s (solar o o e cooling	gains cal	0 Iculated	o for appli o r month,	cable we	eather re 2195.83	egion, se 2094.34	e Table 1901.23	10)	0	0		c (41)m	
Gains (103)m=	(solar o o e coolino 04)m to	gains cal	0 lculated 0 ement fo	o for appli o r month,	cable we	eather re 2195.83	egion, se 2094.34	e Table 1901.23	10)	0	0	0	c (41)m	
Gains (103)m= Space set (1	(solar o o e coolino 04)m to	gains cal 0 g require zero if (0 lculated 0 ement for 104)m <	0 for appli 0 r month, 3 × (98	o cable we o whole o	eather re 2195.83 Iwelling,	egion, se 2094.34 continuo	e Table 1901.23 ous (kW	$ \begin{array}{c} 10) \\ 0 \\ 7h) = 0.0 \end{array} $	0 24 x [(10	0 03)m – (1	0 102)m]>	c (41)m 0	
Gains (103)m= <i>Space</i> set (1 (104)m=	(solar o o e coolino 04)m to	gains cal 0 g require zero if (0 lculated 0 ement for 104)m <	0 for appli 0 r month, 3 × (98	o cable we o whole o	eather re 2195.83 Iwelling,	egion, se 2094.34 continuo	e Table 1901.23 ous (kW	$ \begin{array}{c} 10) \\ 0 \\ (h) = 0.0 \end{array} $ $ \begin{array}{c} 0 \\ \text{Total} \end{array} $	0 24 x [(10	0)3)m – (1 0 104)	0 102)m] > 0 =	. ,	(103)
Gains (103)m= Space set (1 (104)m= Cooled Intermi	o (solar o o o o o o o o o o o o o o o o o o o	gains cal 0 g require zero if (0	0 lculated 0 ement for 104)m <	0 for appli 0 r month, 3 x (98	o cable we o whole o	eather re 2195.83 Iwelling,	egion, se 2094.34 continuo	e Table 1901.23 ous (kW	$ \begin{array}{c} 10) \\ 0 \\ (h) = 0.0 \end{array} $ $ \begin{array}{c} 0 \\ \text{Total} \end{array} $	0 24 x [(10 0 = Sum(0)3)m – (1 0 104)	0 102)m] > 0 =	0	(103)
Gains (103)m= Space set (1 (104)m=	o (solar o o o o o o o o o o o o o o o o o o o	gains cal 0 g require zero if (0	0 lculated 0 ement fo 104)m <	0 for appli 0 r month, 3 x (98	o cable we o whole o	eather re 2195.83 Iwelling,	egion, se 2094.34 continuo	e Table 1901.23 ous (kW	$ \begin{array}{c} 10) \\ 0 \\ (h) = 0.0 \end{array} $ $ \begin{array}{c} 0 \\ \text{Total} \end{array} $	0 24 x [(10 0 = Sum(0)3)m – (1 0 104)	0 102)m] > 0 =	0	(103)
Gains (103)m= Space set (1 (104)m= Cooled Intermi	o (solar o o o o o o o o o o o o o o o o o o o	gains cal 0 g require zero if (0 actor (Ta	0	0 for appli 0 r month, 3 × (98 0	o cable we o whole o)m	2195.83 Iwelling,	egion, se 2094.34 continuo 0	e Table 1901.23 ous (kW 0	10) 0 /h) = 0.0 0 Total f C =	0 24 x [(10 0 = Sum(cooled a	0 03)m - (1 0 104) area ÷ (4	0 102)m] > 0 = 4) =	0 0.62	(103)

Space cooling	require	ment for	month =	= (104)m	× (105)	× (106)ı	m		•		, ,		
(107)m= 0	0	0	0	0	0	0	0	0 Tota	0 I = Sum	(107)	0		(107)
Space cooling	require	ment in l	k\/\/h/m²/	vear					ii = Sum i) ÷ (4) =	. ,	= [0	(107)
9b. Energy red	•				scheme)		(107) · (·) –				
This part is us	ed for sp	oace hea	ating, sp	ace cool	ing or w	ater hea				nunity so	heme.		_
Fraction of spa			•	• •	•		(Table 1	1) '0' if r	none			0	(301)
Fraction of spa			-	•	,	,					l	1	(302)
The community so includes boilers, h		-							up to four	other hea	t sources; th	he latter	
Fraction of hea		-									[1	(303a
Fraction of tota	al space	heat fro	m Comr	nunity b	oilers				(3	302) x (30	3a) =	1	(304a
Factor for cont	trol and	charging	g method	l (Table	4c(3)) fc	r comm	unity hea	ating sys	stem		[1	(305)
Distribution los	ss factor	(Table	12c) for	commun	ity heati	ng syste	m				[1.05	(306)
Space heating	_										ı	kWh/year	_
Annual space	_										ļ	17627.09	_
Space heat fro		•							04a) x (30		=	18508.44	(307a
Efficiency of so						`						0	(308
Spa <mark>ce he</mark> ating	require	ment fro	m secor	ndary/s <mark>u</mark>	pplemen	itary sys	tem	(98) x (3	01) x 100	÷ (308) =		0	(309)
Wat<mark>er he</mark>atin ç Ann <mark>ual w</mark> ater l		requirem	nent									3738.58	7
If DHW from c	7										l	0700.00	
Wat <mark>er he</mark> at fro	m Comr	nunity b	oilers					(64) x (3	03a) x (30	5) x (306)	=	3925.51	(310a
Electricity use	d for hea	at distrib	ution				0.0	1 × [(307a)	(3 <mark>07e) -</mark>	+ (310a)	.(310e)] =	224.34	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								4.38	(314)
Space cooling	(if there	is a fixe	ed coolin	g syster	n, if not	enter 0)		= (107) -	÷ (314) =			0	(315)
Electricity for p							outside	:			[0	(330a
warm air heati			·	·		•					[0	(330b
pump for solar	water h	eating									[0	_ ☐(330g
Total electricity	y for the	above,	kWh/yea	ar				=(330a)	+ (330b) +	+ (330g) =	[0	<u> </u> (331)
Energy for ligh	iting (ca	lculated	in Appei	ndix L)							[665.36	<u> </u> (332)
10b. Fuel cos	sts – Co	mmunity	heating	scheme	;						L		
					F u kV	ı el /h/year			Fuel F (Table			Fuel Cost £/year	
Space heating	from C	HP			(30	7a) x			4.:	24	x 0.01 =	784.76	(340a
Water heating	from Cl	НP			(31	0a) x			4.:	24	x 0.01 =	166.44	(342a
									Fuel F	Price	•		_
Pumps and fai	ns				(33	1)			13	.19	x 0.01 =	0	(349)

Energy for lighting (332) 13.19	x 0.01 =	87.76	(350)
Additional standing charges (Table 12)		120	(351)
Total energy cost = (340a)(342e) + (345)(354) =		1158.96	(355)
11b. SAP rating - Community heating scheme			
Energy cost deflator (Table 12)		0.42	(356)
Energy cost factor (ECF) $[(355) \times (356)] \div [(4) + 45.0] =$		1.8	(357)
SAP rating (section12)		74.84	(358)
12b. CO2 Emissions – Community heating scheme			
	ission factor CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for			(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0 :	5324.98	(367)
Electrical energy for heat distribution [(313) x	0.52	116.43	(372)
Total CO2 associated with community systems (363)(366) + (368)(372)		5441.42	(373)
CO2 associated with space heating (secondary) (309) x	0	0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =		5441.42	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x	0.52	0	(378)
CO2 associated with electricity for lighting (332))) x	0.52	345.32	(379)
Total CO2, kg/year sum of (376)(382) =		5786.74	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		25.73	(384)
El rating (section 14)		71.27	(385)
13b. Primary Energy – Community heating scheme	nary	D Energy	
Energy Prin kWh/year fact	•	P.Energy kWh/year	
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for	or the second fue	91	(367a)
Energy associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0 :	30076.29	(367)
Electrical energy for heat distribution [(313) x	-	688.72	(372)
Total Energy associated with community systems (363)(366) + (368)(372)	:	30765.01	(373)
if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C)		30765.01	(373)
Energy associated with space heating (secondary) (309) x	0 :	0	(374)
Energy associated with water from immersion heater or instantaneous heater(312) x	1.22	0	(375)
Total Energy associated with space and water heating (373) + (374) + (375) =		30765.01	(376)
Energy associated with space cooling (315) x	3.07	0	(377)
Energy associated with electricity for pumps and fans within dwelling (331)) x			_

Energy associated with electricity for lighting

(332))) x

3.07

2042.66 (379)

(383)

32807.68

Total Primary Energy, kWh/year

sum of (376)...(382) =

			User D	otoilo						
			User L							
Assessor Name:				Strom						
Software Name:	Stroma FSAP 20			Softwa		rsion:		Versio	on: 1.0.1.24	
		Pr	operty i	Address	: Flat 4					
Address :										
Overall dwelling dimens	nsions:		A	- (··· 2)		A., 11a	: l- 4 (\		\/ a / /	,
Basement				a(m²)	(10) v		ight(m)	(2a) =	Volume(m³	<u>-</u>
2000					(1a) x	3	3.1	_	172.11	(3a)
Ground floor			8	3.55	(1b) x	2	2.6	(2b) =	217.23	(3b)
First floor			8	5.82	(1c) x	3	.28	(2c) =	281.49	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n) 2:	24.89	(4)			_		_
Dwelling volume					(3a)+(3b)+(3c)+(3d	l)+(3e)+	(3n) =	670.83	(5)
2. Ventilation rate:										
	main heating	secondary heating	y	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	1	=	1	X ·	40 =	40	(6a)
Number of open flues	0 +	0	j + F	0		0	x	20 =	0	(6b)
Number of intermittent far	ns				-	4	х	10 =	40	(7a)
Number of passive vents					F	0	x	10 =	0	(7b)
Number of flueless gas fir	es				\	0	X ·	40 =	0	(7c)
Trainibor of macrosc gas in					L	0			O	(10)
								Air ch	nanges <mark>per</mark> ho	ur
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7a	a)+(7b)+(7c) =		80	\vdash	÷ (5) =	0.12	(8)
If a pressurisation test has be					continue fr			()	V.12	` ′
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timbe	r frame or	0.35 fo	mason	ry consti	ruction			0	(11)
if both types of wall are pro		esponding to	the great	er wall are	a (after					_
deducting areas of opening If suspended wooden fl	• / .	aled) or 0	1 (seale	nd) else	enter ()				0	(12)
If no draught lobby, ent	•	•	i (ocaic	,a), 0.00	CITICI O					(13)
Percentage of windows									0	(14)
Window infiltration	and doors dradgin	зпррси		0.25 - [0.2	! x (14) ÷ 1	1001 =			0	(15)
Infiltration rate						12) + (13) -	+ (15) =		0	(16)
Air permeability value, o	n50 expressed in c	uhic metres	s ner ho					area		(17)
If based on air permeabili	•		•	•	•	.55 51 6	volope	arou	15	(17)
Air permeability value applies						is beina us	sed		0.87	(10)
Number of sides sheltered				, ,					4	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.7	(20)
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.61	(21)
Infiltration rate modified for	or monthly wind spe	ed								
	Mar Apr Ma	1	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind spe						•	•	•	•	
`	40 44 43	20	2.0	2.7	1 4	12	1.5	17	1	

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

4.9

(22)m=

Wind Factor (22a)m = (22)m ÷	4									
(22a)m= 1.27 1.25 1.23		.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltration rate (allowi	na for shelt	er and wind	sneed) =	(21a) x (′22a\m	•		•	•	
0.78 0.76 0.75		.65 0.58	0.58	0.56	0.61	0.65	0.68	0.71		
Calculate effective air change	rate for the	applicable ca	ase	<u> </u>						
If mechanical ventilation:	and the NL (OOk)	(00-)	(° (A	(15\) - (b) (OO -)				0 (23a)
If exhaust air heat pump using Appe) = (23a)				0 (23b)
If balanced with heat recovery: effic	-	_				26\m . /	22h) [4	1 (22.5)		0 (23c)
a) If balanced mechanical ve		n neat recov	T 0	$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$	0	0	23D) x [0	- 100j	(24a)
b) If balanced mechanical ve								Ů		(= 12)
(24b)m = 0 0 0	0	0 0	0	0	0	0	0	0		(24b)
c) If whole house extract ver	ntilation or p	ositive input	ventilatio	on from o	utside					
if $(22b)m < 0.5 \times (23b)$, t	-	•				.5 × (23b)			
(24c)m = 0 0 0	0	0 0	0	0	0	0	0	0		(24c)
d) If natural ventilation or wh										
if $(22b)m = 1$, then $(24d)$		<u> </u>	 			_	0.70	0.70		(244)
(24d)m= 0.8 0.79 0.78		0.67	0.67	0.66	0.69	0.71	0.73	0.76		(24d)
Effective air change rate - er (25)m= 0.8 0.79 0.78		.71 0.67	0.67 or (24	0.66	0.69	0.71	0.73	0.76		(25)
		.71 0.07	0.07	0.00	0.03	0.71	0.73	0.70		(20)
3. Heat losses and heat loss										
ELEMENT Gross	Openings	Net A		U-valu W/m2l		A X U	()	k-value kJ/m²-l		A X k kJ/K
		Net Ai A ,i		U-valu W/m2l		A X U (W/F	<)	k-value kJ/m²-l		A X k kJ/K (26)
ELEMENT Gross area (m²)	Openings	Α,	m ² x	W/m2l	K =	(W/I	<) 			kJ/K
ELEMENT Gross area (m²) Doors	Openings	A ,,	x x1	W/m2l	0.04] =	4.2	<) 			kJ/K (26)
ELEMENT Gross area (m²) Doors Windows Type 1	Openings	A , l	x x1.	W/m2l 2 /[1/(4.5)+	0.04] =	4.2 5.72	<) 			kJ/K (26) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2	Openings	A , , 2.1 1.5 5	x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (0.04] = 0.04] = 0.04] =	4.2 5.72 7.08	<) 			kJ/K (26) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3	Openings	A , , 2.1 1.5 5 1.8	x1. x1. x1. x1. x1.	W/m2I 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(4.5)+ (0.04] = 0.04] = 0.04] = 0.04] =	(W/H 4.2 5.72 7.08 6.86	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Openings	A , 1 2.1 1.5 5 1.8 6.25	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2I 2 /[1/(4.5)+ (/[1/(4.5)+ (/[1/(4.5)+ (/[1/(4.5)+ (/[1/(1.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/N 4.2 5.72 7.08 6.86 8.84				(26) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights	Openings	A , , , , , , , , , , , , , , , , , , ,	x1. x1. x1. x1. x1. x2. x2. x	W/m2l 2 /[1/(4.5)+ + + + + + + + + + + + + + + + + + +	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175				kJ/K (26) (27) (27) (27) (27) (27)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1	Openings	A , l 2.1 1.5 5 1.8 6.25 3.45	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17	0.04] = 0.04]	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384				kJ/K (26) (27) (27) (27) (27) (27b)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2	Openings m ²	A , (2.1 1.5 5 1.8 6.25 3.45 55.55	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ + // /[1/(1.5)+ + // /[1/(1.5)+ + // /[1/(1.5)+ - // 0.17 0.2	0.04] = 0.04]	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606				kJ/K (26) (27) (27) (27) (27) (27b) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 76.26	Openings m ²	A , 1 2.1 1.5 5 1.8 6.25 3.45 55.55 28.03	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (0.17 0.2 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606				kJ/K (26) (27) (27) (27) (27) (27b) (28) (28)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 76.26 Walls Type2	Openings m² 0 20.75	A , 1 2.1 1.5 5 1.8 6.25 3.45 55.5 28.00 76.20	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(4.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (0.17 0.2 0.15 0.8	0.04] = 0.04]	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72				kJ/K (26) (27) (27) (27) (27b) (28) (28) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type3	0 20.75	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17 0.2 0.15 0.8 0.17	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 9.84	0 20.75 0	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17 0.2 0.15 0.8 0.17	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = =	4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type2 Walls Type3 Walls Type4 Walls Type4 Walls Type5 69.86	0 20.75 0 0	A , , , , , , , , , , , , , , , , , , ,	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2l 2 /[1/(4.5)+ (0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25 1.67 55.89				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type4 Walls Type4 Son Son Son Sarea (m²) Walls Type 1 Walls Type 1 Walls Type 1 Walls Type 1 Walls Type 3 Walls Type 3 Walls Type 4 Walls Type 5 Son Son Sarea (m²) Son Sarea (m²) Son Sarea (m²) Son Sarea (m²) Windows Type 4 Son Son Son Son Sarea (m²) Walls Type 1 Son Son Son Sarea (m²) Walls Type 1 Son Son Son Son Sarea (m²) Walls Type 1 Son Son Son Son Son Son Son Son Son Son	0 20.75 0 0 0	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ (/[1/(1.5)+ (/[1/(4.5)+ (/[1/(1.5)+ (/[1/(1.5)+ (0.17 0.2 0.15 0.8 0.17 0.17 0.8 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25 1.67 55.89				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (29) (30)
Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Rooflights Floor Type 1 Floor Type 2 Walls Type1 Valls Type2 Walls Type2 Walls Type3 Walls Type3 Valls Type4 Valls Type4 Floor Type 1 Society 13.27 Walls Type5 Floor Type 1 Floor Type 2 Roof Type1 Floor Type 2 Floor Type 2 Floor Type 2 Floor Type 3 Floor Type 3 Floor Type 4 Floor Type 4 Floor Type 5 Floor Type 69.86 Floor Type 1 Floor Type 2 Floor Type 3 Floor Type 3 Floor Type 4 Floor Type	0 20.75 0 0 0 0	A , , , , , , , , , , , , , , , , , , ,	x x x x x x x x x x	W/m2l 2 /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.17 0.2 0.15 0.8 0.17 0.17 0.8 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/N 4.2 5.72 7.08 6.86 8.84 5.175 9.4384 5.606 11.44 47.72 2.25 1.67 55.89 0.9				(26) (27) (27) (27) (27) (27b) (28) (28) (29) (29) (29) (29) (29) (30) (30)

Party wall					24.18	3 x	0	=	0				(32)
Party wall					43.68	3 x	0	=	0				(32)
Party wall					67.24	4 ×	0	=	0				(32)
* for windows an ** include the are						lated using	g formula 1	/[(1/U-valu	ıе)+0.04] а	s given in	paragraph	1 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				204.05	(33)
Heat capacity	/ Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mas	s parame	eter (TMF	= Cm +	: TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design asses can be used inst				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	ges : S (L	x Y) cal	culated (using Ap	pendix l	K						58.42	(36)
if details of them		are not kn	own (36) =	= 0.15 x (3	11)			(22)	(20)				¬,,,,,
Total fabric h		alaulataa	d manthl					` '	(36) =	05) m v (5)		262.47	(37)
Ventilation he	Feb	Mar	· ·	Ī	Jun	Jul	Δυα	Sep	= 0.33 × (Nov	Dec]	
(38)m= 177.31	+	172.19	Apr 160.27	May 158.05	147.67	147.67	Aug 145.75	151.67	158.05	162.55	167.27		(38)
` '			100.21	100.00	1	1	1		= (37) + (3				(==)
Heat transfer (39)m= 439.77		434.65	422.74	420.51	410.14	410.14	408.22	414.14	420.51	425.02	429.73	1	
(00)	1	10 1100						<u> </u>	Average =			422.73	(39)
Heat loss par	ameter (l	HLP), W	/m²K						= (39)m ÷				_
(40)m= 1.96	1.94	1.93	1.88	1.87	1.82	1.82	1.82	1.84	1.87	1.89	1.91		_
Number of da	ys in mo	nth (Tab	le 1a)						Average =	Sum(40) _{1.}	12 /12=	1.88	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ	cupancy,	N								3.	03]	(42)
if TFA > 13 if TFA £ 13		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	9)		1	
Annual avera	,	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		106	6.26	1	(43)
Reduce the annunct mot more that 12	ual average	hot water	usage by	5% if the a	lwelling is	designed			se target o		5.20]	(- /
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					_	
(44)m= 116.89	112.64	108.39	104.14	99.89	95.64	95.64	99.89	104.14	108.39	112.64	116.89		
Energy content of	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x L	OTm / 3600		Total = Su oth (see Ta	. ,		1275.17	(44)
(45)m= 173.35	151.61	156.45	136.39	130.87	112.93	104.65	120.09	121.52	141.62	154.59	167.88		
If instantaneous	water heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1671.95	(45)
						1		1			05.40	1	(46)
(46)m= 26	22.74	23.47	20.46	19.63	16.94	15.7	18.01	18.23	21.24	23.19	25.18		(40)
Water storage	e loss:	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>]	. ,
` '	e loss: ne (litres)	includin	ng any s	olar or W	/WHRS	storage	within sa	<u> </u>			25.18]	(47)

Water storage loss:				
a) If manufacturer's declared loss factor is known (kWh/day):		0	ı	(48)
Temperature factor from Table 2b		0	1	(49)
Energy lost from water storage, kWh/year	$(48) \times (49) =$	250	1	(50)
b) If manufacturer's declared cylinder loss factor is not known:				
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.04		(51)
If community heating see section 4.3 Volume factor from Table 2a		0.78	1	(52)
Temperature factor from Table 2b		0.78	1	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	4.91	1	(54)
Enter (50) or (54) in (55)		4.91	1	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$			
(56)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26	152.26 147.35 152.26	147.35 152.26	1	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (5	0), else (57)m = (56)m where (H11) is from Append	ix H	
(57)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.26	152.26 147.35 152.26	147.35 152.26	ı	(57)
Primary circuit loss (annual) from Table 3		0	1	(58)
Primary circuit loss calculated for each month (59) m = $(58) \div 36$	65 × (41)m			
(modified by factor from Table H5 if there is solar water heati	ng and a cylinder thermo	stat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26		(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m/			
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0		(61)
Total heat required for water heating calculated for each month	(62) m = $0.85 \times (45)$ m +	(46)m + (57)m +	(59)m + (61)m	
(62)m= 348.87 310.15 331.97 306.25 306.4 282.79 280.17	295.61 291.38 317.14	324.45 343.4		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity	y) (enter '0' if no solar contribut	on to water heating)		
(add additional lines if FGHRS and/or WWHRS applies, see Ap	pendix G)			
(63)m= 0 0 0 0 0 0	0 0 0	0 0	1	(63)
Output from water heater				
(64)m= 348.87 310.15 331.97 306.25 306.4 282.79 280.17	295.61 291.38 317.14	324.45 343.4		_
	Output from water heater	r (annual) ₁₁₂	3738.58	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m	+ (61)m] + 0.8 x [(46)m	+ (57)m + (59)m]	
(65)m= 198.06 177.24 192.44 181.24 183.93 173.44 175.21	180.35 176.29 187.51	187.29 196.24	1	(65)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is fr	om community h	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts				
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	1	
(66)m= 151.71 151.71 151.71 151.71 151.71 151.71 151.71	151.71 151.71 151.71	151.71 151.71	1	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), a	lso see Table 5			
(67)m= 38.69 34.36 27.95 21.16 15.82 13.35 14.43	18.75 25.17 31.96	37.3 39.77	1	(67)
Appliances gains (calculated in Appendix L, equation L13 or L1	3a), also see Table 5			
(68)m= 394.13 398.22 387.91 365.97 338.27 312.24 294.85	290.76 301.07 323.01	350.71 376.74	1	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a)), also see Table 5			
(69)m= 38.17 38.17 38.17 38.17 38.17 38.17 38.17	38.17 38.17 38.17	38.17 38.17	ı	(69)
Pumps and fans gains (Table 5a)	'			
(70)m= 0 0 0 0 0 0 0	0 0 0	0 0	ı	(70)
		•		

Lagge		oporatio	n (nogo	tivo volu	.oo\ /To	hla	E)											
		vaporatio	-121.37	1	1es) (1a	_	21.37	-121.37	-121	37	-121.37	-121.3	37 -121	37	-121.37	╗		(71)
, ,		gains (T		121.07	121.07	Т,	21.07	121.07	_ '-'	.07	121.07	121.0	, '-'	.07	121.07	_		(* -)
(72)m=	266.2	263.75	258.65	251.72	247.22	1 2	40.89	235.5	242	2.4	244.85	252.0	3 260	12	263.76	7		(72)
. ,		l gains =			<u> </u>)m + (67)m	l									, ,
(73)m=	767.53	. 	743.02	707.36	669.83	Т	635	613.3	620		639.61	675.5	`	Ť	748.78	7		(73)
6. So	lar gain																	
Solar	gains are	calculated ı	using sola	ır flux from	Table 6a	a and	l assoc	iated equa	tions	to cor	nvert to the	e appli	cable orie	entatio	on.			
Orient		Access F	actor	Area	l		Flu				g_		F				ains	
	•	Table 6d		m²			Tal	ble 6a		Ta	able 6b		Table	6c			(W)	
North	0.9x	0.77	X		5	X	1	10.63	x		0.85	X	0	.7	=		43.85	(74)
North	0.9x	0.54	Х	1.	8	X	1	10.63	x		0.85	X	0	.7	=		11.07	(74)
North	0.9x	0.77	Х		5	X	2	20.32	x		0.85	X	0	.7	=		83.79	(74)
North	0.9x	0.54	Х	1.	8	X	2	20.32	x		0.85	X	0	.7	=		21.15	(74)
North	0.9x	0.77	Х		5	X	3	34.53	X		0.85	X	0	.7	=		142.38	(74)
North	0.9x	0.54	Х	1.	8	X	3	34.53	X		0.85	X	0	.7	=		35.95	(74)
North	0.9x	0.77	X			X	5	55.46	X		0.85	X	0	.7			228.7	(74)
North	0.9x	0.54	X		8	Х	5	55.46	х		0.85	X	0	.7	_		57.74	(74)
North	0.9x	0.77	X		5	Х	7	74.72	x		0.85	X	0	.7	=		308.08	(74)
North	0.9x	0.54	X	1.	8	X	7	74.72	x		0.85	X	0	.7	=		77.78	(74)
North	0.9x	0.77	X	,	5	X	7	79.99	×		0.85	X	0	.7	=		329.81	(74)
North	0.9x	0.54	X	1.	8	x	7	79.99	х		0.85	X	0	.7	=		83.27	(74)
North	0.9x	0.77	X	ļ į	5	Х	7	4.68	X		0.85	X	0	.7	=		307.92	(74)
North	0.9x	0.54	X	1.	8	X		74.68	X		0.85	X	0	.7	=		77.74	(74)
North	0.9x	0.77	X		5	X		59.25	X		0.85	X	0	.7	=		244.29	(74)
North	0.9x	0.54	Х	1.	8	X		59.25	x		0.85	X	0	.7	=		61.68	(74)
North	0.9x	0.77	Х		5	X		11.52	x		0.85	X	0	.7	=		171.19	(74)
North	0.9x	0.54	х	1.	8	X	4	11.52	x		0.85	X	0	.7	=		43.22	(74)
North	0.9x	0.77	X		5	X	2	24.19	X		0.85	X	0	.7	=		99.74	(74)
North	0.9x	0.54	X	1.	8	X	2	24.19	X		0.85	X	0	.7	=		25.18	(74)
North	0.9x	0.77	X		5	X	1	13.12	x		0.85	X	0	.7	=		54.09	(74)
North	0.9x	0.54	X	1.	8	X	1	13.12	x		0.85	X	0	.7	_ =		13.66	(74)
North	0.9x	0.77	X		5	X		8.86	x		0.85	X	0	.7			36.55	(74)
North	0.9x	0.54	X	1.	8	X		8.86	x		0.85	X	0	.7	<u> </u>		9.23	(74)
South	0.9x	0.3	X	1.	5	X		16.75	x		0.85	x	0	.7	_ =		33.8	(78)
South	0.9x	0.3	х	1.	5	X	7	76.57	x		0.85	X	0	.7	=		55.35	(78)
												_						_

X

X

X

1.5

1.5

1.5

1.5

X

X

X

97.53

110.23

114.87

110.55

X

X

X

0.85

0.85

0.85

0.85

X

X

X

0.7

0.7

0.7

0.7

=

South

South

South

South

0.9x

0.9x

0.9x

0.9x

0.3

0.3

0.3

0.3

(78)

(78)

(78)

(78)

70.51

79.69

83.04

79.92

South	0.9x	0.3	x	1.5	5	X	1	08.01	x		0.85	X		0.7		=	78.08	(78)
South	0.9x	0.3	X	1.	5	x	=	04.89	x		0.85	×		0.7	\dashv	=	75.83	(78)
South	0.9x	0.3	х	1.	5	X	1	01.89	x		0.85	x		0.7		=	73.66	(78)
South	0.9x	0.3	x	1.	5	x	8	32.59	x		0.85	X		0.7		=	59.7	(78)
South	0.9x	0.3	x	1.5	5	X	5	55.42	x		0.85	x		0.7		=	40.06	(78)
South	0.9x	0.3	X	1.	5	X	4	40.4	X		0.85	X		0.7		=	29.2	(78)
West	0.9x	0.77	X	6.2	25	X	1	9.64	x		0.85	X		0.7		=	50.61	(80)
West	0.9x	0.77	X	6.2	25	X	3	88.42	x		0.85	X		0.7		=	99.01	(80)
West	0.9x	0.77	X	6.2	25	X	6	3.27	X		0.85	X		0.7		=	163.06	(80)
West	0.9x	0.77	X	6.2	25	X	9	2.28	X		0.85	X		0.7		=	237.81	(80)
West	0.9x	0.77	X	6.2	25	X	1	13.09	X		0.85	X		0.7		=	291.45	(80)
West	0.9x	0.77	X	6.2	25	X	1	15.77	X		0.85	X		0.7		=	298.35	(80)
West	0.9x	0.77	X	6.2	25	X	1	10.22	X		0.85	X		0.7		=	284.04	(80)
West	0.9x	0.77	X	6.2	25	X	9	94.68	X		0.85	X		0.7		=	243.99	(80)
West	0.9x	0.77	X	6.2	25	X	7	3.59	X		0.85	X		0.7		=	189.65	(80)
West	0.9x	0.77	X	6.2	25	X	4	15.59	x		0.85	X		0.7		=	117.49	(80)
West	0.9x	0.77	X	6.2	25	X	2	24.49	X		0.85	X		0.7		=	63.11	(80)
West	0.9x	0.77	X	6.2	25	X	1	6.15	Х		0.85	X		0.7		=	41.62	(80)
Rooflights	S 0.9x	1	x	3.4	5	Х		26] x		0.65	X		0.7		-	36.73	(82)
Rooflights	0.9x	1	x	3.4	15	Х		54] x		0.65	X		0.7		=	76.29	(82)
Rooflights	0.9x	1	x	3.4	15	X		96	x		0.65	X		0.7		=	135.63	(82)
Rooflights	0.9x	1	x	3.4	15	X		150	Х		0.65	X		0.7		=	211.92	(82)
Rooflights	0.9x	1	x	3.4	15	X		192	х		0.65	X		0.7		=	271.25	(82)
Rooflights	s 0.9x	1	х	3.4	1 5	Х		200	X		0.65	X		0.7		=	282.55	(82)
Rooflights	s 0.9x	1	х	3.4	15	X		189	x		0.65	X		0.7		=	267.01	(82)
Rooflights	S 0.9x	1	X	3.4	15	X		157	X		0.65	X		0.7		=	221.81	(82)
Rooflights	S 0.9x	1	X	3.4	15	X		115	X		0.65	X		0.7		=	162.47	(82)
Rooflights	S 0.9x	1	X	3.4	15	X		66	X		0.65	X		0.7		=	93.24	(82)
Rooflights	S 0.9x	1	X	3.4	15	X		33	X		0.65	X		0.7		=	46.62	(82)
Rooflights	s 0.9x	1	X	3.4	15	X		21	X		0.65	X		0.7		=	29.67	(82)
Solar ga						_			`		um(74)m .						İ	
` ′	176.06	335.6	547.52	815.86	1031.61		073.9	1014.8	847	.59	640.18	395.3	36	217.54	146.	28		(83)
Total gai				<u> </u>	<u> </u>	<u> </u>			l					1			1	(0.4)
(84)m= §	943.59	1100.44	1290.55	1523.22	1701.43	3 17	708.89	1628.1	1468	3.03	1279.79	1070.	87	934.19	895.	05		(84)
7. Meai	n inter	nal temp	erature	(heating	seaso	n)												_
Tempe	rature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ole 9	, Th	1 (°C)						21	(85)
Utilisati		tor for g				Ť											1	
Ļ	Jan	Feb	Mar	Apr	May	+	Jun	Jul	A	ug	Sep	Oc	t	Nov	De	ЭС		
(86)m=	1	1	1	0.99	0.97		0.91	0.82	0.8	36	0.97	0.99		1	1			(86)
Mean_ir	nterna	temper	ature in	living are	ea T1 (1	follo	w ste	ps 3 to 7	7 in T	able	e 9c)							
(87)m=	18.67	18.83	19.17	19.67	20.16		20.6	20.82	20.	77	20.4	19.7	8	19.17	18.6	88		(87)
													_					

remb	erature	durina h	eating p	eriods ir	rest of	dwellina	from Ta	ıble 9. Tl	ո2 (°C)					
(88)m=	19.36	19.37	19.38	19.41	19.42	19.45	19.45	19.46	19.44	19.42	19.41	19.39		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling l	h2 m (se	e Table	9a)						
(89)m=	1	1	0.99	0.98	0.95	0.83	0.64	0.71	0.93	0.99	1	1		(89)
	intornal	tompor	oturo in i	the reet	of duralli	na T2 /f/	ollow oto	no 2 to -	7 in Tabl	0.00				
(90)m=	16.33	16.58	ature in 1	17.82	18.54	19.15	19.38	19.35	18.89	17.99	17.09	16.37		(90)
(90)111=	10.55	10.50	17.07	17.02	10.54	19.15	19.30	19.55		LA = Livin			0.19	(91)
											g a. oa . ('' l	0.19	(31)
			ature (fo											
(92)m=	16.77	17	17.46	18.17	18.84	19.42	19.65	19.62	19.17	18.32	17.48	16.8		(92)
			he mean							·		1		(22)
(93)m=	16.77	17	17.46	18.17	18.84	19.42	19.65	19.62	19.17	18.32	17.48	16.8		(93)
•		·	uirement											
			ernal ter or gains (•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ille ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l Itilies			ains, hm		iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m=		1	0.99	0.98	0.93	0.83	0.67	_0.73	0.92	0.99	1	1		(94)
			W = (9 ⁴			0.00	0.07	0.70	0.02	0.00	<u> </u>			(0.)
	_		1279.35	_	_	1422 66	1087.62	1078.47	1181.53	1055 58	930.7	893.47		(95)
			rnal tem				1007.02	1078.47	1101.55	1033.38	930.7	093.47		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern								7.1	7.2		(00)
	_		4763.99								4411.05	5413.8		(97)
												5415.6		(37)
Space	e neaung	n regulire	7ff100f1f 1()											
(00))m] x (4 ⁻	-	2262.42		
(98)m=			2592.57			0	0	0	0	1630.87	2505.85			(00)
(98)m=								0	0		2505.85		19090	(98)
, ,	3379.07	2817.63		1750.14	1050.75			0	0	1630.87	2505.85		19090	(98)
Space	3379.07 e heatin	2817.63 g require	2592.57	1750.14 kWh/m²	1050.75			0	0	1630.87	2505.85			===
Space 8c. Sp	a379.07	2817.63 g require	2592.57 ement in	1750.14 kWh/m²	1050.75 /year	0		0	0	1630.87	2505.85			===
Space 8c. Sp	a379.07	2817.63 g require	2592.57 ement in uiremen	1750.14 kWh/m²	1050.75 /year	0		0	0	1630.87	2505.85			===
Space 8c. Sp Calcu	e heating pace cool lated for Jan	g require pling req r June, J Feb	ement in uiremen luly and Mar	kWh/m² t August. Apr	1050.75 /year See Tak May	o ole 10b Jun	Jul	0 Tota	0 I per year	1630.87 (kWh/year	2505.85) = Sum(9 Nov	8)15,912 =		===
Space 8c. Sp Calcu	e heating ace cool lated for Jan loss rate	g require pling req r June, J Feb	ement in uiremen luly and Mar	kWh/m² t August. Apr	1050.75 /year See Tak May	o ole 10b Jun	Jul perature	0 Tota Aug and exte	0 I per year	1630.87 (kWh/year	2505.85) = Sum(9 Nov	8) _{15,912} =		===
Space 8c. Sp Calcu Heat (100)m=	e heating ace cool lated for Jan loss rate	g require pling req T June, C Feb E Lm (ca	ement in uirement July and Mar Iculated	kWh/m² t August. Apr using 25	/year See Tab May 5°C inter	ole 10b Jun	Jul perature	0 Tota Aug and exte	0 I per year Sep ernal ten	1630.87 (kWh/year Oct	2505.85) = Sum(9 Nov e from T	8) _{15,912} = Dec		(99)
Space 8c. Sp Calcu Heat (100)m=	e heating ace coo lated for Jan loss rate 0 ation face	g require pling req T June, C Feb E Lm (ca	ement in uirement July and Mar Iculated	kWh/m² t August. Apr using 25	/year See Tab May 5°C inter	ole 10b Jun	Jul perature	0 Tota Aug and exte	0 I per year Sep ernal ten	1630.87 (kWh/year Oct	2505.85) = Sum(9 Nov e from T	8) _{15,912} = Dec		(99)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m=	e heating pace cool lated for Jan loss rate 0 ation face	g require pling req T June, C Feb Lm (ca 0 tor for lo	ement in uirement luly and Mar lculated 0 ess hm	kWh/m² t August. Apr using 25	/year See Tate May 5°C inter 0	0 Die 10b Jun rnal temp 3855.31	Jul perature 3035.03	O Tota Aug and exte 3102.46	0 I per year Sep ernal ten 0	Oct nperatur 0	2505.85) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10)		(100)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m=	e heating coace coo lated for Jan loss rate 0 ation fac 0 Il loss, h	g require pling req T June, C Feb Lm (ca 0 tor for lo	ement in uirement July and Mar Iculated 0 oss hm 0	kWh/m² t August. Apr using 25	/year See Tate May 5°C inter 0	0 Die 10b Jun rnal temp 3855.31	Jul Derature 3035.03	O Tota Aug and exte 3102.46	0 I per year Sep ernal ten 0	Oct nperatur 0	2505.85) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10)		(100)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heating pace cool lated for Jan loss rate 0 ation face 0 Il loss, h	g require pling require r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W	ement in uirement luly and Mar lculated 0 ess hm 0 /atts) = (kWh/m² t August. Apr using 25 0 0 100)m x	/year See Tat May 5°C inter 0 (101)m 0	0 Die 10b Jun nal temp 3855.31 0.52	Jul perature 3035.03 0.6	0 Tota Aug and exte 3102.46 0.55	Sep ernal ten 0	Oct nperatur 0	2505.85) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10)		(100) (101)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heating pace coo plated for Jan loss rate 0 ation fac ul loss, h 0 (solar g	g require pling require r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W	ement in uirement July and Mar Iculated 0 oss hm 0 /atts) = (kWh/m² t August. Apr using 25 0 0 100)m x	/year See Tat May 5°C inter 0 (101)m 0	0 Dle 10b Jun nal temp 3855.31 0.52	Jul perature 3035.03 0.6	0 Tota Aug and exte 3102.46 0.55	Sep ernal ten 0	Oct nperatur 0	2505.85) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10)		(100) (101)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heating pace cool lated for Jan loss rate 0 ation face 0 Il loss, h 0 s (solar cooling	g require Tune, C Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains cal 0 grequire	ement in uirement July and Mar lculated 0 sss hm 0 /atts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	/year See Tat May 5°C inter 0 (101)m 0 cable we 0 whole o	0 Die 10b Jun mal temp 3855.31 0.52 1993.02 eather re	Jul perature 3035.03 0.6 1829.03 egion, see	0 Tota Aug and exte 3102.46 0.55 1710.14 ee Table 1839.05	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	2505.85) = Sum(9 Nov e from T 0 0	Dec Table 10) 0	84.89	(100) (101) (102)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heating pace cool lated for Jan loss rate 0 ation face 0 Il loss, h 0 s (solar cooling	g require Tune, C Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains cal 0 grequire	ement in uirement July and Mar lculated 0 oss hm 0 /atts) = (0 lculated 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	/year See Tat May 5°C inter 0 (101)m 0 cable we 0 whole o	0 Die 10b Jun mal temp 3855.31 0.52 1993.02 eather re	Jul perature 3035.03 0.6 1829.03 egion, se 2018.41	0 Tota Aug and exte 3102.46 0.55 1710.14 ee Table 1839.05	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	2505.85) = Sum(9 Nov e from T 0 0	Dec able 10) 0 0	84.89	(100) (101) (102)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heating pace cool lated for Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar g 0 e cooling 04)m to	g require Tune, C Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains cal 0 grequire	ement in uirement July and Mar lculated 0 sss hm 0 /atts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	/year See Tat May 5°C inter 0 (101)m 0 cable we 0 whole o	0 Die 10b Jun mal temp 3855.31 0.52 1993.02 eather re	Jul perature 3035.03 0.6 1829.03 egion, se 2018.41	0 Tota Aug and exte 3102.46 0.55 1710.14 ee Table 1839.05	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	2505.85) = Sum(9 Nov e from T 0 0	Dec able 10) 0 0	84.89	(100) (101) (102)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	asympton a heating pace cool lated for Jan loss rate 0 ation face 0 Il loss, h 0 s (solar g 0 e cooling 04)m to	g require pling require r June, J Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains cal 0 g require zero if (ement in uirement luly and Mar lculated 0 ess hm 0 /atts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98)	See Tab May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun nal temp 3855.31 0.52 1993.02 eather re 2115.13	Jul perature 3035.03 0.6 1829.03 egion, se 2018.41 continuo	0 Tota Aug and exte 3102.46 0.55 1710.14 e Table 1839.05 ous (kW	0 per year Sep ernal ten 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2505.85) = Sum(9 Nov e from T 0 0 0 0 104)	Dec	84.89	(100) (101) (102) (103)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heating ace cool lated for Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar g 0 e cooling 04)m to 0 d fraction	g require pling recorder June, of the Lm (can be considered) tor for longuing calculations and the considered calculations are calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated calculated as a considered calculated calcula	ement in uirement July and Mar lculated 0 oss hm 0 /atts) = (0 lculated 0 ement for 104)m < 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98)	See Tab May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun nal temp 3855.31 0.52 1993.02 eather re 2115.13	Jul perature 3035.03 0.6 1829.03 egion, se 2018.41 continuo	0 Tota Aug and exte 3102.46 0.55 1710.14 e Table 1839.05 ous (kW	0 per year Sep ernal ten 0	Oct nperatur 0 0 24 x [(10	2505.85) = Sum(9 Nov e from T 0 0 0 0 104)	Dec	84.89 c (41)m	(100) (101) (102) (103)
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Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heating pace coo plated for Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar c 0 d fractior ittency fa	g require pling recorder June, of the Lm (can be considered) tor for longuing calculations and the considered calculations are calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated as a considered calculated calculated as a considered calculated calcula	ement in uirement July and Mar lculated 0 oss hm 0 /atts) = (0 lculated 0 ement for 104)m < 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98)	See Tab May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun nal temp 3855.31 0.52 1993.02 eather re 2115.13	Jul perature 3035.03 0.6 1829.03 egion, se 2018.41 continuo	0 Tota Aug and exte 3102.46 0.55 1710.14 e Table 1839.05 ous (kW	0 Sep Sep O O O O O O O O Total f C = O O O O O O O O O	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2505.85) = Sum(9 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	Dec	84.89 ((41)m	(100) (101) (102) (103) (104) (105)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Cooled Intermit (106)m=	e heating pace coo plated for Jan loss rate 0 ation fac 0 ation fac 0 s (solar c 0 e cooling 04)m to d fractior ittency fa 0	g require pling require r June, J Feb tor for lo 0 mLm (W 0 gains cal 0 g require zero if (0	ement in uirement luly and Mar lculated 0 ss hm 0 /atts) = (0 lculated 0 ement for 104)m < 0	t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98) 0	Joso.75 Jyear See Tat May S°C inter 0 (101)m 0 cable we 0 whole of	0 Dile 10b Jun nal temp 3855.31 0.52 1993.02 eather re 2115.13 dwelling, 0	Jul Derature 3035.03 0.6 1829.03 egion, se 2018.41 continue 0	0 Tota Aug and exte 3102.46 0.55 1710.14 e Table 1839.05 Dus (kW	0 Sep Sep O O O O O O O O Total f C = O O O O O O O O O	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2505.85) = Sum(9 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	Dec fable 10) 0 0 102)m] >	84.89 (41)m 0 0.62	(100) (101) (102) (103)

Space cooling	require	ment for	month =	: (104)m	× (105)	× (106)	m						
(107)m= 0	0	0	0	0	0	0	0	0	0	0	0		
									l = Sum	` ,	=	0	(107)
Space cooling	•		•					(107)) ÷ (4) =			0	(108)
9b. Energy red			·	Ĭ			ting prov	idad by	0.00mm	unity oo	homo		
This part is us Fraction of spa										iuriity SC	neme.	0	(301)
Fraction of spa	ace heat	t from co	mmunity	system	1 – (30	1) =						1	(302)
The community sincludes boilers, I		•							up to four	other hea	t sources; t	he latter	
Fraction of he		_			,							1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity b	oilers				(3	302) x (303	3a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (commun	ity heati	ng syste	em					1.05	(306)
Space heatin	_											kWh/ye	ar
Annual space	•											19090	
Space heat from)5) x (306)	-	20044.5	(307a)
Efficiency of s						· ·						0	(308
Space heating Water heating		ment fro	m secon	dary/su	pplemen	itary sys	tem	(98) x (30	01) x 100	÷ (308) =		0	(309)
Ann <mark>ual w</mark> ater	7											3738.58	
If DHW from o								(64) x (30	03a) x (30	95) x (306)	=	3925.51	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e)	+ (310a)	(310e)] =	239.7	(313)
Cooling Syste	m Energ	gy Efficie	ncy Rati	0								4.38	(314)
Space cooling	(if there	e is a fixe	ed coolin	g systen	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity for processing the mechanical versions.							outside					0	(330a)
warm air heati			,	·		•						0	(330b)
pump for solar	• .											0	(330g)
Total electricit		•	kWh/yea	r				=(330a) -	+ (330b) -	+ (330g) =		0	(331)
Energy for ligh			•									683.29	(332)
12b. CO2 Emi	ssions -	- Commı	unity hea	ting sch	eme								
								ergy h/year		mission g CO2/l		Emissions kg CO2/yea	r
CO2 from othe Efficiency of h		•		water he			ng two fuels	s repeat (3	63) to (36	6) for the	second fue	J 91	(367a)
CO2 associate	ed with h	neat soui	rce 1			[(307b)-	+(310b)] x	100 ÷ (367	'b) х Г	0		5689.59	(367)
Electrical ener	av for h	eat distri	bution				[(313) x		Г	0.52	<u> </u>	124.4	(372)

Total CO2 associated with community s	systems	(363)(366) + (368)(372)	= [5813.99	(373)	
CO2 associated with space heating (see	condary)	(309) x	0	= [0	(374)
CO2 associated with water from immers	sion heater or instantar	neous heater (312) x	0.22	= [0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =		[5813.99	(376)
CO2 associated with electricity for pump	ps and fans within dwe	elling (331)) x	0.52	= [0	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	= [354.63	(379)
Total CO2, kg/year	sum of (376)(382) =				6168.62	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				27.43	(384)
El rating (section 14)					69.37	(385)

Property Details: Flat 1

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

 Basement floor
 55.75 m²
 3.1 m

 Floor 1
 156.34 m²
 2.6 m

 Floor 2
 156.01 m²
 3.28 m

Living area: 52.13 m² (fraction 0.142)

Front of dwelling faces: Unspecified

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			Wood
D2	Manufactur <mark>er</mark>	Half glazed	low-E, En = 0.2, hard coat	No	Metal
W1	SAP 2012	Windows	Single-glazed	No	
W2	SAP 2012	Windows	Single-glazed	No	Wood
W3	SAP 2012	Windows	Single-glazed	No	Wood
W4	SAP 2012	Windows	Single-glazed	No	Wood
W5	SAP 2012	Windows	Single-glazed	No	Wood
W6	SAP 2012	Windows	Single-glazed	No	Wood
W7	SAP 2012	Windows	Single-glazed	No	Wood
W8	SAP 2012	Windows	low-E, $En = 0.2$, hard coat	No	Wood
W09	SAP 2012	Windows	Single-glazed	No	Wood
w10	SAP 2012	Windows	Single-glazed	No	Wood
w11	SAP 2012	Windows	Single-glazed	No	Wood
w12	SAP 2012	Windows	Single-glazed	No	Wood
w13	SAP 2012	Windows	Single-glazed	No	Wood

Name:	Gap:	Frame Fac	tor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
D2	16mm or more mm	0.8	0.65	2	1.64	1
W1		0.7	0.85	4.5	1.5	2
W2		0.7	0.85	4.5	1.64	1
W3		0.7	0.85	4.5	1.64	1
W4		0.7	0.85	4.5	1.64	1
W5		0.7	0.85	4.5	1.64	1
W6		0.7	0.85	4.5	0.83	1
W7		0.7	0.85	4.5	1.64	1
W8	16mm or more	0.7	0.72	2.1	3.1	3

W09	0.7	0.85	4.8	5.13	1
w10	0.7	0.85	4.5	2.4	1
w11	0.7	0.85	4.5	2.4	1
w12	0.7	0.85	4.5	2.4	1
w13	0.7	0.85	4.5	2.83	3

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D1	•	corridor		1	2.1
D2		External wall GF	West	0.78	2.1
W1		External wall GF	South	1	1.5
W2		External wall GF	West	1.09	1.5
W3		External wall GF	South West	1.09	1.5
W4		External wall GF	West	1.09	1.5
W5		External wall GF	North West	1.09	1.5
W6		External wall GF	West	0.753	1.1
W7		External wall GF	South West	1.09	1.5
W8		External wall GF	North	1.24	2.5
W09		External FF	South	2.33	2.2
w10		External FF	South West	1.09	2.2
w11		External FF	West	1.09	2.2
w12		External FF	North West	1.09	2.2
w13		External FF	North	1.09	2.6

Overshading: More than average

Opaque Elements:							
Typ <mark>e</mark> :	Gross area:	Openings:	Net area:	Ú-value:	Ru value:	Curtain wall:	Kappa:
External Elements	<u>S</u>						
Base <mark>ment</mark> wall	87.11	0	87.11	0.15	0	False	N/A
Exte <mark>rnal w</mark> all GF	101.74	22.97	78.77	0.8	0	False	N/A
corri <mark>dor GF</mark>	43.34	0	43.34	0.2	0.9	False	N/A
Copr <mark>ridor FF</mark>	53.64	0	53.64	0.2	0.9	False	N/A
External FF	119.93	20.82	99.11	0.8	0	False	N/A
internal	23.62	0	23.62	0.15	0		N/A
Basement floor	55.75			0.17			N/A
ground floor	100.58			0.2			N/A
internal floor	24.67			0.2			N/A
Internal Elements							
Party Elements							
party wall Basemen	t 30.03						N/A
Party wall FF	25.87						N/A

Thermal bridges:	No information on thermal bridging $(y=0.15)$ $(y=0.15)$

Pressure test:	No (Assumed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	2 (main: 0, secondary: 1, other: 1)
N	0

Number of open flues: 0
Number of fans: 6
Number of passive stacks: 0
Number of sides sheltered: 4
Pressure test: 15

Main heating system

Main heating system: Community heating schemes
Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 91 Piping>=1991, pre-insulated, low temp, variable flow

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and at least two room thermosta

Control code: 2312

Secondary heating system:

Secondary heating system: Room heaters

Solid fuel room heaters

Fuel: wood pellets (bulk supply in bags, for main heating)

Info Source: SAP Tables Closed room heater HETAS Approved

Space cooling system:

Space cooling system: Split/multiple systems

Tested data to EN 14511: Brand/Model: TBC

EER: 3.5

Compressor control: Systems with On/Off control

Cooled area: 140 (fraction 0.380)

Water heating:

Water heating: From main heating system

Water code: 901

Fuel : heat from boilers - mains gas

Hot water cylinder Cylinder volume: 310 litres

Cylinder insulation: Jacket 35 mm Primary pipework insulation: True

Cylinderstat: True

Cylinder in heated space: True

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

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

		User Details:					
Assessor Name:		Stroma	Numbe	er:			
Software Name:	Stroma FSAP 2012	Softwa	re Versi	on:	Versio	n: 1.0.1.24	
	Pro	operty Address: I	Flat 1				
Address :							
Overall dwelling dime	ensions:	A (2)				V - I (2)	
Basement		Area(m²) 55.75	1a) x [v. Height(m) 3.1	(2a) =	Volume(m³)	(3a)
Ground floor			1b) x	2.6		406.48	(3b)
First floor			1c) x	3.28		511.71](3c)
	a)+(1b)+(1c)+(1d)+(1e)+(1n)		L	3.20	(20) -	511.71	(3c)
`	a)+(1b)+(1c)+(1a)+(1e)+(111)	`	4) (3a)+(3b)+(3	3c)+(3d)+(3e)+	(3n) - [7 .5
Dwelling volume			(3a)+(3b)+(3	oc)+(ou)+(oe)+	(311) =	1091.02	(5)
2. Ventilation rate:	main secondary	other		otal		m³ per houi	,
	heating heating	,			40 [III per nour	_
Number of chimneys	0 + 1	1	=	2	40 =	80	(6a)
Number of open flues	0 + 0	+ 0	=	0	20 =	0	(6b)
Number of intermittent fa				0	10 =	60	(7a)
Number of passive vents				0 x	10 =	0	(7b)
Number of flueless gas f	ires			0 x	40 =	0	(7c)
					Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =		140	÷ (5) =	0.13	(8)
	peen carried out or is intended, proceed		ontinue from		+ (5) =	0.13	(0)
Number of storeys in t	he dwelling (ns)					0	(9)
Additional infiltration				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber frame or 0	0.35 for masonry	construc	tion	Ī	0	(11)
**	resent, use the value corresponding to t	he greater wall area	(after		•		_
deducting areas of openi	ngs); ir equal user 0.35 floor, enter 0.2 (unsealed) or 0.1	(sealed), else e	enter 0		[0	(12)
If no draught lobby, en	, ,	(554.54), 5.55			L [0	(13)
•	s and doors draught stripped					0	(14)
Window infiltration		0.25 - [0.2 x	(14) ÷ 100]	=	Į [0	(15)
Infiltration rate		(8) + (10) +	(11) + (12)	+ (13) + (15) =	L	0	(16)
	q50, expressed in cubic metres				l area [15	(17)
,	lity value, then $(18) = [(17) \div 20] + (8)$			o or onvolope	, a.oa [0.88	(18)
•	es if a pressurisation test has been done			eing used	L	0.00	(,
Number of sides sheltered	ed		-		[4	(19)
Shelter factor		(20) = 1 - [0	0.075 x (19)]	=	•	0.7	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18)	x (20) =			0.61	(21)
Infiltration rate modified t	for monthly wind speed						
Jan Feb	Mar Apr May Jun	Jul Aug	Sep	Oct Nov	Dec		
Monthly average wind sp	peed from Table 7						

4.9

5.1

(22)m=

5

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

Wind Factor (22a))m = ((22)m ÷	4											
	.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
									<u>!</u>			l		
Adjusted infiltratio		`				` `	`	ì ´		0.00	0.70	Ī		
0.78 0 Calculate effective).77 e air (0.75 Change	0.68 rate for t	0.66 he appli	0.58 Cable ca	0.58 se	0.57	0.61	0.66	0.69	0.72			
If mechanical ve		-		upp									0	(23a)
If exhaust air heat p	oump u	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)				0	(23b)
If balanced with hea	at reco	very: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =					0	(23c)
a) If balanced m	necha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1	– (23c)	÷ 100]		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If balanced m	necha	anical ve	entilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)				
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole hous				•	-									
if (22b)m <		` ,	· ` `	``	<u> </u>	<u> </u>	ŕ		<u> </u>	i e		1		(0.4 -)
(' '	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural ven if (22b)m =									0.51					
	0.8	0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(24d)
Effective air cha	\rightarrow													
	0.8	0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(25)
2 Hoot loogoo or	nd ho	ot loce r	oromot	or:					_					
3. Heat losses ar					Net Ar	92	I I-valı	II.	ΔΧΙΙ		k-value	2	Δ	Y k
ELEMENT	nd he Gros area	ss	oaramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l			X k J/K
ELEMENT	Gros	ss	Openin	gs						<)				
ELEMENT	Gros	ss	Openin	gs	A ,r	m² x	W/m2	2K	(W/I	<)				J/K
ELEMENT Doors Type 1	Gros	ss	Openin	gs	A ,r	m ² x	W/m2 2	= [= [4.2	<) 				J/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros	ss	Openin	gs	A ,r 2.1 1.64	x x x1/	W/m2 2 2	= [0.04] = [4.2 3.28	<) 				(26) (26)
Doors Type 1 Doors Type 2 Windows Type 1	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(4.5)+	= [0.04] = [0.04] = [4.2 3.28 5.72	<) 				(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64	x x x 1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04]	(W/l 4.2 3.28 5.72 6.25	<) 				(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64	x x x 1/2 x	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 3.28 5.72 6.25 6.25	<) 				(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64	x x x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x	W/m2 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/l 4.2 3.28 5.72 6.25 6.25 6.25	<)				(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64	x x x 1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/l 4.2 3.28 5.72 6.25 6.25 6.25 6.25	<) 				(26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 0.83 1.64	x x x x 1/2	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	Gros	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	=	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9	Gros area	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 20.66	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10	Gros area	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 20.66 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11	Gros area	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	Gros area	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12 Windows Type 13	Gros area	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4 2.83	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66 9.15 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	Gros area	ss	Openin	gs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Floor Type 3	24.67 ×	0.2	4.934		(28)									
Walls Type1 87.11 0	87.11 ×	0.15 =	13.07		(29)									
Walls Type2 101.74 22.97	78.77 ×	0.8	63.02		(29)									
Walls Type3 43.34 0	43.34 ×	0.17 =	7.35		(29)									
Walls Type4 53.64 0	53.64 ×	0.17 =	9.09		(29)									
Walls Type5 119.93 20.82	99.11 ×	0.8	79.29		(29)									
Roof 23.62 0	23.62 X	0.15 =	3.54		(30)									
Total area of elements, m ²	_	(31)												
Party wall	30.03 ×	0 =	0		(32)									
Party wall	25.87 ×	0 =	0		(32)									
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2														
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 361.74 (33)														
, ,	361.74	(33)												
Heat capacity Cm = S(A x k) Thermal mass personator (TMB = Cm : TF	32e) = 0	(34)												
Thermal mass parameter (TMP = Cm ÷ TF	250	(35)												
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.														
Thermal bridges: S (L x Y) calculated using Appendix K 91.87 (36)														
if details of thermal bridging are not known (36) = 0.15 x (31)														
Total fabric heat loss			+ (36) =	453.62	(37)									
Ventilation heat loss calculated monthly Jan Feb Mar Apr I	May lun lul		$n = 0.33 \times (25) \text{m x (5)}$	Doo										
	May Jun Jul 8.66 241.43 241.43	Aug Sep 238.24 248.07	Oct Nov 258.66 266.14 2	Dec	(38)									
Heat transfer coefficient, W/K	211.10				()									
	2.27 695.05 695.05	691.86 701.68	n = (37) + (38)m 712.27 719.76 7	27.58										
(65)111	2.27 000.00 000.00		Average = $Sum(39)_{112}$		(39)									
Heat loss parameter (HLP), W/m²K			$n = (39)m \div (4)$		」 ` ′									
(40)m= 2.02 2.01 2 1.95 1	.94 1.89 1.89	1.88 1.91	1.94 1.96	1.98	_									
Number of days in month (Table 1a)			Average = $Sum(40)_{112}$	/12= 1.95	(40)									
Number of days in month (Table 1a) Jan Feb Mar Apr I	May Jun Jul	Aug Sep	Oct Nov	Dec										
 	31 30 31	31 30	31 30	31	(41)									
(1)	3. 3. 3.	1 3 1 3	1 3 1 3		,									
4. Water heating energy requirement:			k	:Wh/year:										
4. Water heating energy requirement.				year.										
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.0000)$	000240 v /TEA 12 ())2)]	3.22		(42)									
if TFA £ 13.9, N = 1 + 1.76 x [1 - $\exp(-0.00)$	000349 X (TFA -13.8	3)2)] + 0.0013 X (1FA -13.9)											
Annual average hot water usage in litres p			110.6	9	(43)									
Reduce the annual average hot water usage by 5% in not more that 125 litres per person per day (all water	•	to achieve a water u	se target of											
	May Jun Jul	Aug Sep	Oct Nov	Dec										
Jan Feb Mar Apr I Hot water usage in litres per day for each month Vd,			Oct 1407	Dec										
(44)m= 121.75 117.33 112.9 108.47 10	4.04 99.62 99.62	104.04 108.47	112.9 117.33 1	21.75										
	1 1 1 1 1 1	 	Total = $Sum(44)_{112}$ =	1328.23	(44)									
					_									

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 180.56 157.92 162.96 142.07 136.32 117.63 109 125.08 126.58 147.51 161.02 174.86 (45)m =Total = $Sum(45)_{1...12}$ = 1741.52 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)27.08 23.69 24.44 21.31 20.45 17.64 16.35 22.13 24.15 26.23 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 310 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year $(48) \times (49) =$ 310 (50)b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51)0.04 If community heating see section 4.3 Volume factor from Table 2a 0.73 (52)Temperature factor from Table 2b 0.6 (53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 5.67 (54)Enter (50) or (54) in (55) (55)5.67 Water storage loss calculated for each month $((56)m = (55) \times (41)m$ 158.73 (56)m= 175.74 175.74 170.07 175.74 170.07 175.74 175.74 170.07 175.74 170.07 175.74 (56)If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)m= 175.74 158.73 175.74 170.07 175.74 170.07 175.74 175.74 170.07 175.74 170.07 175.74 (57)(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)(59)m =23.26 21.01 23.26 23.26 22.51 23.26 22.51 23.26 22.51 23.26 Combi loss calculated for each month (61)m = (60) \div 365 x (41)m 0 0 0 0 0 0 (61)(61)m =0 0 0 Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 379.56 337.66 361.96 334.65 (62)335.32 310.21 308 324.08 319.16 346.52 353.6 373.86 (62)m =Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)(63)m =0 0 0 0 0 0 0 Output from water heater 379.56 337.66 361.96 334.65 (64)m =335.32 310.21 308 324.08 319.16 346.52 353.6 373.86 (64)Output from water heater (annual) 1...12 4084.59 Heat gains from water heating, kWh/month 0.25 \(^{10.85}\) x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] 193.18 195.44 200.79 (65)(65)m =219.24 213.38 201.3 204.53 196.15 208.25 207.61 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

(66)m= 193.23	3 193.23	193.23	193.23	193.23	19	3.23 193.23	193	.23 193	3.23	193.23	193.23	193.23		(66)
Lighting gain	s (calculate	ed in Ap	pendix l	_, equat	ion	L9 or L9a), a	lso s	ee Tabl	e 5					
(67)m= 128.45	114.09	92.78	70.24	52.51	44	4.33 47.9	62.	26 83.	.57	106.11	123.84	132.02		(67)
Appliances g	ains (calcu	ılated in	Append	lix L, eq	uati	ion L13 or L1	3a),	also see	Tab	le 5				
(68)m= 763.18 771.1 751.15 708.66 655.03 604.63 570.95 563.03 582.99 625.47 679.11 729.51 (68)														(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
(69)m= 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 57.54 (69)														
Pumps and fans gains (Table 5a)														
(70)m= 0	0	0	0	0		0 0	C) (0	0	0		(70)
Losses e.g. evaporation (negative values) (Table 5)														
(71)m= -128.82	(71)m= -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82 -128.82												(71)	
Water heating gains (Table 5)														
(72)m= 294.67	292.12	286.81	279.59	274.9	26	68.3 262.69	269	.88 272	2.43	279.9	288.34	292.13		(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$														
` '		1252.69	1180.44	1104.39	10	39.21 1003.5	1017	7.13 106	0.94	1133.44	1213.24	1275.61		(73)
6. Solar gains:														
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g FF Gains														
Orientation:	Table 6d	actor	Area m²			Table 6a		g_ Table	6b	Т	able 6c		(W)	
North 0.9x		x			x /			0.7				[` '	(74)
North 0.9x			3.		L	10.63	X	\rightarrow			0.7		24.22	(74)
North 0.9x		X X	2.8		X [20.32	X	0.8		x L	0.7		26.11 46.29	(74)
North 0.9x			2.8	_	^	20.32	X	0.72	_		0.7	╣┇	49.89	= (74) (74)
North 0.9x			3.		^	34.53	^ x	0.7		⊒ ^	0.7	<u> </u>	78.66	= (74) (74)
North 0.9x	0.0 :	$=$ \hat{x}	2.8		^ L x [34.53	^ x	0.7		」^L 1 _× 「	0.7	<u> </u>	84.77	(74)
North 0.9x	0.0 .	X	3.		^ L x [55.46	l x	0.7		」^L 1 _x [0.7		126.35	(74)
North 0.9x		X	2.8		^ L x [55.46	l ^	0.8] ^ L] _x [0.7		136.17	(74)
North 0.9x		X	3.		x [74.72	X	0.7]	0.7		170.2	(74)
North 0.9x		X	2.8		x [74.72	l X	0.8] _x [0.7	 	183.43	(74)
North 0.9x		X	3.		x [79.99	X	0.72] _x [0.7	-	182.2	(74)
North 0.9x		X	2.8		x [79.99	X	0.8]	0.7	╡┇	196.37	(74)
North 0.9x	0.54	X	3.		x [74.68	X	0.72		┪ _╺ ╞	0.7	┤ ₌ ˈi	170.11	(74)
North 0.9x	0.54	x	2.8		x	74.68	x	0.8		x	0.7	-	183.33	(74)
North 0.9x		x	3.		x	59.25	X	0.72		x	0.7	-	134.96	(74)
North 0.9x	0.54	x	2.8	3	x [59.25	х	0.8	 5	x	0.7	-	145.45	(74)
North 0.9x		x	3.		x	41.52	X	0.7		x	0.7	<u> </u>	94.57	(74)
North 0.9x	0.54	x	2.8	3	×	41.52	x	0.8	 5	x	0.7	=	101.93	(74)
North 0.9x	0.54	X	3.		x	24.19	х	0.7	2	×	0.7	<u> </u>	55.1	(74)
North 0.9x	0.54	x	2.8	3	×	24.19	x	0.8	5	i x i	0.7	<u> </u>	59.39	(74)
North 0.9x	0.54	x	3.	1	x [13.12	x	0.7	2	j × [0.7	<u> </u>	29.88	(74)
	-				-		-			_				

North		_		,						ı				_
North	North	0.9x	0.54	X	2.83	X	13.12	X	0.85	X	0.7	=	32.2	(74)
South		0.9x	0.54	X	3.1	X	8.86	X	0.72	X	0.7	=	20.19	(74)
South		0.9x	0.54	X	2.83	X	8.86	X	0.85	X	0.7	=	21.76	(74)
South 0.9% 0.3 x 1.5 x 76.57 x 0.85 x 0.7 = 36.9 (78) South 0.9% 1 x 5.13 x 76.57 x 0.85 x 0.7 = 210.34 (78) South 0.9% 1 x 5.13 x 97.53 x 0.85 x 0.7 = 210.34 (78) South 0.9% 0.3 x 1.5 x 97.53 x 0.85 x 0.7 = 267.44 (78) South 0.9% 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 267.44 (78) South 0.9% 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 363.33 (78) South 0.9% 1 x 5.13 x 110.23 x 0.85 x 0.7 = 362.83 (78) South 0.9% 1 x 5.13 x 110.23 x 0.85 x 0.7 = 362.83 (78) South 0.9% 1 x 5.13 x 110.23 x 0.85 x 0.7 = 362.83 (78) South 0.9% 1 x 5.13 x 114.87 x 0.85 x 0.7 = 363.28 (78) South 0.9% 1 x 5.13 x 114.87 x 0.85 x 0.7 = 363.28 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 110.55 x 0.85 x 0.7 = 332.83 (78) South 0.9% 1 x 5.13 x 108.01 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 108.01 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 1 x 5.13 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 286.72 (78) South 0.9% 0.3 x 1.5 x 104.89	South	0.9x	0.3	X	1.5	X	46.75	X	0.85	X	0.7	=	22.53	(78)
South 0.9x 1	South	0.9x	1	X	5.13	X	46.75	X	0.85	X	0.7	=	128.43	(78)
South 0.9x	South	0.9x	0.3	X	1.5	x	76.57	X	0.85	X	0.7	=	36.9	(78)
South 0.9x 1 x 5.13 x 97.53 x 0.85 x 0.7 = 267.94 (78) South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 302.83 (78) South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 302.83 (78) South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 315.56 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 303.69 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 303.69 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 205.26 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 206.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 226.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 226.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.16 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.16 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.16 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.3 x 1.5 x 0.40.4 x 0.85 x 0.7 = 228.73 (78) South 0.9x 0.5 x 0.5 x 0.5 x 0.5 x 0.7 = 228.73 (78) South 0.9x 0.5 x 0.5 x 0.5 x 0.5 x 0.7 = 228.73 (78) South 0.9x 0.5 x 0.5 x 0.5 x 0.5 x	South	0.9x	1	X	5.13	X	76.57	X	0.85	x	0.7	=	210.34	(78)
South 0.9x 0.3 x 1.5 x 110.23 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 114.87 x 0.85 x 0.7 = 55.36 (78) South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 315.56 (78) South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 110.56 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 110.56 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 106.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 106.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 298.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 298.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 229.89 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 5.42 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 5.42 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 5.42 x 0.85 x 0.7 = 228.71 (78) South 0.9x 1 x 5.13 x 64.4 x 62.67 x 0.85 x 0.7 = 228.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 227.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 23.72 (79) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 50.33 (72) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 50.33 (72) Southwesto, 9x 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 50.33 (72)	South	0.9x	0.3	X	1.5	X	97.53	X	0.85	X	0.7	=	47.01	(78)
South 0.9x	South	0.9x	1	X	5.13	X	97.53	X	0.85	X	0.7	=	267.94	(78)
South 0.9x 0.3	South	0.9x	0.3	X	1.5	x	110.23	x	0.85	X	0.7	=	53.13	(78)
South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 1 x 5.13 x 108.01 x 0.85 x 0.7 = 296.72 (78) South 0.9x 1 x 5.13 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 119.47 (78) South 0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 177.45 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 177.45 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 227.2 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 227.2 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 227.2 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79)	South	0.9x	1	x	5.13	x	110.23	x	0.85	X	0.7	=	302.83	(78)
South 0.9x 0.3 x 1.5 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 53.28 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 296.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 226.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 283.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 56.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 1.64 x 85.75 0.85 x 0.7 = 50.39 (79)	South	0.9x	0.3	X	1.5	x	114.87	x	0.85	X	0.7] =	55.36	(78)
South 0.9x 1 x 5.13 x 110.55 x 0.85 x 0.7 = 303.69 (78) South 0.9x 0.3 x 1.5 x 108.01 x 0.85 x 0.7 = 52.06 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 296.72 (78) South 0.9x 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9x 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 0.3 x 1.6 x 36.79 0.85 x 0.7 = 110.98 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 110.98 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 229.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 50.39 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 50.39 (79)	South	0.9x	1	x	5.13	x	114.87	x	0.85	x	0.7	=	315.56	(78)
South 0.9x 0.3	South	0.9x	0.3	X	1.5	x	110.55	x	0.85	x	0.7	=	53.28	(78)
South 0.9× 1 x 5.13 x 108.01 x 0.85 x 0.7 = 296.72 (78) South 0.9× 0.3 x 1.5 x 104.89 x 0.85 x 0.7 = 298.16 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 288.16 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9× 0.3 x 1.5 x 82.59 x 0.85 x 0.7 = 279.89 (78) South 0.9× 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 226.87 (78) South 0.9× 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 152.24 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 0.54 x 1.64 x 36.79 x 0.85 x 0.7 = 110.98 (78) Southwesto.9× 0.54 x 1.64 x 36.79 x 0.85 x 0.7 = 25.54 (79) Southwesto.9× 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 x 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 40.67 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 1.64 x 85.75 x 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 1.64 x 106.25 x 0.85 x 0.7 = 50.39 (79)	South	0.9x	1	x	5.13	x	110.55	x	0.85	x	0.7] =	303.69	(78)
South 0.9× 0.3 x 5.13 x 104.89 x 0.85 x 0.7 = 288.16 (78) South 0.9× 1 x 5.13 x 101.89 x 0.85 x 0.7 = 298.81 (78) South 0.9× 0.3 x 1.5 x 101.89 x 0.85 x 0.7 = 298.81 (78) South 0.9× 1 x 5.13 x 101.89 x 0.85 x 0.7 = 299.72 (79) South 0.9× 1 x 5.13 x 101.89 x 0.85 x 0.7 = 226.87 (78) South 0.9× 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9× 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9× 1 x 5.13 x 82.59 x 0.85 x 0.7 = 26.71 (78) South 0.9× 1 x 5.13 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9× 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9× 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 40.67 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 59.51 (79) Southwesto.9× 0.54 x 1.64 x 62.67 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9× 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79)	South	0.9x	0.3	x	1.5	x	108.01	x	0.85	x	0.7	=	52.06	(78)
South 0.9x 1	South	0.9x	1	X	5.13	X	108.01	x	0.85	X	0.7	=	296.72	(78)
South 0.9x 0.3	South	0.9x	0.3	x	1.5	X	104.89	Х	0.85	X	0.7	=	50.55	(78)
South 0.9x 1 x 5.13 x 101.89 x 0.85 x 0.7 = 279.89 (78) South 0.9x 0.3 x 1.6 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 226.87 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 152.24 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85	South	0.9x	1	x	5.13	х	104.89	x	0.85	x	0.7	=	288.16	(78)
South 0.9x 0.3	South	0.9x	0.3	x	1.5	х	101.89	x	0.85	x	0.7	=	49.1	(78)
South 0.9x 1 x 5.13 x 82.59 x 0.85 x 0.7 = 226.87 (78) South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 110.98 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 36.79 0.85 x 0.7 = 25.54 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79)	South	0.9x	1	x	5.13	X	101.89	x	0.85	x	0.7	=	279.89	(78)
South 0.9x 0.3 x 1.5 x 55.42 x 0.85 x 0.7 = 26.71 (78) South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 19.47 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = <th< td=""><td>South</td><td>0.9x</td><td>0.3</td><td>x</td><td>1.5</td><td>x</td><td>82.59</td><td>Х</td><td>0.85</td><td>x</td><td>0.7</td><td>=</td><td>39.8</td><td>(78)</td></th<>	South	0.9x	0.3	x	1.5	x	82.59	Х	0.85	x	0.7	=	39.8	(78)
South 0.9x 1 x 5.13 x 55.42 x 0.85 x 0.7 = 152.24 (78) South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South (0.9x) 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79)	South	0.9x	1	x	5.13	x	82.59	X	0.85	x	0.7	=	226.87	(78)
South 0.9x 0.3 x 1.5 x 40.4 x 0.85 x 0.7 = 19.47 (78) South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest0.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest0.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 43.5 (79) Southwest0.9x	South	0.9x	0.3	x	1.5	х	55.42	x	0.85	x	0.7	=	26.71	(78)
South 0.9x 1 x 5.13 x 40.4 x 0.85 x 0.7 = 110.98 (78) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto,9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto,9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto,9x	South	0.9x	1	X	5.13	X	55.42	X	0.85	X	0.7	=	152.24	(78)
Southwest _{0.9x} 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest _{0.9x} 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwest _{0.9x} 0.54 x 2.4 x 36.79 0.85 x 0.7 = 25.54 (79) Southwest _{0.9x} 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest _{0.9x} 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest _{0.9x} 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwest _{0.9x} 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest _{0.9x} 0.54	South	0.9x	0.3	X	1.5	X	40.4	x	0.85	X	0.7	=	19.47	(78)
Southwesto.9x 0.54 x 1.64 x 36.79 0.85 x 0.7 = 17.45 (79) Southwesto.9x 0.54 x 2.4 x 36.79 0.85 x 0.7 = 25.54 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x <td></td> <td>ᆫ</td> <td>1</td> <td>X</td> <td>5.13</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.85</td> <td>x</td> <td>0.7</td> <td>=</td> <td>110.98</td> <td>(78)</td>		ᆫ	1	X	5.13	X	40.4	X	0.85	x	0.7	=	110.98	(78)
Southwesto.9x 0.54 x 2.4 x 36.79 0.85 x 0.7 = 25.54 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x	Southwe	st _{0.9x}	0.54	X	1.64	X	36.79]	0.85	X	0.7	=	17.45	(79)
Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x	Southwe	st _{0.9x}	0.54	X	1.64	X	36.79]	0.85	X	0.7	=	17.45	(79)
Southwesto.9x 0.54 x 1.64 x 62.67 0.85 x 0.7 = 29.72 (79) Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x <td>Southwe</td> <td>st_{0.9x}</td> <td>0.54</td> <td>X</td> <td>2.4</td> <td>x</td> <td>36.79</td> <td>]</td> <td>0.85</td> <td>X</td> <td>0.7</td> <td>=</td> <td>25.54</td> <td>(79)</td>	Southwe	st _{0.9x}	0.54	X	2.4	x	36.79]	0.85	X	0.7	=	25.54	(79)
Southwesto.9x 0.54 x 2.4 x 62.67 0.85 x 0.7 = 43.5 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwesto.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwesto.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 50.39 (79)	Southwe	st _{0.9x}	0.54	X	1.64	X	62.67]	0.85	X	0.7	=	29.72	(79)
Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	X	1.64	X	62.67]	0.85	X	0.7	=	29.72	(79)
Southwest0.9x 0.54 x 1.64 x 85.75 0.85 x 0.7 = 40.67 (79) Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	X	2.4	x	62.67]	0.85	x	0.7	=	43.5	(79)
Southwest0.9x 0.54 x 2.4 x 85.75 0.85 x 0.7 = 59.51 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	x	1.64	x	85.75]	0.85	X	0.7	=	40.67	(79)
Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest0.9x 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	X	1.64	x	85.75]	0.85	X	0.7] =	40.67	(79)
Southwest _{0.9x} 0.54 x 1.64 x 106.25 0.85 x 0.7 = 50.39 (79) Southwest _{0.9x} 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	x	2.4	x	85.75]	0.85	x	0.7] =	59.51	(79)
Southwest _{0.9x} 0.54 x 2.4 x 106.25 0.85 x 0.7 = 73.74 (79)	Southwe	st _{0.9x}	0.54	x	1.64	x	106.25]	0.85	x	0.7] =	50.39	(79)
	Southwe	st _{0.9x}	0.54	x	1.64	x	106.25]	0.85	x	0.7	=	50.39	(79)
Southwest $0.9x$ 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.55 0.54 0.7 0.85 0.85 0	Southwe	st _{0.9x}	0.54	x	2.4	x	106.25]	0.85	x	0.7	=	73.74	(79)
0.00 \ \ \ 0.01 \ \ 0.044 \ \ (107)	Southwe	st _{0.9x}	0.54	x	1.64	x	119.01]	0.85	x	0.7] =	56.44	(79)
Southwest _{0.9x} 0.54 x 1.64 x 119.01 0.85 x 0.7 = 56.44 (79)	Southwe	st _{0.9x}	0.54	X	1.64	X	119.01]	0.85	x	0.7	=	56.44	(79)

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Southwest _{0.9x}	0.54	X	2.4	X	119.01	 	0.85	X	0.7	=	82.59	(79)
Southwest _{0.9x}	0.54	X	1.64	X	118.15	 	0.85	X	0.7	=	56.03	<u> </u> (79)
Southwest _{0.9x}	0.54	X	1.64	X	118.15] i	0.85	X	0.7	=	56.03	<u> </u> (79)
Southwest _{0.9x}	0.54	X	2.4	X	118.15		0.85	X	0.7	=	82	<u> </u> (79)
Southwest _{0.9x}	0.54	X	1.64	X	113.91		0.85	X	0.7	=	54.02	(79)
Southwest _{0.9x}	0.54	X	1.64	X	113.91	<u> </u>	0.85	X	0.7	=	54.02	(79)
Southwest _{0.9x}	0.54	X	2.4	X	113.91		0.85	X	0.7	=	79.05	(79)
Southwest _{0.9x}	0.54	X	1.64	X	104.39	[0.85	X	0.7	=	49.51	(79)
Southwest _{0.9x}	0.54	X	1.64	X	104.39		0.85	X	0.7	=	49.51	(79)
Southwest _{0.9x}	0.54	X	2.4	X	104.39		0.85	X	0.7	=	72.45	(79)
Southwest _{0.9x}	0.54	X	1.64	X	92.85		0.85	X	0.7	=	44.03	(79)
Southwest _{0.9x}	0.54	X	1.64	X	92.85		0.85	X	0.7	=	44.03	(79)
Southwest _{0.9x}	0.54	X	2.4	x	92.85		0.85	X	0.7	=	64.44	(79)
Southwest _{0.9x}	0.54	x	1.64	x	69.27		0.85	X	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	X	1.64	X	69.27		0.85	X	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	X	2.4	x	69.27		0.85	X	0.7	=	48.07	(79)
Southwest _{0.9x}	0.54	X	1.64	X	44.07		0.85	X	0.7	=	20.9	(79)
Southwest _{0.9x}	0.54	X	1.64	X	44.07		0.85	X	0.7	=	20.9	(79)
Southwest _{0.9x}	0.54	x	2.4	x	44.07		0.85	x	0.7	=	30.59	(79)
Southwest _{0.9x}	0.54	x	1.64	х	31.49		0.85	x	0.7	=	14.93	(79)
Southwest _{0.9x}	0.54	x	1.64	x	31.49		0.85	x	0.7	=	14.93	(79)
Southwest _{0.9x}	0.54	x	2.4	x	31.49		0.85	x	0.7	=	21.85	(79)
West 0.9x	0.54	x	1.64	x	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	1.64	х	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	0.83	X	19.64	X	0.85	X	0.7	=	4.71	(80)
West 0.9x	0.54	X	2.4	X	19.64	X	0.85	X	0.7	=	13.63	(80)
West 0.9x	0.54	X	1.64	x	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	0.83	X	38.42	X	0.85	X	0.7	=	9.22	(80)
West 0.9x	0.54	X	2.4	x	38.42	X	0.85	X	0.7	=	26.66	(80)
West 0.9x	0.54	X	1.64	X	63.27	X	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	1.64	X	63.27	X	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	0.83	x	63.27	X	0.85	X	0.7	=	15.19	(80)
West 0.9x	0.54	X	2.4	x	63.27	X	0.85	X	0.7	=	43.91	(80)
West 0.9x	0.54	x	1.64	x	92.28	x	0.85	x	0.7	=	43.76	(80)
West 0.9x	0.54	X	1.64	x	92.28	x	0.85	X	0.7	=	43.76	(80)
West 0.9x	0.54	x	0.83	x	92.28	x	0.85	X	0.7	=	22.15	(80)
West 0.9x	0.54	X	2.4	x	92.28	x	0.85	x	0.7	=	64.04	(80)
West 0.9x	0.54	x	1.64	x	113.09	x	0.85	x	0.7	=	53.63	(80)
West 0.9x	0.54	x	1.64	x	113.09	x	0.85	x	0.7	j =	53.63	(80)
West 0.9x	0.54	x	0.83	x	113.09	x	0.85	X	0.7	=	27.14	(80)
_				_								_

	_		,						ı				_
	.9x	0.54	X	2.4	X	113.09	X	0.85	X	0.7	=	78.49	(80)
West 0	.9x	0.54	X	1.64	X	115.77	X	0.85	X	0.7	=	54.9	(80)
	.9x	0.54	X	1.64	X	115.77	X	0.85	X	0.7	=	54.9	(80)
West 0	.9x	0.54	X	0.83	X	115.77	x	0.85	X	0.7	=	27.79	(80)
West 0	.9x	0.54	X	2.4	X	115.77	X	0.85	X	0.7	=	80.35	(80)
West 0	.9x	0.54	x	1.64	x	110.22	X	0.85	x	0.7	=	52.27	(80)
West 0	.9x	0.54	X	1.64	X	110.22	X	0.85	x	0.7	=	52.27	(80)
West 0	.9x	0.54	X	0.83	X	110.22	X	0.85	X	0.7	=	26.45	(80)
West 0	.9x	0.54	X	2.4	X	110.22	X	0.85	X	0.7	=	76.49	(80)
West 0	.9x	0.54	X	1.64	x	94.68	X	0.85	X	0.7	=	44.9	(80)
West 0	.9x	0.54	X	1.64	X	94.68	X	0.85	X	0.7	=	44.9	(80)
West 0	.9x	0.54	X	0.83	X	94.68	X	0.85	X	0.7	=	22.72	(80)
West 0	.9x	0.54	x	2.4	x	94.68	x	0.85	x	0.7	=	65.71	(80)
West 0	.9x	0.54	x	1.64	x	73.59	x	0.85	x	0.7	=	34.9	(80)
West 0	.9x	0.54	x	1.64	x	73.59	x	0.85	x	0.7	=	34.9	(80)
West 0	.9x	0.54	x	0.83	x	73.59	x	0.85	x	0.7	=	17.66	(80)
West 0	.9x	0.54	X	2.4	x	73.59	x	0.85	x	0.7	=	51.07	(80)
West 0	.9x	0.54	X	1.64	X	45.59	Х	0.85	X	0.7	=	21.62	(80)
West 0	.9x	0.54	x	1.64	x	45.59	x	0.85	x	0.7	=	21.62	(80)
West 0	.9x	0.54	x	0.83	х	45.59] x	0.85	x	0.7	=	10.94	(80)
West 0	.9x	0.54	x	2.4	x	45.59	x	0.85	x	0.7	=	31.64	(80)
West 0	.9x	0.54] x	1.64	x	24.49	Х	0.85	x	0.7	=	11.61	(80)
West 0	.9x	0.54	x	1.64	x	24.49	x	0.85	x	0.7	=	11.61	(80)
West 0	.9x	0.54	X	0.83	х	24.49	X	0.85	X	0.7	=	5.88	(80)
West 0	.9x	0.54	X	2.4	X	24.49	X	0.85	X	0.7	=	17	(80)
West 0	.9x	0.54	X	1.64	X	16.15	x	0.85	X	0.7	=	7.66	(80)
West 0	.9x	0.54	X	1.64	x	16.15	x	0.85	x	0.7	=	7.66	(80)
West 0	.9x	0.54	X	0.83	X	16.15	x	0.85	X	0.7	=	3.88	(80)
West 0	.9x	0.54	X	2.4	X	16.15	X	0.85	X	0.7	=	11.21	(80)
Northwest 0	.9x	0.54	X	1.64	x	11.28	x	0.85	x	0.7	=	5.35	(81)
Northwest 0	.9x	0.54	X	2.4	x	11.28	X	0.85	X	0.7	=	7.83	(81)
Northwest 0	.9x	0.54	X	1.64	X	22.97	x	0.85	X	0.7	=	10.89	(81)
Northwest 0	.9x	0.54	X	2.4	x	22.97	x	0.85	x	0.7	=	15.94	(81)
Northwest 0	.9x	0.54	X	1.64	x	41.38	x	0.85	x	0.7	=	19.62	(81)
Northwest 0	.9x	0.54	x	2.4	x	41.38	x	0.85	x	0.7	=	28.72	(81)
Northwest 0	.9x	0.54	×	1.64	x	67.96	x	0.85	X	0.7	=	32.23	(81)
Northwest 0	.9x	0.54	×	2.4	x	67.96	x	0.85	X	0.7] =	47.16	(81)
Northwest 0	.9x	0.54	×	1.64	x	91.35	x	0.85	X	0.7	<u> </u>	43.32	(81)
Northwest 0	.9x	0.54	×	2.4	x	91.35	x	0.85	x	0.7] =	63.39	(81)
Northwest 0	.9x	0.54	x	1.64	x	97.38	x	0.85	X	0.7	=	46.18	(81)
Northwest 0	.9x	0.54	X	2.4	x	97.38	x	0.85	X	0.7	=	67.59	(81)

Northwest [
Northwest _{0.9x}	0.54	X	1.6	64	x	91.1	X		0.85	x	0.7	=	43.2	(81)
Northwest _{0.9x}	0.54	X	2.4	4	x	91.1	x		0.85	x	0.7	=	63.22	(81)
Northwest _{0.9x}	0.54	X	1.6	64	x	72.63	x		0.85	x	0.7	=	34.44	(81)
Northwest _{0.9x}	0.54	X	2.4	4	x	72.63	x		0.85	x	0.7	=	50.4	(81)
Northwest _{0.9x}	0.54	x	1.6	64	x	50.42	x		0.85	_ x _	0.7	_ =	23.91	(81)
Northwest _{0.9x}	0.54	х	2.4	4	x	50.42	x		0.85	_ x [0.7	=	34.99	(81)
Northwest 0.9x	0.54	x	1.6	64	x	28.07	x		0.85	_ x [0.7	=	13.31	(81)
Northwest _{0.9x}	0.54	x	2.4	4	x	28.07	x		0.85	_ x [0.7		19.48	(81)
Northwest _{0.9x}	0.54	x	1.6	64	x	14.2	x		0.85	_ x [0.7	_ =	6.73	(81)
Northwest 0.9x	0.54	x	2.4	4	x	14.2	x		0.85	_ × [0.7	-	9.85	(81)
Northwest _{0.9x}	0.54	x	1.6	64	x \square	9.21	x		0.85	_ × [0.7		4.37	(81)
Northwest _{0.9x}	0.54	x	2.4	4	x	9.21	X		0.85	x	0.7	=	6.39	(81)
Solar gains in v (83)m= 311.88 Total gains – ir	545.52	786.68	1046.09	1239.64	1261.				m(74)m . 875.44	(82)m 613.55	376.1	265.29		(83)
	1844.78				2300.	_	2070	79 /	1936.38	1746.98	1589.34	1540.9		(84)
` '						02 2200.70	2070	<i></i> , 0	1000.00	17 40.00	1000.04	1040.0		(= -)
7. Mean interr			<u>` </u>			, -		T. 4	(0.0)	-		_		
Temperature							ble 9,	, Ih1	(°C)				21	(85)
Util <mark>isatio</mark> n fact									0	0 1				
Jan	Feb	Mar	Apr	May	Ju		_	ug	Sep	Oct	Nov	Dec		(96)
(86)m= 1	1	1	0.99	0.98	0.95	0.88	0.9	,,	0.97	0.99	1	1		(86)
Me <mark>an int</mark> ernal						i e	_							
(87)m= 18.62	18.78	19.09	19.56	20.03	20.4	9 20.75	20.7	71	20.34	19.73	19.13	18.63		(87)
Temperature	during h	eating p	eriods ir	rest of	dwelli	ng from Ta	able 9	9, Th2	2 (°C)					
(88)m= 19.32	19.33	19.33	19.37	19.38	19.4	1 19.41	19.4	41	19.4	19.38	19.36	19.35		(88)
Utilisation fact	tor for ga	ains for r	est of d	welling,	h2,m	(see Table	9a)							
(89)m= 1	1	1	0.99	0.97	0.89	0.73	0.7	'8	0.95	0.99	1	1		(89)
Mean internal	tempera	ature in t	the rest	of dwell	ina T2	(follow ste	eps 3	to 7	in Tabl	e 9c)	-		•	
(90)m= 16.24	16.47	16.93	17.64	18.33	18.9		19.2		18.78	17.9	17	16.27		(90)
								-	f	LA = Livir	ng area ÷ (4	1) =	0.14	(91)
Mean internal	tompor	aturo (fo	r tha wh	olo dwo	lling) .	_ fl Λ ∨ T1	⊥ /1 .	fΙ_Λ	.\ ∨ T2					
(92)m= 16.57	16.8	17.24	17.91	18.57	19.2		19.4		19	18.16	17.3	16.6		(92)
Apply adjustm					<u> </u>							1010		, ,
(93)m= 16.57	16.8	17.24	17.91	18.57	19.2		19.4		19	18.16	17.3	16.6		(93)
8. Space heat	ting requ	irement												
Set Ti to the n				e obtair	ned at	step 11 of	Tabl	e 9b,	so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation			•							·			1	
Jan	Feb	Mar	Apr	May	Ju	n Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fact							1						1	40.00
(94)m= 1	1	0.99	0.98	0.96	0.88	0.74	0.7	78	0.93	0.99	1	1		(94)
Useful gains,		<u>`</u>	<u> </u>		2000	0E 4000 77	4005	- 1	1000 05	1700.00	1500 15	1507.40	1	(OF)
(95)m= 1615.63	1836.42	2022.37	2186.19	2239.42	2030.	95 1630.77	1625	0.39 ^	1808.05	1720.88	1582.15	1537.43		(95)

Mont	alv ovor	ogo ovto	ernal tem	porotur	from T	oblo 0								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	e for mea			ļ		<u> </u>	x [(93)m	– (96)m	1				, ,
						3196.17		 	<u> </u>	5383.88	7344.55	9024.58		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	m – (95	5)m] x (4	1)m		l	
(98)m=	5594.13	4682.67	4374.57	3072.41	1975.36	0	0	0	0	2725.28	4148.93	5570.44		
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	32143.8	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								87.32	(99)
8c. S	pace co	oling rec	quiremer	nt										
Calcu	lated fo	r June, c	July and	August.	See Tal	ble 10b				1	1		ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ĭ					r		r -		able 10)	1	(400)
(100)m=		0	0	0	0	6533.46	5143.36	5258.13	0	0	0	0		(100)
(101)m=		tor for lo	oss nm	0	0	0.39	0.46	0.43	0	0	0	0		(101)
	L	<u> </u>	l				0.40	0.43	U			0		(101)
(102)m=		0	0	0	0	2537.45	2384.52	2238.54	0	0	0	0		(102)
Gains	s (solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)	ļ	<u> </u>			
(103)m=	0	0	0	0	0	2603.99	2494.61	2316.32	0	0	0	0		(103)
						dwelling,	continu	ous (kW	h) = 0.0	24 x [(10)3)m – (102)m] x	x (41)m	
,			(104)m <	<u> </u>										
(104)m=	0	0	0	0	0	0	0	0	0 Tota	0 I = Sum(0	0	0	(104)
Cooled	d fraction	n								cooled	1 '	= 1) =	0.38	(104)
			able 10b)						ooolog .	. (''	0.00	`
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
						•		•	Tota	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n						_
(107)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
									Tota	I = Sum((1,0,7)	=	0	(107)
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107) ÷ (4) =			0	(108)
9b. En	ergy red	quiremer	nts – Cor	mmunity	heating	scheme	;							
				•		_		ting prov	•		unity sch	neme.	2.4	7(204)
	•			•		•		(Table 1	1) 0 11 11	one			0.1	(301)
	•			•	•	1 – (30	,						0.9	(302)
	-							allows for See Apper		up to four	other heat	sources; ti	he latter	
			Commun			rom power	otationo.	000 / Ippol	raix o.				1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	0.9	(304a)
Factor	for cont	trol and	charging	method	(Table	4c(3)) fo	r commi	unity hea	iting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m					1.05	(306)
	heating		•	,		-							kWh/yea	
-		_	requiren	nent									32143.8	٦
														_

Space heat from Community boilers		(98) x (304a) x (305) x (306) =	30375.89	(307a)
Efficiency of secondary/supplementar	ry heating system in % (from Tab	le 4a or Appendix E)	65	(308
Space heating requirement from second	ondary/supplementary system	(98) x (301) x 100 ÷ (308) =	4945.2	(309)
Water heating				
Annual water heating requirement			4084.59	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	4288.82	(310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e) + (310a)(310e)] =	346.65	(313)
Cooling System Energy Efficiency Ra	tio		4.38	(314)
Space cooling (if there is a fixed cooli	ng system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within one mechanical ventilation - balanced, extended to the control of the con		e	0	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appe	endix L)		907.39	(332)
10b. Fuel costs – Community heatin	g scheme			
Space heating from CHP Space heating (secondary) Water heating from CHP	Fuel kWh/year (307a) x (309) x (310a) x	Fuel Price (Table 12) 4.24	Fuel Cost £/year 1287.94 260.12	(340a) (341) (342a)
· ·		Fuel Price		」 ` ′
Pumps and fans	(331)	13.19 x 0.01 =	0	(349)
Energy for lighting	(332)	13.19 x 0.01 =	119.68	(350)
Additional standing charges (Table 12	2)		120	(351)
Total energy cost	= (340a)(342e) + (345)(354) =		1969.59	(355)
11b. SAP rating - Community heatin	g scheme			
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		2	(357)
SAP rating (section12)			72.07	(358)
12b. CO2 Emissions – Community he	eating scheme			
		nergy Emission factor Nh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)		els repeat (363) to (366) for the second fue	91	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x 0	8228.11	(367)
Electrical energy for heat distribution	[(313) x	0.52	179.91	(372)

Total CO2 associated with community s	systems	(363)(366) + (368)(372)	=	8408.02	(373)
CO2 associated with space heating (se	econdary)	(309) x	0.04	=	192.86	(374)
CO2 associated with water from immer	sion heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			8600.88	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	=	470.94	(379)
Total CO2, kg/year	sum of (376)(382) =				9071.82	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				24.64	(384)
El rating (section 14)				Ī	70.57	(385)
13b. Primary Energy – Community hea	ting scheme					
		Energy	Primary	Ρ.	Energy	
		1 1 A / 1 . /	factor	LeV	Vh/year	
		kWh/year	factor	KV	vii/yeai	
Energy from other sources of space an Efficiency of heat source 1 (%)		•			91	(367a)
•	If there is CHP us	HP)				(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP us	HP) ing two fuels repeat (363) to (366) for the secon	nd fuel	91	」`
Efficiency of heat source 1 (%) Energy associated with heat source 1	If there is CHP us	HP) ing two fuels repeat (363) to ()+(310b)] x 100 ÷ (367b) x	0	nd fuel =	91 46473.57	367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution	If there is CHP us [(307b	HP) ing two fuels repeat (363) to (367b) x [(313) x (363)(366) + (368)(372)	0 0	ad fuel =	91 46473.57 1064.21	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community	If there is CHP us [(307b ty systems ess specified otherwise	HP) ing two fuels repeat (363) to (367b) x [(313) x (363)(366) + (368)(372)	0 0	ad fuel =	91 46473.57 1064.21 47537.78	(367) (372) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communit if it is negative set (373) to zero (unle	If there is CHP us [(307b ty systems ess specified otherwise (secondary)	HP) ing two fuels repeat (363) to (367b) x [(313) x (363)(366) + (368)(372 , see C7 in Appendix C, (309) x	366) for the secon	ed fuel	91 46473.57 1064.21 47537.78 47537.78	(367) (372) (373) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communit if it is negative set (373) to zero (unlet Energy associated with space heating in the source of the sou	If there is CHP us [(307b ty systems ess specified otherwise, (secondary) nersion heater or instan	HP) ing two fuels repeat (363) to (367b) x [(313) x (363)(366) + (368)(372 , see C7 in Appendix C, (309) x	0 0 1.26	and fuel	91 46473.57 1064.21 47537.78 47537.78 6230.95	(367) (372) (373) (373) (374)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communit if it is negative set (373) to zero (unle Energy associated with space heating of Energy associated with water from imm	If there is CHP us [(307b ty systems ess specified otherwise, (secondary) nersion heater or instan	HP) ing two fuels repeat (363) to (367b) x [(313) x (363)(366) + (368)(372) see C7 in Appendix C (309) x staneous heater(312) x	0 0 1.26	and fuel	91 46473.57 1064.21 47537.78 47537.78 6230.95	(367) (372) (373) (373) (374) (375)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communit if it is negative set (373) to zero (unle Energy associated with space heating to Energy associated with water from immortal Energy associated with space and	If there is CHP us [(307b) ty systems ess specified otherwise (secondary) nersion heater or instand d water heating	HP) ing two fuels repeat (363) to (367b) x [(313) x (363)(366) + (368)(372) , see C7 in Appendix C, (309) x ataneous heater(312) x (373) + (374) + (375) = (315) x	0 0 1.26 1.22	= = = =	91 46473.57 1064.21 47537.78 47537.78 6230.95 0 53768.73	(367) (372) (373) (373) (374) (375) (376)

sum of (376)...(382) =

Total Primary Energy, kWh/year

56554.42

(383)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Strom Softwa	are Vei			Versio	n: 1.0.1.24	
Address		Property A	Address	: Flat 1					
Address: 1. Overall dwelling dimer	nsions:								
1. Overall aweiling aimer	Volume(m³)								
Basement			a(m²) 5.75	(1a) x	Av. He	3.1	(2a) =	172.82	(3a)
Ground floor		15	56.34	(1b) x	2	2.6	(2b) =	406.48	(3b)
First floor		15	56.01	(1c) x	3	.28	(2c) =	511.71] (3c)
Total floor area TFA = (1a	u)+(1b)+(1c)+(1d)+(1e)+(1	n) 3	68.1	(4)			J ` ′		_1` ′
Dwelling volume)+(3c)+(3d)+(3e)+	.(3n) =	1091.02	(5)
2. Ventilation rate:									
2. Volidianon rato.	main seconda heating heating	ıry	other		total			m³ per hour	
Number of chimneys	heating heating 0 + 1	- + -	1] = [2	X e	40 =	80	(6a)
Number of open flues	0 + 0	- + -	0	Ī = [0	x :	20 =	0	(6b)
Number of intermittent far	ns				6	x	10 =	60	(7a)
Number of passive vents				Ì	0	x	10 =	0	(7b)
Number of flueless gas fir	es			\	0	X ·	40 =	0	(7c)
	s, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b				140		Air ch ÷ (5) =	oanges per ho	ur [(8)
Number of storeys in th	•	ea 10 (17), t	Jiriei wise (conunue n	om (9) to (10)		0	(9)
Additional infiltration	3 (1)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber frame of	r 0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding t	to the great	er wall are	a (after			·		_
= :	oor, enter 0.2 (unsealed) or (0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic metr	es per ho	our per s	quare m	etre of e	nvelope	area	15	(17)
If based on air permeabilit	ty value, then (18) = [(17) ÷ 20]+	(8), otherwi	ise (18) = ((16)				0.88	(18)
Air permeability value applies	if a pressurisation test has been do	one or a deg	gree air pe	rmeability	is being us	sed	'		_
Number of sides sheltered	d							4	(19)
Shelter factor			(20) = 1 -		9)] =			0.7	(20)
Infiltration rate incorporati			(21) = (18) x (20) =				0.61	(21)
Infiltration rate modified for	- 1 		l .					l	
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		1	l					1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a) m	Wind Factor (22a)m = (22)m	÷ 4											
Calculate of Fine Curve air change rate for the application without heat recovery (MVHR) (24b)m = (22b)m + (23b) × (23b) × (24b)m = (24b)m + 0.5 × (23b) + (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b)m + (23b) × (24b)m + (23b)			1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Calculate of Fine Curve air change rate for the application without heat recovery (MVHR) (24b)m = (22b)m + (23b) × (23b) × (24b)m = (24b)m + 0.5 × (23b) + (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b) × (23b) × (24b)m + (23b)m + (23b) × (24b)m + (23b)						(0.4.)	(22.)		Į.	ļ.	1		
Caclouiste effective air change rate for the applicable case	·			ı —	` 	`	ì ´	0.66	0.60	0.70	1		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) \					l	0.57	0.61	0.00	0.69	0.72]		
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m = (0.0	If mechanical ventilation:											0	(23a)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) + 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	If exhaust air heat pump using A	opendix N, (2	23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)				0	(23b)
C4a m	If balanced with heat recovery: e	fficiency in %	allowing f	or in-use f	actor (from	n Table 4h) =					0	(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1		·	- 	- ` ` - 	ŕ	, 		``) ÷ 100]	
Cation				<u> </u>		<u> </u>				0]		(24a)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1		i	- 	- ` ` 	i `	r ´ `			1		(245)
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				<u> </u>				0	0	0]		(240)
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,		•	-				5 x (23h)				
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] [24d)m					<u> </u>	ŕ		<u> </u>		0	1		(24c)
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m 0.81 0.8 0.78 0.73 0.72 0.67 0.67 0.66 0.69 0.72 0.74 0.76 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m = 0.81 0.8 0.78 0.73 0.72 0.67 0.67 0.66 0.69 0.72 0.74 0.76 (25) 3. Heat losses and heat loss parameter ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 1.64 x 2 = 4.2 Windows Type 1 Windows Type 2 1.64 x 1/1/(4.5) + 0.04] = 5.72 Windows Type 5 1.64 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 6 0.83 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 8 3.1 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 9 5.13 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 9 5.13 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 9 5.13 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 1 2.4 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 1 2.4 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 1 2.4 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 1 2.4 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 1 2.4 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 10 2.4 x 1/1/(4.5) + 0.04] = 6.25 (27) Windows Type 10 2.4 x 1/1/(4.5) + 0.04] = 9.15 (27) Windows Type 13 2.83 x 1/1/(4.5) + 0.04] = 9.15 (28)		vhole hous	se positiv	/e input	ventilatio	on from I	oft	<u> </u>		<u> </u>	1		
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.81								0.5]			_		
Capacitage Cap	(24d)m= 0.81 0.8 0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(24d)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Doenings area (m²) Parameter: Openings area (m²) Parameter: A x W W/m2K W/m2K W/m2K W/m² W/	Effective air change rate -	enter (24a	a) or (24b	o) or (24	c) or (24	d) in box	(25)				,		
ELEMENT Gross area (m²) Openings m² Net Area A ,m² U-value W/m2K A X U (W/K) k-value kJ/m²-k A X k kJ/k Doors Type 1 2.1 x 2 = 4.2 (26) Windows Type 2 1.64 x 2 = 3.28 (26) Windows Type 3 1.5 x1/[1/(4.5) + 0.04] = 5.72 (27) Windows Type 3 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 4 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 5 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 6 0.83 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 8 3.1 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 9 5.13 x1/[1/(4.8) + 0.04] = 2.066 (27) Windows Type 10 2.4 x1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 12 2.4 x1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 13 </td <td>(25)m= 0.81 0.8 0.78</td> <td>0.73</td> <td>0.72</td> <td>0.67</td> <td>0.67</td> <td>0.66</td> <td>0.69</td> <td>0.72</td> <td>0.74</td> <td>0.76</td> <td></td> <td></td> <td>(25)</td>	(25)m= 0.81 0.8 0.78	0.73	0.72	0.67	0.67	0.66	0.69	0.72	0.74	0.76			(25)
Doors Type 1													
Doors Type 1 2.1 x 2 = 4.2 (26) Doors Type 2 1.64 x 2 = 3.28 (26) Windows Type 1 1.5 x1/[1/(4.5) + 0.04] = 5.72 (27) Windows Type 2 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 3 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 4 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 5 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 6 0.83 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 7 1.64 x1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 8 3.1 x1/[1/(4.5) + 0.04] = 6.01 (27) Windows Type 9 5.13 x1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 10 2.4 x1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 12 2.4 x1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 13 2.83 x1/[1/(4.5) + 0.04] = 9.15	3. Heat losses and heat los	s paramet	er:										
Doors Type 2 1.64 X 2 3.28 (26) Windows Type 1 1.5 X1/[1/(4.5) + 0.04] = 5.72 (27) Windows Type 2 1.64 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 3 1.64 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 4 1.64 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 5 1.64 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 6 0.83 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 7 1.64 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 8 3.1 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 9 1.64 X1/[1/(4.5) + 0.04] = 6.25 (27) Windows Type 9 X1/[1/(4.5) + 0.04] = 20.66 (27) Windows Type 10 2.4 X1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 11 2.4 X1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 12 2.4 X1/[1/(4.5) + 0.04] = 9.15 (27) Windows Type 13 Eass X1/[1/(4.5) + 0.04] = 9.15 (28)	ELEMENT Gross	Openir	ngs						0				
Windows Type 1 1.5 $x1/[1/(4.5) + 0.04] =$ 5.72 (27) Windows Type 2 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 3 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 4 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 5 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 6 0.83 $x1/[1/(4.5) + 0.04] =$ 3.17 (27) Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 8 3.1 $x1/[1/(4.5) + 0.04] =$ 6.01 (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] =$ 2.66 (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Floor Type 1 55.75 $x 0.17$ $y 0.17$ $y 0.17$ $y 0.17$ $y 0.17$ $y 0.17$	ELEMENT Gross area (m²)	Openir	ngs	A ,r	m²	W/m2	2K	(W/I	<)				kJ/K
Windows Type 2 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 3 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 4 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 5 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 6 0.83 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] = 6.01$ (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] = 20.66$ (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 $x 0.17$ $y 0.4775$ (28)	ELEMENT Gross area (m²) Doors Type 1	Openir	ngs	A ,r	m² x	W/m2 2	= =	4.2	<)				kJ/K (26)
Windows Type 3 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 4 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 5 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 6 0.83 $x1/[1/(4.5) + 0.04] = 3.17$ (27) Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] = 6.01$ (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] = 20.66$ (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 x 0.17 $=$ 9.4775 (28)	ELEMENT Gross area (m²) Doors Type 1 Doors Type 2	Openir	ngs	A ,r 2.1 1.64	m ² x	W/m2 2 2	= = = = = = = = = = = = = = = = = = =	4.2 3.28	<) 				(26) (26)
Windows Type 4 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 5 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 6 0.83 $x1/[1/(4.5) + 0.04] =$ 3.17 (27) Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] =$ 6.01 (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] =$ 20.66 (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] =$ 10.79 (27) Floor Type 1 55.75 x 0.17 9.4775 (28)	ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1	Openir	ngs	A ,r 2.1 1.64 1.5	m ² x x x 1/2	W/m2 2 2 /[1/(4.5)+	= = = = = = = = = = = = = = = = = = =	4.2 3.28 5.72	<) 				(26) (26) (27)
Windows Type 5 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 6 0.83 $x1/[1/(4.5) + 0.04] = 3.17$ (27) Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] = 6.01$ (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] = 20.66$ (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 x 0.17 $=$ 9.4775 (28)	ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	Openir	ngs	A ,r 2.1 1.64 1.5	x x x 1 x 1 x 1	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] =	(W/l 4.2 3.28 5.72 6.25	<) 				(26) (26) (27) (27)
Windows Type 6 0.83 $x1/[1/(4.5) + 0.04] =$ 3.17 (27) Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] =$ 6.25 (27) Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] =$ 6.01 (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] =$ 20.66 (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] =$ 9.15 (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] =$ 10.79 (27) Floor Type 1 55.75 x 0.17 $=$ 9.4775 (28)	ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64	x x x x 1/2	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] =	(W/l 4.2 3.28 5.72 6.25 6.25	<) 				(26) (26) (27) (27) (27)
Windows Type 7 1.64 $x1/[1/(4.5) + 0.04] = 6.25$ (27) Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] = 6.01$ (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] = 20.66$ (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 x 0.17 $=$ 9.4775 (28)	Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64	x x x 1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04] = 0.04] =	(W/l 4.2 3.28 5.72 6.25 6.25 6.25	<) 				(26) (26) (27) (27) (27) (27)
Windows Type 8 3.1 $x1/[1/(2.1) + 0.04] = 6.01$ (27) Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] = 20.66$ (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 $x 0.17$ $y 0.17$ <td< td=""><td>Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5</td><td>Openir</td><td>ngs</td><td>A ,r 2.1 1.64 1.5 1.64 1.64 1.64</td><td>x x x x x x x x x x x x x x x x x x x</td><td>W/m² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+</td><td>= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =</td><td>(W/I 4.2 3.28 5.72 6.25 6.25 6.25</td><td><)</td><td></td><td></td><td></td><td>(26) (26) (27) (27) (27) (27) (27)</td></td<>	Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 3.28 5.72 6.25 6.25 6.25	<)				(26) (26) (27) (27) (27) (27) (27)
Windows Type 9 5.13 $x1/[1/(4.8) + 0.04] = 20.66$ (27) Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 $x = 9.4775$ (28)	Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64	x x x 1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17	<)				(26) (26) (27) (27) (27) (27) (27) (27)
Windows Type 10 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 $x = 9.4775$ (28)	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83	x x x 1/2 x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04]	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27)
Windows Type 11 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 $x = 9.4775$ (28)	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64	x x x x x x x x x x x x x x x x x x x	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.04] = 0.04]	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type 12 2.4 $x1/[1/(4.5) + 0.04] = 9.15$ (27) Windows Type 13 2.83 $x1/[1/(4.5) + 0.04] = 10.79$ (27) Floor Type 1 55.75 x 0.17 $=$ 9.4775 (28)	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.8)+	= 0.04] = 0.04	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type 13 $ 2.83 $	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Floor Type 1	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.8)+ /[1/(4.5)+ /[1/(4.5)+	= 0.04] = 0.04	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 20.66 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m ² 2 2 /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.8)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+ /(1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15	()				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Floor Type 2 100.58 x 0.2 = 20.116 (28)	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12 Windows Type 13	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 0.83 1.64 3.1 5.13 2.4 2.4	x x x x x x x x x x x x x x x x x x x	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 6.25 6.25 6.25 9.15 9.15	<)				(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
	Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 10 Windows Type 11 Windows Type 12 Windows Type 13 Floor Type 1	Openir	ngs	A ,r 2.1 1.64 1.5 1.64 1.64 1.64 1.64 2.4 2.4 2.83	x x x x x x x x x x x x x x x x x x x	W/m ² 2 [1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	C C C C C C C C C C	(W/I 4.2 3.28 5.72 6.25 6.25 6.25 6.25 3.17 6.25 6.01 20.66 9.15 9.15 9.15					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Floor Type 2													
Floor Type 3		24.67	x	0.2	= [4.934				(28)			
Walls Type1 87.11	0	87.11	x	0.15	= [13.07				(29)			
Walls Type2 101.74	22.97	78.77	x	0.8	= [63.02				(29)			
Walls Type3 43.34	0	43.34	x	0.17	= [7.35				(29)			
Walls Type4 53.64	0	53.64	x	0.17	_ = [9.09	-			(29)			
Walls Type5 119.93	20.82	99.11	x	0.8	=	79.29				(29)			
Roof 23.62	0	23.62	x	0.15	=	3.54				(30)			
Total area of elements, m ²		612.48	Ē .							(31)			
Party wall		30.03	x	0	=	0				(32)			
Party wall		25.87	= x	0	= i	0	₹ i			(32)			
* for windows and roof windows, use			ed using	formula 1/	/[(1/U-valu	re)+0.04] a	s given in	paragraph	n 3.2	_			
** include the areas on both sides of in	•	titions		(26) (20)	. (22) –					¬,,,,,			
Fabric heat loss, W/K = S (A x	. ()			(26)(30)		(20) + (20))	(220) -	361.74	(33)			
Heat capacity Cm = S(A x k) Thermal mass parameter (TM)	D _ Cm · TEA) ii	n k 1/m2k/			,	.(30) + (32 tive Value:	, , ,	(32e) =	0	(34)			
For design assessments where the de	•		nown pre	ecisely the				able 1f	250	(35)			
can be used instead of a detailed calc		on are not n	nom pr	soldery une	maioanro	values of		2010 11					
Thermal bridges : S (L x Y) ca	Iculated using Ap	pendix K							91.87	(36)			
if details of thermal bridging are not kn	$nown(36) = 0.15 \times (3)$	31)			(22)	(20)				7(07)			
Total fabric heat loss Ventilation heat loss calculated	d monthly					$(36) = 0.33 \times (36)$	25)m v (5)		453.62	(37)			
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1				
(38)m= 290.64 286.34 282.13		 	241.43	238.24	248.07	258.66	266.14	273.97		(38)			
Heat transfer coefficient, W/K					(39)m	= (37) + (3	88)m	l	J	. ,			
(39)m= 744.26 739.96 735.75	715.97 712.27	695.05	695.05	691.86	701.68	712.27	719.76	727.58					
	1 1					Average =			715.96	(39)			
Heat loss parameter (HLP), W	¹ /m²K				(40)m	= (39)m ÷	(4)			_			
(40)m= 2.02 2.01 2	1.95 1.94	1.89	1.89	1.88	1.91	1.94	1.96	1.98		_			
Number of days in month (Tab	nle 1a)				,	Average =	Sum(40)₁	12 /12=	1.95	(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)			
		<u> </u>							J				
4. Water heating energy requ	uirement:							kWh/y	ear:				
									1				
Assumed occupancy, N if TFA > 13.9 , N = $1 + 1.76$ >	x [1 - exp(-0.0003	349 x (TFA	· -13.9)	2)] + 0.0	013 x (ΓFA -13.		.22		(42)			
if TFA £ 13.9, $N = 1$									_				
Annual average hot water usa Reduce the annual average hot water						se target of		0.69		(43)			
not more that 125 litres per person pe	• •	•	-	- 20111010		. s targot of							
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]				
Hot water usage in litres per day for e		ector from Tab	ble 1c x		-			•					
(44)m= 121.75 117.33 112.9	108.47 104.04	99.62	99.62	104.04	108.47	112.9	117.33	121.75		_			
						Total = Sur	n(44) ₁₁₂ :	=	1328.23	(44)			

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 180.56 157.92 162.96 142.07 136.32 117.63 109 125.08 126.58 147.51 161.02 174.86 (45)m =Total = $Sum(45)_{1...12}$ = 1741.52 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)27.08 23.69 24.44 21.31 20.45 17.64 16.35 22.13 24.15 26.23 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 310 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year $(48) \times (49) =$ 310 (50)b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51)0.04 If community heating see section 4.3 Volume factor from Table 2a 0.73 (52)Temperature factor from Table 2b 0.6 (53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 5.67 (54)Enter (50) or (54) in (55) (55)5.67 Water storage loss calculated for each month $((56)m = (55) \times (41)m$ 158.73 (56)m= 175.74 175.74 170.07 175.74 170.07 175.74 175.74 170.07 175.74 170.07 175.74 (56)If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)m= 175.74 158.73 175.74 170.07 175.74 170.07 175.74 175.74 170.07 175.74 170.07 175.74 (57)(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)(59)m =23.26 21.01 23.26 23.26 22.51 23.26 22.51 23.26 22.51 23.26 Combi loss calculated for each month (61)m = (60) \div 365 x (41)m 0 0 0 0 0 0 (61)(61)m =0 0 0 Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 379.56 337.66 361.96 334.65 (62)335.32 310.21 308 324.08 319.16 346.52 353.6 373.86 (62)m =Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)(63)m =0 0 0 0 0 0 0 Output from water heater 379.56 337.66 361.96 334.65 (64)m =335.32 310.21 308 324.08 319.16 346.52 353.6 373.86 (64)Output from water heater (annual) 1...12 4084.59 Heat gains from water heating, kWh/month 0.25 \(^{10.85}\) x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] 193.18 195.44 200.79 (65)(65)m =219.24 213.38 201.3 204.53 196.15 208.25 207.61 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

(66)m= 16														
Lighting g	ains (calcula	ted in Ap	ppendix	L, equat	ion	L9 or L9a), a	lso s	ee Table 5	•	•				
(67)m= 5	1.71 45.93	37.35	28.28	21.14	1	7.84 19.28	25.	06 33.64	42.71	49.85	53.14		(67)	
Appliance	es gains (cald	culated in	Append	dix L, eq	uat	ion L13 or L1	3a),	also see Ta	ble 5					
(68)m= 51	1.33 516.64	503.27	474.8	438.87	4	05.1 382.54	377	.23 390.6	419.07	455	488.77		(68)	
Cooking g	gains (calcula	ated in A	ppendix	L, equat	tion	L15 or L15a)	, als	o see Table	5	-				
(69)m= 3	9.1 39.1	39.1	39.1	39.1	3	39.1	39	.1 39.1	39.1	39.1	39.1		(69)	
Pumps ar	nd fans gains	(Table	5a)											
(70)m=	(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (70) Losses e.g. evaporation (negative values) (Table 5)													
Losses e.	g. evaporation	on (nega	tive valu	es) (Tab	le s	5)								
(71)m= -12	(71)m= -128.82													
Water hea	ating gains (Table 5)												
(72)m= 29	Water heating gains (Table 5) (72)m= 294.67 292.12 286.81 279.59 274.9 268.3 262.69 269.88 272.43 279.9 288.34 292.13 (72)													
Total inte	rnal gains =	=				(66)m + (67)m	+ (68	3)m + (69)m +	(70)m + (71)m + (72)	m			
` ′	925.99	898.73	853.97	806.22	76	62.55 735.82	743	.48 767.98	812.99	864.5	905.35		(73)	
6. Solar														
					and	associated equa	tions		e applica		ion.			
Orientatio	n: Access I Table 6c		Area m²			Flux Table 6a		g_ Table 6b	-	FF able 6c		Gains (W)		
North					4							` '	7.7.0	
	0.9x 0.54				X	10.63	X	0.72	X	0.7		24.22	(74)	
	0.9x 0.54				X	10.63	X	0.85	X	0.7	=	26.11	(74)	
	0.9x 0.54				X	20.32	Х	0.72	× [0.7	=	46.29	(74)	
	0.9x 0.54				Х	20.32	X	0.85	×	0.7	=	49.89	(74)	
	0.9x 0.54		<u> </u>		X	34.53	X	0.72	× [0.7	=	78.66	(74)	
N. d	0.9x 0.54				X	34.53	X	0.85	× [0.7		84.77	= (74)	
	0.9x 0.54				X	55.46	X	0.72		0.7	=	126.35	(74)	
	0.9x 0.54				X	55.46	X	0.85		0.7	=	136.17	(74)	
	0.9x 0.54				X	74.72	X	0.72		0.7	=	170.2	$= \frac{(74)}{(74)}$	
	0.9x 0.54				x	74.72	X	0.85		0.7	=	183.43	(74)	
	0.9x 0.54 0.9x 0.54				X	79.99	X	0.72		0.7	=	182.2	$= \frac{(74)}{(74)}$	
					X	79.99	X	0.85		0.7		196.37	(74)	
					x	74.68	X	0.72	× [, [0.7	=	170.11	$\frac{1}{2} (74)$	
					x	74.68	x x	0.85		0.7	=	183.33	(74)	
					X	59.25	 	0.72	×	0.7	⁼	134.96	=	
					X	59.25	X	0.85	_ × [0.7	=	145.45	(74)	
					X	41.52	X	0.72	× [, [0.7	=	94.57	=	
					x	41.52	X	0.85	× [, [0.7	=	101.93	$\frac{1}{2} (74)$	
					x	24.19	X	0.72	× [, [0.7	=	55.1	$\frac{1}{2} (74)$	
					x	24.19	X	0.85	× [, [0.7	⁼	59.39		
1401111	0.9x 0.54	X	3.	1	X	13.12	X	0.72	x [0.7	=	29.88	(74)	

	_		_		_						_		_
North	0.9x	0.54	X	2.83	X	13.12	X	0.85	X	0.7	=	32.2	(74)
North	0.9x	0.54	X	3.1	X	8.86	X	0.72	X	0.7	=	20.19	(74)
North	0.9x	0.54	X	2.83	X	8.86	x	0.85	X	0.7	=	21.76	(74)
South	0.9x	0.3	X	1.5	x	46.75	X	0.85	X	0.7	=	22.53	(78)
South	0.9x	0.77	X	5.13	x	46.75	X	0.85	X	0.7	=	98.89	(78)
South	0.9x	0.3	X	1.5	X	76.57	X	0.85	X	0.7	=	36.9	(78)
South	0.9x	0.77	X	5.13	x	76.57	X	0.85	X	0.7	=	161.96	(78)
South	0.9x	0.3	X	1.5	x	97.53	x	0.85	X	0.7	=	47.01	(78)
South	0.9x	0.77	X	5.13	x	97.53	X	0.85	X	0.7	=	206.31	(78)
South	0.9x	0.3	X	1.5	x	110.23	X	0.85	X	0.7	=	53.13	(78)
South	0.9x	0.77	X	5.13	x	110.23	X	0.85	X	0.7	=	233.18	(78)
South	0.9x	0.3	X	1.5	X	114.87	X	0.85	X	0.7	=	55.36	(78)
South	0.9x	0.77	X	5.13	x	114.87	x	0.85	X	0.7	=	242.98	(78)
South	0.9x	0.3	X	1.5	X	110.55	x	0.85	X	0.7	=	53.28	(78)
South	0.9x	0.77	X	5.13	x	110.55	X	0.85	X	0.7	=	233.84	(78)
South	0.9x	0.3	X	1.5	x	108.01	x	0.85	X	0.7	=	52.06	(78)
South	0.9x	0.77	X	5.13	X	108.01	X	0.85	X	0.7	=	228.48	(78)
South	0.9x	0.3	X	1.5	X	104.89	X	0.85	X	0.7	=	50.55	(78)
South	0.9x	0.77	X	5.13	х	104.89	x	0.85	x	0.7	=	221.88	(78)
South	0.9x	0.3	X	1.5	х	101.89	x	0.85	x	0.7	=	49.1	(78)
South	0.9x	0.77	X	5.13	X	101.89	X	0.85	x	0.7	=	215.52	(78)
South	0.9x	0.3	X	1.5	x	82.59	Х	0.85	x	0.7	=	39.8	(78)
South	0.9x	0.77	X	5.13	x	82.59	X	0.85	x	0.7	=	174.69	(78)
South	0.9x	0.3	X	1.5	х	55.42	x	0.85	x	0.7	=	26.71	(78)
South	0.9x	0.77	X	5.13	x	55.42	x	0.85	X	0.7	=	117.22	(78)
South	0.9x	0.3	X	1.5	X	40.4	X	0.85	X	0.7	=	19.47	(78)
South	0.9x	0.77	X	5.13	x	40.4	X	0.85	X	0.7	=	85.45	(78)
Southwe	st _{0.9x}	0.54	X	1.64	x	36.79		0.85	X	0.7	=	17.45	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	36.79		0.85	X	0.7	=	17.45	(79)
Southwe	st _{0.9x}	0.54	X	2.4	x	36.79		0.85	X	0.7	=	25.54	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	62.67		0.85	X	0.7	=	29.72	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	62.67		0.85	X	0.7	=	29.72	(79)
Southwe	st _{0.9x}	0.54	X	2.4	x	62.67		0.85	X	0.7	=	43.5	(79)
Southwe	st _{0.9x}	0.54	X	1.64	X	85.75		0.85	X	0.7	=	40.67	(79)
Southwe	st _{0.9x}	0.54	X	1.64	X	85.75		0.85	X	0.7	=	40.67	(79)
Southwe	st _{0.9x}	0.54	x	2.4	x	85.75		0.85	x	0.7	=	59.51	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	106.25		0.85	x	0.7	=	50.39	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	106.25		0.85	x	0.7	=	50.39	(79)
Southwe	st _{0.9x}	0.54	x	2.4	x	106.25		0.85	x	0.7	=	73.74	(79)
Southwe	st _{0.9x}	0.54	x	1.64	x	119.01		0.85	x	0.7	=	56.44	(79)
Southwe	st _{0.9x}	0.54	X	1.64	x	119.01		0.85	X	0.7	=	56.44	(79)

Southwest _{0.9x}	0.54	1 🗸	0.4	l v	440.04	1	0.05	v	0.7	1 =	00.50	(79)
Southwest _{0.9x}	0.54	l x	2.4	X I v	119.01]]	0.85	x	0.7]]	82.59	
Southwest _{0.9x}	0.54	x	1.64	x	118.15]]	0.85	X	0.7] =] =	56.03	
Southwest _{0.9x}	0.54	^ x	2.4	^ x	118.15 118.15]]	0.85	X	0.7] - =	56.03 82	(79)
Southwest _{0.9x}	0.54] ^ x	1.64	^ x	113.91]]	0.85	X	0.7]	54.02](79)
Southwest _{0.9x}	0.54	^ x	1.64	^ x	113.91]]	0.85	X	0.7] -] =	54.02	(79)
Southwest _{0.9x}	0.54] ^ x	2.4	^ x	113.91]]	0.85	X	0.7] -] =	79.05	(79)
Southwest _{0.9x}	0.54] ^] _X	1.64	x	104.39]]	0.85	X	0.7]	49.51	(79)
Southwest _{0.9x}	0.54	l x	1.64	l x	104.39] 	0.85	x	0.7]] =	49.51	(79)
Southwest _{0.9x}	0.54	l L	2.4	l X	104.39	!]	0.85	x	0.7] =	72.45	(79)
Southwest _{0.9x}	0.54	X	1.64	x	92.85	! 	0.85	x	0.7] =	44.03	(79)
Southwest _{0.9x}	0.54	X	1.64	X	92.85	 	0.85	x	0.7	, =	44.03	(79)
Southwest _{0.9x}	0.54	×	2.4	X	92.85	İ	0.85	x	0.7	, =	64.44	(79)
Southwest _{0.9x}	0.54	X	1.64	x	69.27	ĺ	0.85	x	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	x	1.64	x	69.27		0.85	x	0.7	=	32.85	(79)
Southwest _{0.9x}	0.54	×	2.4	x	69.27	ĺ	0.85	x	0.7	j =	48.07	(79)
Southwest _{0.9x}	0.54	×	1.64	x	44.07	j	0.85	x	0.7	j =	20.9	(79)
Southwest _{0.9x}	0.54	x	1.64	X	44.07		0.85	X	0.7	=	20.9	(79)
Southwest _{0.9x}	0.54	x	2.4	х	44.07	İ.	0.85	x	0.7	=	30.59	(79)
Southwest _{0.9x}	0.54	×	1.64	х	31.49		0.85	x	0.7] <u>=</u>	14.93	(79)
Southwest _{0.9x}	0.54	x	1.64	x	31.49		0.85	x	0.7	=	14.93	(79)
Southwest _{0.9x}	0.54	X	2.4	x	31.49		0.85	x	0.7	=	21.85	(79)
West 0.9x	0.54	x	1.64	x	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	1.64	х	19.64	X	0.85	x	0.7	=	9.31	(80)
West 0.9x	0.54	X	0.83	X	19.64	X	0.85	X	0.7	=	4.71	(80)
West 0.9x	0.54	X	2.4	X	19.64	x	0.85	X	0.7	=	13.63	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	1.64	X	38.42	X	0.85	X	0.7	=	18.22	(80)
West 0.9x	0.54	X	0.83	x	38.42	x	0.85	X	0.7	=	9.22	(80)
West 0.9x	0.54	X	2.4	X	38.42	X	0.85	X	0.7	=	26.66	(80)
West 0.9x	0.54	X	1.64	X	63.27	х	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	1.64	x	63.27	x	0.85	X	0.7	=	30.01	(80)
West 0.9x	0.54	X	0.83	X	63.27	x	0.85	X	0.7	=	15.19	(80)
West 0.9x	0.54	X	2.4	x	63.27	x	0.85	X	0.7	=	43.91	(80)
West 0.9x	0.54	X	1.64	X	92.28	X	0.85	X	0.7	=	43.76	(80)
West 0.9x	0.54	X	1.64	x	92.28	x	0.85	X	0.7	=	43.76	(80)
West 0.9x	0.54	X	0.83	X	92.28	X	0.85	X	0.7	=	22.15	(80)
West 0.9x	0.54	X	2.4	X	92.28	X	0.85	X	0.7	=	64.04	(80)
West 0.9x	0.54	X	1.64	X	113.09	X	0.85	X	0.7	=	53.63	(80)
West 0.9x	0.54	X	1.64	X	113.09	X	0.85	X	0.7] = 1	53.63	(80)
West 0.9x	0.54	X	0.83	X	113.09	X	0.85	X	0.7	=	27.14	(80)

West	٥.٠.٠		1		1		1		١		1		7(00)
West	0.9x	0.54	X	2.4	X	113.09	X	0.85	X	0.7] = 1	78.49	(80)
West	0.9x	0.54	X	1.64	X	115.77	X	0.85	X	0.7] = 1	54.9	(80)
	0.9x	0.54	X	1.64	X	115.77] X]	0.85	X	0.7] = 1	54.9	(80)
West	0.9x	0.54	X	0.83	X	115.77	X	0.85	X	0.7	=	27.79	(80)
West	0.9x	0.54	X	2.4	X	115.77	X	0.85	X	0.7	=	80.35	(80)
West	0.9x	0.54	X	1.64	X	110.22	X	0.85	X	0.7	=	52.27	(80)
West	0.9x	0.54	X	1.64	X	110.22	X	0.85	X	0.7	=	52.27	(80)
West	0.9x	0.54	X	0.83	X	110.22	X	0.85	X	0.7	=	26.45	(80)
West	0.9x	0.54	X	2.4	X	110.22	X	0.85	X	0.7	=	76.49	(80)
West	0.9x	0.54	X	1.64	X	94.68	X	0.85	X	0.7	=	44.9	(80)
West	0.9x	0.54	X	1.64	X	94.68	X	0.85	X	0.7	=	44.9	(80)
West	0.9x	0.54	X	0.83	X	94.68	Х	0.85	X	0.7	=	22.72	(80)
West	0.9x	0.54	X	2.4	x	94.68	X	0.85	X	0.7	=	65.71	(80)
West	0.9x	0.54	X	1.64	x	73.59	X	0.85	X	0.7	=	34.9	(80)
West	0.9x	0.54	X	1.64	X	73.59	X	0.85	X	0.7	=	34.9	(80)
West	0.9x	0.54	X	0.83	x	73.59	X	0.85	x	0.7	=	17.66	(80)
West	0.9x	0.54	X	2.4	x	73.59	X	0.85	X	0.7	=	51.07	(80)
West	0.9x	0.54	X	1.64	X	45.59	Х	0.85	X	0.7	=	21.62	(80)
West	0.9x	0.54	x	1.64	x	45.59	x	0.85	X	0.7	=	21.62	(80)
West	0.9x	0.54	x	0.83	х	45.59] x	0.85	x	0.7	=	10.94	(80)
West	0.9x	0.54	x	2.4	X	45.59	x	0.85	x	0.7	=	31.64	(80)
West	0.9x	0.54	x	1.64	x	24.49	Х	0.85	x	0.7	=	11.61	(80)
West	0.9x	0.54	x	1.64	x	24.49	X	0.85	x	0.7	=	11.61	(80)
West	0.9x	0.54	x	0.83	х	24.49	x	0.85	x	0.7	=	5.88	(80)
West	0.9x	0.54	x	2.4	x	24.49	x	0.85	x	0.7	=	17	(80)
West	0.9x	0.54	X	1.64	x	16.15	X	0.85	x	0.7	=	7.66	(80)
West	0.9x	0.54	x	1.64	x	16.15	x	0.85	x	0.7	=	7.66	(80)
West	0.9x	0.54	x	0.83	x	16.15	x	0.85	x	0.7	=	3.88	(80)
West	0.9x	0.54	x	2.4	x	16.15	X	0.85	x	0.7	=	11.21	(80)
Northwes	t 0.9x	0.54	x	1.64	x	11.28	x	0.85	x	0.7	=	5.35	(81)
Northwes	t 0.9x	0.54	x	2.4	x	11.28	х	0.85	x	0.7	=	7.83	(81)
Northwes	t 0.9x	0.54	x	1.64	x	22.97	x	0.85	x	0.7] =	10.89	(81)
Northwes	t 0.9x	0.54	x	2.4	x	22.97	x	0.85	x	0.7] =	15.94	(81)
Northwes	t 0.9x	0.54	x	1.64	x	41.38	x	0.85	x	0.7	=	19.62	(81)
Northwes	t 0.9x	0.54	x	2.4	x	41.38	x	0.85	x	0.7	=	28.72	(81)
Northwes	t 0.9x	0.54	x	1.64	x	67.96	x	0.85	х	0.7	j =	32.23	(81)
Northwes	t _{0.9x}	0.54	x	2.4	x	67.96	x	0.85	x	0.7	j =	47.16	(81)
Northwes	t 0.9x	0.54	×	1.64	x	91.35	x	0.85	x	0.7	j =	43.32	(81)
Northwes	t 0.9x	0.54	x	2.4	×	91.35	x	0.85	x	0.7	j =	63.39	(81)
Northwes	t 0.9x	0.54	×	1.64	x	97.38	x	0.85	x	0.7	i =	46.18	(81)
Northwes	t 0.9x	0.54	×	2.4	x	97.38	x	0.85	х	0.7	=	67.59	(81)
	L								ı				_ '

Northwest 0.9x	0.54	X	1.6	64	x	9	1.1	x [0.85	X		0.7		= [43.2	(81)
Northwest 0.9x	0.54	X	2.4	4	x	9	1.1	x[0.85	X		0.7		= [63.22	(81)
Northwest _{0.9x}	0.54	X	1.6	64	x	72	2.63	x		0.85	×		0.7		= [34.44	(81)
Northwest 0.9x	0.54	X	2.4	4	x	72	2.63	х		0.85	X		0.7		= [50.4	(81)
Northwest _{0.9x}	0.54	X	1.6	64	x	50).42	x		0.85	x		0.7		- [23.91	(81)
Northwest _{0.9x}	0.54	X	2.4	4	x	50).42	x		0.85	x		0.7		- Ī	34.99	(81)
Northwest 0.9x	0.54	x	1.6	64	x	28	3.07	x		0.85	×		0.7		- Ī	13.31	(81)
Northwest _{0.9x}	0.54	x	2.4	4	x	28	3.07	x		0.85	X		0.7		<u> </u>	19.48	(81)
Northwest _{0.9x}	0.54	x	1.6	64	x	1.	4.2	x		0.85	×		0.7		- Ī	6.73	(81)
Northwest 0.9x	0.54	x	2.4	4	x	1.	4.2	x		0.85	×		0.7		<u> </u>	9.85	(81)
Northwest 0.9x	0.54	x	1.6	64	x	9.	.21	x		0.85	×		0.7		<u> </u>	4.37	(81)
Northwest _{0.9x}	0.54	X	2.4	4	X	9.	21	x		0.85	×		0.7		<u> </u>	6.39	(81)
ı					١			J L			_				_		
Solar gains in	watts, ca	alculated	l for eacl	h month				(83)m	= Su	m(74)m	(82)m	1					
(83)m= 282.34	497.14	725.05	976.44	1167.06		91.46	1134.99	987.	-	811.06	561.3	$\overline{}$	341.09	239.7	7		(83)
Total gains – i	internal a	nd solar	(84)m =	= (73)m	+ (8	33)m ,	watts		'			•			_		
(84)m= 1211.36	1423.13	1623.78	1830.42	1973.28	19	54.01	1870.81	1730	.86	1579.05	1374.	36	1205.59	1145.	12		(84)
7. Mean inte	rnal temp	erature	(heating	season)												_
Temperature			ì			area fr	om Ta	ole 9.	Th1	(°C)					Г	21	(85)
Utilisation fac		- 1								(- /					L		``
Jan	Feb	Mar	Apr	May	Ù	Jun	Jul	Αι	ia l	Sep	Oc	t	Nov	De	С		
(86)m= 1	1	1	1	0.99).97	0.92	0.9	_	0.99	1		1	1			(86)
Moon interne	l tompor	oturo in	living or	00 T1 /f/	الما	u oton	0 2 to 7	Zin T	abla	00)					_		
Mean internation (87)m= 18.53	18.69	19	19.48	19.96		0.42	20.7	20.6	_	20.26	19.6	5	19.04	18.5	4		(87)
					_										_		, ,
Temperature (88)m= 19.32	19.33	eating p	eriods ir 19.37	19.38	_	elling 1 9.41	19.41	19.4		2 (°C) 19.4	19.3	<u>.</u> Т	19.36	19.3			(88)
	<u> </u>							l	*'	19.4	19.5	°	19.50	19.5	3		(00)
Utilisation fac												_			_		(00)
(89)m= 1	1	1	0.99	0.98		0.93	0.79	0.8	4	0.97	1		1	1			(89)
Mean interna	al temper	ature in	the rest	of dwell	ing	T2 (fo	llow ste	ps 3	to 7	in Tabl	e 9c)				_		
(90)m= 16.1	16.34	16.8	17.52	18.22	1	8.91	19.25	19.2	21	18.68	17.7		16.88	16.1	4		(90)
										f	LA = Li	iving	area ÷ (4	1) =		0.14	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling	g) = fL	A × T1	+ (1 -	– fL/	A) x T2							
(92)m= 16.45	16.67	17.11	17.79	18.47	1	9.12	19.46	19.4	41	18.9	18.0	5	17.19	16.48	В		(92)
Apply adjusti	ment to th	ne mean	internal	temper	atu	re fror	n Table	4e, ۱	wher	re appro	priate	=					
(93)m= 16.45	16.67	17.11	17.79	18.47	1	9.12	19.46	19.4	41	18.9	18.0	5	17.19	16.4	8		(93)
8. Space hea	ating requ	uirement															
Set Ti to the					ned	at ste	p 11 of	Table	e 9b	, so that	t Ti,m	=(70	6)m and	d re-c	alcı	ulate	
the utilisation					Г	lun T	J. J	Λ.	<u>,,, T</u>	Co. 1	0-	, T	Naci	D.	\Box		
Jan Utilisation fac	Feb	Mar	Apr	May	<u></u>	Jun	Jul	Αι	ng [Sep	Oc	ι	Nov	De	C		
Umbanun 180	Ť) oo T						_	4		\neg		(94)
(94)m= 1	I 1 I	1 	().99	0.97		J.97 I	0.8	0.8	4 I	0.96 I	U do) I	1 1	1			(34)
(94)m= 1 Useful gains		W = (94)	0.99 1)m x (84	0.97 4)m).92	0.8	0.8	4	0.96	0.99	<u> </u>	1	1			(34)
Useful gains				4)m	_		0.8 1493.06			0.96 1514.42	1363		1203.21	11144.	08		(95)

Mont	hly aver	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	9041.3	8709.09	7808.98	6368.06	4819.99	3141.98	1986.7	2083.81	3370.02	5303.23	7259.19	8935.54		(97)
-				r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	5826.53	4898.18	4607.03	3281.05	2160.7	0	0	0	0	2930.86	4360.3	5796.85		
Cnaa	a baatin	a roauir.	amant in	Is\A/b/m²	2h cor			Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	33861.5	(98)
-			ement in		year								91.99	(99)
			uiremer		_									
Calc			July and							I	l			
Heet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec 10)		
		e Lm (ca	o o	using 2			r	5258.13	r	nperatur 0	e from 1	able 10)		(100)
(100)m=		tor for lo		U	0	6533.46	5143.36	5258.13	0		U	0		(100)
(101)m=		0	oss nm	0	0	0.38	0.46	0.42	0	0	0	0		(101)
		l	l			l	0.40	0.42	U		0	0		(101)
(102)m=		0	Vatts) = (0	0	2510.29	2359.87	2213.68	0	0	0	0		(102)
Gain	s (solar (gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)	•				
(103)m=	0	0	0	0	0	2573.9	2465.24	2287.9	0	0	0	0		(103)
			ement fo (104)m <			dwelling,	continu	ous (kW	h) = 0.0	24 x [(10)3)m – (102)m] :	x (41)m	
(104)m=		0	0	0	0	0	0	0	0	0	0	0		
· /						<u> </u>			Tota	l = Sum(104)	=	0	(104)
Coole	d fraction	n								cooled	1 '	4) =	0.38	(105)
Interm	ittency f	actor (Ta	able 10b)										
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Tota	I = Sum((104)	=	0	(106)
			ment for		(104)m	× (105)	× (106)r	m		,		,		
(107)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
									Tota	I = Sum((1.0.7)	=	0	(107)
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107	$)\div(4)=$			0	(108)
9b. En	ergy rec	quiremer	nts – Cor	mmunity	heating	scheme	;							
								ting prov			unity sch	neme.		
Fraction	on of spa	ace heat	from se	condary,	/supplen	nentary I	heating ((Table 1	1) '0' if n	one			0.1	(301)
Fraction	on of spa	ace heat	from co	mmunity	system	1 – (30	1) =						0.9	(302)
	-							allows for See Appei		up to four	other heat	sources; t	he latter	
			Commun			,		,,,,					1	(303a)
Fraction	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	0.9	(304a)
Factor	for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for 0	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g										·	kWh/yea	ar
Annua	l space	heating	requiren	nent									33861.5	

Space heat from Community boilers	(98) x (30-	4a) x (305) x (306) =	31999.11	(307a)				
Efficiency of secondary/supplementary heating syst	em in % (from Table 4a or Ap	ppendix E)	65	(308				
Space heating requirement from secondary/suppler	nentary system (98) x (30	1) x 100 ÷ (308) =	5209.46	(309)				
Water heating Annual water heating requirement			4084.59	_				
If DHW from community scheme: Water heat from Community boilers	(64) x (30)	3a) x (305) x (306) =	4288.82	(310a)				
Electricity used for heat distribution	0.01 × [(307a)	0.01 × [(307a)(307e) + (310a)(310e)] =						
Cooling System Energy Efficiency Ratio								
Space cooling (if there is a fixed cooling system, if r	$= (107) \div$	(314) =	0	(315)				
Electricity for pumps and fans within dwelling (Table mechanical ventilation - balanced, extract or positive			0	(330a)				
warm air heating system fans			0	(330b)				
pump for solar water heating			0	(330g)				
Total electricity for the above, kWh/year	=(330a) +	(330b) + (330g) =	0	(331)				
Energy for lighting (calculated in Appendix L)			913.16	(332)				
				_				
12b. CO2 Emissions - Community heating scheme								
12b. CO2 Emissions – Community heating scheme	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year					
CO2 from other sources of space and water heating	kWh/year	kg CO2/kWh	kg CO <mark>2/yea</mark> r	(367a)				
CO2 from other sources of space and water heating	kWh/year (not CHP)	kg CO2/kWh	kg CO2/year	(367a) (367)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	kWh/year y (not CHP) re is CHP using two fuels repeat (36	kg CO2/kWh	91 8613.4	` 				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1	kWh/year y (not CHP) re is CHP using two fuels repeat (36 [(307b)+(310b)] x 100 ÷ (367b)	kg CO2/kWh (33) to (366) for the second fuel (b) x	91 8613.4 188.33	(367)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year y (not CHP) re is CHP using two fuels repeat (36 [(307b)+(310b)] x 100 ÷ (367b) [(313) x	kg CO2/kWh (33) to (366) for the second fuel (b) x	91 8613.4 188.33 8801.73	(367)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368).	kg CO2/kWh (33) to (366) for the second fuel (53) x 0 = (52) = (52) = (52) = (53) 0.04 =	91 8613.4 188.33 8801.73 203.17	(367) (372) (373)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	(307b)+(310b)] x 100 ÷ (367b) [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368). (309) x or instantaneous heater (312	kg CO2/kWh 63) to (366) for the second fuel 0) x 0 0.52 0.04 2) x 0.22 =	91 8613.4 188.33 8801.73 203.17	(367) (372) (373) (374)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater of	(373) + (374) + (375)	kg CO2/kWh 63) to (366) for the second fuel 0) x 0 0.52 0.04 2) x 0.22 =	91 8613.4 188.33 8801.73 203.17 0 9004.9	(367) (372) (373) (374) (375)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater of total CO2 associated with space and water heating	(373) + (374) + (375)	kg CO2/kWh (33) to (366) for the second fuel (372) = 0.04 = 0.02 = 0.0	91 8613.4 188.33 8801.73 203.17 0 9004.9	(367) (372) (373) (374) (375) (376)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater of the control of the	(307b)+(310b)] x 100 ÷ (367b) [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368). (309) x or instantaneous heater (312 (373) + (374) + (375) within dwelling (331)) x (332))) x	kg CO2/kWh 63) to (366) for the second fuel 0) x 0 0.52 0.04 2) x 0.22 = 0.52	91 8613.4 188.33 8801.73 203.17 0 9004.9	(367) (372) (373) (374) (375) (376) (378)				
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater of the control of the	(307b)+(310b)] x 100 ÷ (367b) [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368). (309) x or instantaneous heater (312 (373) + (374) + (375) within dwelling (331)) x (332))) x	kg CO2/kWh 63) to (366) for the second fuel 0) x 0 0.52 0.04 2) x 0.22 = 0.52	91 8613.4 188.33 8801.73 203.17 0 9004.9 0 473.93	(367) (372) (373) (374) (375) (376) (378) (379)				

SAP Input

Property Details: Flat 5

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

Floor 0 91.6 m² 3.28 m Floor 1 84.96 m² 2.65 m

Living area: 54.11 m² (fraction 0.591)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
D1		Manufacturer	Solid			W <mark>ood</mark>
d2		Manufacturer	Half glazed	low-E, En = 0.2, hard coa	it No	Wood
W1		Manufactur <mark>e</mark> r 💮	Windows	low-E, En = 0.2 , hard coa	it No	W <mark>ood</mark>
W2		Manufacturer	Windows	low-E, $En = 0.2$, hard coa	it No	
W3		Manufacturer	Windows	low-E, $En = 0.2$, hard coa	it No	
W4		Manufacturer	Windows	low-E, $En = 0.2$, hard coa	it No	
w5		Manufacturer	Windows	low-E, $En = 0.2$, hard coa	it No	
W6		Manufacturer	Windows	low-E, $En = 0.2$, hard coa	it No	
w7		Manufacturer	Windows	low-E, $En = 0.2$, hard coa	it No	
RF1		Manufacturer	Roof Windows	low-F Fn = 0.2 hard coa	it No	PVC-U

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
d2	16mm or more mm	0.7	0.65	2	2.06	1

0.65 1.93 2 W1 16mm or more 0.7 1.5 W2 16mm or more 0.7 0.65 1.5 1.8 4 3 W3 16mm or more 0.7 0.65 1.5 1.8 2 W4 16mm or more 0.7 0.85 1.5 1.84 w5 0.7 0.85 1.5 1.43 3 16mm or more 2 W6 0.85 1.5 1.43 16mm or more 0.7 3 w7 16mm or more 0.7 0.85 1.5 1.43 RF1 16mm or more 0.7 0.65 1.5 1.2 1

Name: D1	Type-Name:	Location: corridor	Orient:	Width: 1	Height: 2.1
d2		External wall GF	South	0.98	2.1
W1		External wall GF	South	0.963	2
W2		External wall GF	South	1	1.8
W3		External wall GF	East	1	1.8

SAP Input

W4	External wall GF	North	1.02	1.8
w5	External wall GF	North	1.02	1.4
W6	External wall GF	East	1.02	1.4
w7	External wall GF	South	1.02	1.4
RF1	Flat roof 2	Horizontal	1.518	0.792

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
External wall GF	110.667	33.64	77.03	8.0	0	False	N/A
corridor GF	21.14	0	21.14	0.2	0.9	False	N/A
External FF	48.075	0	48.08	0.8	0	False	N/A
flat roof 1	39.87	0	39.87	0.15	0		N/A
Flat roof 2	84.96	1.2	83.76	0.15	0		N/A
above garage	68.67			0.2			N/A
Internal Elements	<u>S</u>						
Party Elements							
party GF	71.63						N/A
Party wall FF	118.11						N/A

Thermal bridges:	No information on thermal bridging $(y=0.15)$ $(y=0.15)$
Ventilation:	
Pres <mark>sure test:</mark>	No (Assumed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	1 (main: 0, secondary: 0, other: 1)
Number of open flues:	0

2

Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 15

Main heating system

Number of fans:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 91 Piping>=1991, pre-insulated, low temp, variable flow

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and at least two room thermosta

Control code: 2312

Secondary heating system:

Secondary heating system: None

Space cooling system:

Space cooling system: Split/multiple systems

Tested data to EN 14511: Brand/Model: tbc

EER: 3.5

Compressor control: Systems with On/Off control

Cooled area: 140 (fraction 0.793)

Water heating

Water heating: From main heating system

Water code: 901

SAP Input

Fuel :heat from boilers - mains gas

Hot water cylinder

Cylinder volume: 250 litres Cylinder insulation: Jacket 35 mm Primary pipework insulation: True

Cylinderstat: True

Cylinder in heated space: True

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

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

		User Details:			
Assessor Name: Software Name:	Stroma FSAP 2012	Stroma Nu Software \		ersion: 1.0.1.24	
	Pı	operty Address: Flat	5		
Address :					
1. Overall dwelling dimens	sions:				
		Area(m²)	Av. Height(m)	Volume(m³)	,
Ground floor		91.6 (1a)	x 3.28 (2a	300.45	(3a)
First floor		84.96 (1b)	x 2.65 (2)	225.14	(3b)
Total floor area TFA = (1a)-	+(1b)+(1c)+(1d)+(1e)+(1n) 176.56 (4)			_
Dwelling volume		(3a)+	(3b)+(3c)+(3d)+(3e)+(3n	525.59	(5)
2. Ventilation rate:					_
	main secondary	y other	total	m³ per hour	
Number of chimneys	0 + 0	+ 1 =	1 x 40 :	40	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 :	0	(6b)
Number of intermittent fans			2 x 10 :	20	(7a)
Number of passive vents			0 x 10 :	= 0	(7b)
Number of flueless gas fires	s		0 x 40 :	0	(7c)
	, flues and fans = (6a)+(6b)+(7a		60 ÷ (5	Air changes per hou	 Ir (8)
If a pressurisation test has been Number of storeys in the	n ca <mark>rried out or is intended, proceed</mark>	to (17), otherwise continu	e from (9) to (16)	0] (9)
Additional infiltration	dwoming (115)		[(9)-1]x		(10)
Structural infiltration: 0.25	5 for steel or timber frame or	0.35 for masonry cor		0	(11)
if both types of wall are pres deducting areas of openings	ent, use the value corresponding to); if equal user 0.35	the greater wall area (afte	r		J
If suspended wooden floo	or, enter 0.2 (unsealed) or 0.	1 (sealed), else enter	. 0	0	(12)
If no draught lobby, enter	0.05, else enter 0			0	(13)
Percentage of windows a	and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14)	÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11)	+ (12) + (13) + (15) =	0	(16)
Air permeability value, q5	50, expressed in cubic metre	s per hour per square	metre of envelope are	ea 15	(17)
If based on air permeability	value, then $(18) = [(17) \div 20] + (8)$	(18)), otherwise $(18) = (16)$		0.86	(18)
	a pressurisation test has been don	e or a degree air permeab	ility is being used		_
Number of sides sheltered		(00) 4 [0.075	(40)]	2	(19)
Shelter factor		(20) = 1 - [0.075]		0.85	(20)
Infiltration rate incorporating		$(21) = (18) \times (20)$) =	0.73	(21)
Infiltration rate modified for					
Jan Feb M	ar Apr May Jun	Jul Aug Se	ep Oct Nov	Dec	
Monthly average wind spee	ed from Table 7				

4.3

3.8

3.8

3.7

4.3

4.5

4.7

Wind Factor (22a)m = (22)m -	÷ 4											
(22a)m= 1.27 1.25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
		·			(24)	(22.)		ļ.	Į.	ı		
Adjusted infiltration rate (allow 0.94 0.92 0.9	ving for st	nelter an	d wind s	o.7	(21a) x 0.68	(22a)m _{0.73}	0.79	0.00	0.06	l		
Calculate effective air change	1				0.00	0.73	0.79	0.83	0.86			
If mechanical ventilation:											0	(23a)
If exhaust air heat pump using Ap	pendix N, (2	(23a) = (23a) × Fmv (6	equation (N	N5)) , othe	rwise (23b) = (23a)				0	(23b)
If balanced with heat recovery: eff	iciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					0	(23c)
a) If balanced mechanical v	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [l – (23c)	÷ 100]		
(24a)m = 0 0 0	0	0	0	0	0	0	0	0	0			(24a)
b) If balanced mechanical v	entilation	without	heat red	covery (N	MV) (24b	p)m = (2)	2b)m + (23b)		1		
(24b)m = 0 0 0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole house extract ve		•	-				F (00)	,				
if $(22b)m < 0.5 \times (23b)$,	tnen (24)	(230) = (230)	o); otner\	wise (24)	$\frac{c}{0} = (220)$	o) m + 0	.5 × (23b	0	0	l		(24c)
(1,									U			(240)
d) If natural ventilation or w if (22b)m = 1, then (24c							0.5]					
(24d)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87			(24d)
Effective air change rate - e	enter (24a) or (24b	or (24	c) or (24	d) in box	k (25)						
(25)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87			(25)
										•		
3 Heat losses and heat loss	naramet											
3. Heat losses and heat loss			Net Ar	ea	U-valı	ue	AXU		k-value	9	A	X k
ELEMENT Gross area (m²)	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l			X k J/K
ELEMENT Gross	Openin	gs						<) 				
ELEMENT Gross area (m²)	Openin	gs	A ,r	m² x	W/m2	2K	(W/I	<) 				J/K
ELEMENT Gross area (m²) Doors Type 1	Openin	gs	A ,r	m ² x	W/m2	= = = = = = = = = = = = = = = = = = =	4.2	K)				J/K (26)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2	Openin	gs	A ,r 2.1 2.06	m ² x x x x1.	W/m2 2 2	= = = = = = = = = = = = = = = = = = =	4.2 4.12	<) 				(26) (26)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1	Openin	gs	A ,r 2.1 2.06 1.93	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(1.5)+	= 0.04] = 0.04] =	4.2 4.12 2.73	<) 				(26) (26) (27)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	Openin	gs	A ,r 2.1 2.06 1.93	x x x1. x1. x1.	W/m2 2 2 /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04] =	4.2 4.12 2.73 2.55	<) 				(26) (26) (27) (27)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3	Openin	gs	A ,r 2.1 2.06 1.93 1.8	x x x 1. x 1. x 1. x 1. x 1. x 1. x 1.	W/m2 2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 2.73 2.55 2.55	<) 				(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84	x x x1. x1. x1. x1. x1.	W/m2 2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 2.73 2.55 2.55 2.6	<) 				(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43	x x x1. x1. x1. x1. x1. x1.	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 2.73 2.55 2.55 2.6 2.02	<)				(26) (26) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04	4.2 4.12 2.73 2.55 2.55 2.6 2.02	<)				(26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights	Openin	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02 1.8					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor	Openin	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 1.8 13.734					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type 1 110.67	Openin m	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.2 0.8	= 0.04] = 0.04	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02 1.8 13.734 61.62					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14	Openin m	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 1.8 13.734 61.62 3.58					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 Roof Type1 39.87	33.6 0 0	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.43 1.43 48.08 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.2 0.8 0.17 0.8 0.15	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 1.8 13.734 61.62 3.58 38.46 5.98					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 Roof Type1 39.87	33.6 0	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.43 1.43 48.08	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.2 0.8 0.17 0.8	= 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = 0.04 = = = = = = = = = =	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02 1.8 13.734 61.62 3.58 38.46					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Party wall (32)71.63 0 Party wall (32)118.11 0 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss, $W/K = S(A \times U)$ (33)190.65 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium (35)250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)56.32 if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) =246.97 (37)Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m x (5)Feb May Jul Jan Mar Apr Jun Aug Sep Oct Nov Dec 162.79 159.83 (38)156.94 143.34 140.79 128.95 128.95 126.76 133.51 140.79 145.94 151.32 (38)m =Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =409.76 406.8 403.91 390.31 387.77 375.92 375.92 373.73 380.49 387.77 392.91 398.29 (39)Average = $Sum(39)_{1...12}/12=$ 390.3 Heat loss parameter (HLP), W/m2K (40)m = (39)m \div (4)2.32 (40)m =2.3 2.2 2.13 2.13 2.12 2.15 2.2 2.26 (40)Average = $Sum(40)_{1...12}/12=$ 2.21 Number of days in month (Table 1a) 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 heating energy requirement: kWh/year: Assumed occupancy, N 2.97 (42)if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 104.77 (43)Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Nov Jan Feb Mar Apr May Jun Jul Aug Sep Oct Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =115.24 111.05 106.86 102.67 98.48 94.29 94.29 98.48 102.67 106.86 111.05 115.24 Total = $Sum(44)_{1...12}$ = (44)1257.22 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m =170.9 149.47 154.24 134.47 129.03 111.34 103.18 118.4 119.81 139.63 152.41 165.51 Total = $Sum(45)_{1...12}$ = 1648.41 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)(46)m =25.64 22.42 23.14 20.17 19.35 16.7 15.48 17.76 17.97 20.94 22.86 24.83 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:

									•		
a) If manufacturer's declared		own (kWł	n/day):					0	<u> </u>		(48)
Temperature factor from Tabl	e 2b							0	<u> </u>		(49)
Energy lost from water storag	•		len avenue	(48) x (49) =		2	50			(50)
b) If manufacturer's declaredHot water storage loss factor	•						0	.04	1		(51)
If community heating see sec	•	71711110740	•97				0.	.04	J		(31)
Volume factor from Table 2a							0.	.78	1		(52)
Temperature factor from Tabl	e 2b						0	0.6			(53)
Energy lost from water storage	e, kWh/year			(47) x (51) x (52) x (53) =	4.	.91	ĺ		(54)
Enter (50) or (54) in (55)							4.	.91			(55)
Water storage loss calculated	I for each month			((56)m = ((55) × (41)	m			_		
(56)m= 152.26 137.52 152.26	147.35 152.26	147.35	152.26	152.26	147.35	152.26	147.35	152.26]		(56)
If cylinder contains dedicated solar s	torage, (57)m = (56)n	n x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H		
(57)m= 152.26 137.52 152.26	147.35 152.26	147.35	152.26	152.26	147.35	152.26	147.35	152.26]		(57)
Drimary airquit loss (annual) f	rom Tabla 2	1	l	<u> </u>	<u> </u>			0)]		(58)
Primary circuit loss (annual) f Primary circuit loss calculated		(59)m – ((58) ± 36	S5 v (41)	ım			<u> </u>	J		(00)
(modified by factor from Ta		, ,		` '		r thermo	stat)				
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26]		(59)
Combi loss saleulated for sea	h magneth (C1)ma	(CO) + 20	25 /44) ma	<u> </u>				J		
Combi loss calculated for eac	1 1	(60) ÷ 30	0	1	0	0	0		1		(61)
` '				(22)				0] (=a)	(0.4)	, ,
Total heat required for water		1	_				<u>` </u>	<u> </u>	(59)m 1	+ (61)m	
(62)m= 346.43 308.01 329.77		281.2	278.7	293.92	289.67	315.15	322.27	341.03			(62)
Solar DHW input calculated using Ap						r contribut	on to wate	er heating)			
(add additional lines if FGHR			·	i –				1 0	1		(63)
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0	ļ		(03)
Output from water heater	.	T							1		
(64)m= 346.43 308.01 329.77	304.33 304.55	281.2	278.7	293.92	289.67	315.15	322.27	341.03	0-	745.04	7(04)
					out from w					715.04	(64)
Heat gains from water heating	-		``	- ` 		-``	`	- ` 	i] 1		(0.7)
(65)m= 197.24 176.53 191.7	180.6 183.32	172.91	174.72	179.78	175.73	186.84	186.57	195.45			(65)
include (57)m in calculation	of (65)m only if	cylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	neating		
5. Internal gains (see Table	5 and 5a):										
Metabolic gains (Table 5), Wa	atts							-			
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m= 178.28 178.28 178.28	178.28 178.28	178.28	178.28	178.28	178.28	178.28	178.28	178.28			(66)
Lighting gains (calculated in A	Appendix L, equa	tion L9 o	r L9a), a	lso see	Table 5						
(67)m= 77.6 68.93 56.05	42.44 31.72	26.78	28.94	37.61	50.49	64.1	74.82	79.76			(67)
Appliances gains (calculated	in Appendix L, ed	quation L	13 or L1	3a), also	see Ta	ble 5	•	•	•		
(68)m= 519.67 525.07 511.48	482.55 446.03	411.71	388.78	383.39	396.97	425.9	462.42	496.75]		(68)
Cooking gains (calculated in	Appendix L. equa	tion L15	or L15a), also s	ee Table	5			ı		
(69)m= 55.8 55.8 55.8	55.8 55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8]		(69)
Pumps and fans gains (Table		1	!	!	!	Į	Į	1	J		
(70)m= 0 0 0	0 0	0	0	0	0	0	0	0	1		(70)
, , , , , , , , , , , , , , , , , , , ,	1 1								J		. ,

Losses e.g. evaporation (negative values) (Table							5)						_				
(71)m=	-118.85	-118.85	-118.85	-118.85	-118.85	-1	18.85	-118.85	-118	3.85	-118.85	-118.8	5 -118.85	-118.	85		(71)
Water	heating	gains (Ta	able 5)											_			
(72)m=	265.11	262.69	257.67	250.83	246.4	2	40.15	234.84	241	.65	244.06	251.1	3 259.12	262.	7		(72)
Total	internal	gains =					(66))m + (67)m	+ (68	3)m +	(69)m + (7	70)m +	(71)m + (72)m			
(73)m=	977.61	971.91	940.42	891.04	839.37	7:	93.87	767.78	777	.87	806.75	856.3	7 911.58	954.4	43		(73)
	lar gains																
	_		_		Table 6a	and			tions	to cor	nvert to the	e applic	able orienta	tion.			
Orient		Access Fa Fable 6d	actor	Area m²			Flu	ıx ble 6a			g_ able 6b		FF Table 6c			Gains (W)	
N 1 41	_	able ou							ı			_					_
North	0.9x	1	X	1.8	34	X	1	10.63	X		0.85	X	0.7	_	=	20.95	(74)
North	0.9x	1	X	1.4	3	X	1	10.63	Х		0.85	X	0.7		=	24.43	(74)
North	0.9x	1	X	1.8	34	X	2	20.32	Х		0.85	X	0.7		=	40.05	(74)
North	0.9x	1	X	1.4	3	X	2	20.32	X		0.85	×	0.7		=	46.68	(74)
North	0.9x	1	X	1.8	34	X	3	34.53	X		0.85	X	0.7		=	68.05	(74)
North	0.9x	1	X	1.4	3	X	3	34.53	X		0.85	X	0.7		=	79.33	(74)
North	0.9x	1	X	1.8	34	X		55.46	X		0.85	X	0.7		=	109.3	(74)
North	0.9x	1	X	1.4	3	Х		55.46	х		0.85	X	0.7		-	127.42	(74)
North	0.9x	1	X	1.8	34	X	7	74.72	X		0.85	X	0.7		=	147.24	(74)
North	0.9x	1	X	1.4	3	X	7	74.72	X		0.85	X	0.7		=	171.64	(74)
North	0.9x	1	X	1.8	14	X	7	79.99	×		0.85	Х	0.7		=	157.62	(74)
North	0.9x	1	X	1.4	3	x	7	79.99	Х		0.85	X	0.7		=	183.75	(74)
North	0.9x	1	X	1.8	34	X	7	4.68	X		0.85	X	0.7		=	147.16	(74)
North	0.9x	1	X	1.4	3	X	7	74.68	X		0.85	X	0.7		=	171.55	(74)
North	0.9x	1	X	1.8	34	X	5	59.25	x		0.85	X	0.7		= [116.75	(74)
North	0.9x	1	X	1.4	3	X	5	59.25	x		0.85	x	0.7		=	136.11	(74)
North	0.9x	1	X	1.8	34	X	4	11.52	X		0.85	X	0.7		=	81.81	(74)
North	0.9x	1	X	1.4	3	X	۷	11.52	x		0.85	X	0.7		=	95.38	(74)
North	0.9x	1	X	1.8	34	X	2	24.19	X		0.85	X	0.7		=	47.67	(74)
North	0.9x	1	X	1.4	3	X	2	24.19	X		0.85	X	0.7		=	55.57	(74)
North	0.9x	1	X	1.8	34	X	1	13.12	х		0.85	X	0.7		=	25.85	(74)
North	0.9x	1	X	1.4	3	X	1	13.12	х		0.85	X	0.7		=	30.14	(74)
North	0.9x	1	X	1.8	34	x		8.86	x		0.85	X	0.7		=	17.47	(74)
North	0.9x	1	x	1.4	3	x		8.86	x		0.85	X	0.7		= j	20.36	(74)
East	0.9x	3	x	1.8	3	X	1	19.64	x		0.65	X	0.7		=	43.43	(76)
East	0.9x	2	X	1.4	3	x	1	19.64	x		0.85	x	0.7		= j	30.08	(76)
East	0.9x	3	x	1.8	3	X	3	38.42	x		0.65	X	0.7		=	84.96	(76)
_			==		==		_		i	=		=		=			╡

X

X

1.43

1.8

1.43

X

X

38.42

63.27

63.27

X

X

0.85

0.65

0.85

X

X

0.7

0.7

0.7

East

East

East

0.9x

0.9x

0.9x

3

2

(76)

(76)

(76)

58.84

139.92

96.9

	_												_
East	0.9x	3	X	1.8	X	92.28	X	0.65	X	0.7	=	204.06	(76)
East	0.9x	2	X	1.43	X	92.28	x	0.85	X	0.7	=	141.33	(76)
East	0.9x	3	x	1.8	X	113.09	x	0.65	X	0.7	=	250.08	(76)
East	0.9x	2	x	1.43	x	113.09	x	0.85	X	0.7	=	173.2	(76)
East	0.9x	3	X	1.8	X	115.77	X	0.65	X	0.7	=	256	(76)
East	0.9x	2	X	1.43	X	115.77	X	0.85	X	0.7	=	177.31	(76)
East	0.9x	3	x	1.8	x	110.22	x	0.65	X	0.7	=	243.73	(76)
East	0.9x	2	x	1.43	X	110.22	x	0.85	X	0.7	=	168.8	(76)
East	0.9x	3	X	1.8	X	94.68	x	0.65	X	0.7	=	209.36	(76)
East	0.9x	2	x	1.43	x	94.68	x	0.85	X	0.7	=	145	(76)
East	0.9x	3	x	1.8	x	73.59	x	0.65	X	0.7	=	162.73	(76)
East	0.9x	2	x	1.43	x	73.59	x	0.85	X	0.7	=	112.7	(76)
East	0.9x	3	x	1.8	x	45.59	x	0.65	x	0.7	=	100.81	(76)
East	0.9x	2	x	1.43	x	45.59	x	0.85	x	0.7	=	69.82	(76)
East	0.9x	3	x	1.8	x	24.49	x	0.65	X	0.7	=	54.15	(76)
East	0.9x	2	x	1.43	x	24.49	x	0.85	x	0.7	=	37.51	(76)
East	0.9x	3	x	1.8	x	16.15	x	0.65	x	0.7	=	35.72	(76)
East	0.9x	2	x	1.43	X	16.15	Х	0.85	X	0.7	=	24.74	(76)
South	0.9x	1	x	1.93	x	46.75	x	0.65	x	0.7	=	73.9	(78)
South	0.9x	1	x	1.8	х	46.75	×	0.65	x	0.7	=	137.84	(78)
South	0.9x	1	x	1.43	X	46.75	x	0.85	x	0.7	=	107.4	(78)
South	0.9x	1	x	1.93	x	76.57	Х	0.65	x	0.7	=	121.03	(78)
South	0.9x	1	x	1.8	x	76 <mark>.57</mark>	X	0.65	x	0.7	=	225.75	(78)
South	0.9x	1	x	1.43	х	76.57	x	0.85	x	0.7	=	175.9	(78)
South	0.9x	1	x	1.93	x	97.53	x	0.65	X	0.7	=	154.17	(78)
South	0.9x	1	x	1.8	x	97.53	x	0.65	X	0.7	=	287.57	(78)
South	0.9x	1	x	1.43	x	97.53	x	0.85	X	0.7	=	224.06	(78)
South	0.9x	1	x	1.93	x	110.23	x	0.65	x	0.7	=	174.24	(78)
South	0.9x	1	x	1.8	x	110.23	x	0.65	x	0.7	=	325.02	(78)
South	0.9x	1	x	1.43	x	110.23	x	0.85	x	0.7	=	253.24	(78)
South	0.9x	1	x	1.93	x	114.87	x	0.65	X	0.7	=	181.57	(78)
South	0.9x	1	x	1.8	x	114.87	X	0.65	X	0.7	=	338.69	(78)
South	0.9x	1	x	1.43	x	114.87	x	0.85	X	0.7	=	263.89	(78)
South	0.9x	1	x	1.93	х	110.55	X	0.65	X	0.7	=	174.74	(78)
South	0.9x	1	x	1.8	x	110.55	X	0.65	X	0.7	=	325.94	(78)
South	0.9x	1	x	1.43	x	110.55	x	0.85	x	0.7	j =	253.96	(78)
South	0.9x	1	x	1.93	x	108.01	x	0.65	x	0.7	j =	170.73	(78)
South	0.9x	1	x	1.8	x	108.01	x	0.65	x	0.7	j =	318.46	(78)
South	0.9x	1	x	1.43	x	108.01	x	0.85	x	0.7	j =	248.14	(78)
South	0.9x	1	x	1.93	x	104.89	x	0.65	x	0.7	j =	165.8	(78)
South	0.9x	1	x	1.8	x	104.89	x	0.65	X	0.7	j =	309.27	(78)
	_		-		-								_

Courth						ı		٦.		_				–
South	0.9x	1	X	1.4		X	104.89	X	0.85	×	0.7	=	240.97	(78)
South	0.9x	1	X	1.9	3	X	101.89	X	0.65	X	0.7	=	161.05	(78)
South	0.9x	1	X	1.8	3	X	101.89	X	0.65	X	0.7	=	300.4	(78)
South	0.9x	1	X	1.4	3	X	101.89	X	0.85	X	0.7	=	234.06	(78)
South	0.9x	1	X	1.9	3	X	82.59	X	0.65	X	0.7	=	130.54	(78)
South	0.9x	1	X	1.8	3	x	82.59	X	0.65	X	0.7	=	243.5	(78)
South	0.9x	1	X	1.4	3	X	82.59	X	0.85	X	0.7	=	189.72	(78)
South	0.9x	1	X	1.9	13	x	55.42	X	0.65	X	0.7	=	87.6	(78)
South	0.9x	1	X	1.8	3	x	55.42	X	0.65	X	0.7	=	163.39	(78)
South	0.9x	1	X	1.4	3	x	55.42	x	0.85	x	0.7	=	127.31	(78)
South	0.9x	1	x	1.9	13	x	40.4	x	0.65	x	0.7	=	63.86	(78)
South	0.9x	1	x	1.8	3	x	40.4	X	0.65	x	0.7	=	119.11	(78)
South	0.9x	1	x	1.4	3	x	40.4	x	0.85	×	0.7	=	92.81	(78)
Rooflights	0.9x	1	x	1.3	2	x	26	x	0.65	x	0.7	=	12.78	(82)
Rooflights	0.9x	1	x	1.3	2	x	54	x	0.65	x	0.7	=	26.54	(82)
Rooflights	0.9x	1	x	1.3	2	x	96	X	0.65	×	0.7	_	47.17	(82)
Rooflights	0.9x	1	x	1.2	2	x	150	X	0.65	×	0.7		73.71	(82)
Rooflights	0.9x	1	x	1.3	2	X	192	Х	0.65	Х	0.7	=	94.35	(82)
Rooflights	0.9x	1	×	1.:	2	х	200	x	0.65	x	0.7	= -	98.28	(82)
Rooflights	0.9x	1	×	1.3	2	х	189	i x	0.65	X	0.7	=	92.87	(82)
Rooflights	0.9x	1	×	1.:		x	157	X	0.65	X	0.7	_	77.15	(82)
Rooflights	0.9x	1	X	1.3		x	115	X	0.65	X	0.7	_	56.51	(82)
Rooflights	0.9x	1	X	1.3	_	x	66	X	0.65	X	0.7		32.43	(82)
Rooflights	_	1	×	1.:		X	33]]	0.65	×	0.7	= =	16.22	(82)
Rooflights	_	1	×	1.3		x	21]]	0.65	X	0.7	= =	10.32	(82)
	L							J						` ′
Solar gai	ins in	watts, ca	lculated	for eacl	n month			(83)n	n = Sum(74)m .	(82)m				
<u> </u>	50.82	779.75	1097.17				527.6 1561.45	140	0.41 1204.64	870.0	6 542.16	384.38]	(83)
Total gai	ns – ir	nternal a	nd sola	r (84)m =	(73)m	+ (8	33)m , watts	•	•	•	•		•	
(84)m= 1	428.43	1751.66	2037.59	2299.36	2460.04	24	21.47 2329.23	217	8.28 2011.39	1726.	1453.74	1338.81		(84)
7. Mear	n inter	nal temp	erature	(heating	season)								
							area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisatio	on fac	tor for ga	ains for	living are	ea, h1,m	(Se	ee Table 9a)		, ,					
	Jan	Feb	Mar	Apr	May	È	Jun Jul	A	ug Sep	Oc	t Nov	Dec]	
(86)m=	0.99	0.99	0.97	0.94	0.88	┢	0.76 0.62	0.6		0.96	0.99	0.99		(86)
∟ Mean ir	terna	l tampar	atura in	livina ar	 22 T1 (fo	مالد	w steps 3 to 7	7 in 7	ahle Oc)	!			J	
	18.62	18.88	19.29	19.86	20.35	1	0.74 20.9	20.		19.94	1 19.21	18.63	1	(87)
` ' _		<u> </u>				_		<u> </u>	I		.	. 0.00	J	, ,
· · ·				ı		1	elling from Ta	1		40.0	10.40	10.47	1	(88)
` ' _	19.13	19.14	19.15	19.2	19.21		9.25 19.25	19.	26 19.23	19.2°	19.19	19.17	J	(00)
				i		1	m (see Table	T	-	ı			1	1551
(89)m=	0.99	0.98	0.96	0.92	0.82	(0.41	0.4	16 0.75	0.93	0.98	0.99]	(89)
Mean ir	nterna	l tempera	ature in	the rest	of dwelli	ing	T2 (follow ste	eps 3	to 7 in Tab	le 9c)				

(90)m= 16.13	16.52	17.12	17.95	18.61	19.1	19.22	19.22	18.94	18.08	17.02	16.16		(90)
								f	LA = Livin	g area ÷ (4	4) =	0.31	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 16.9	17.24	17.78	18.53	19.15	19.6	19.74	19.73	19.44	18.65	17.69	16.92		(92)
Apply adjustr	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate	<u> </u>			
(93)m= 16.9	17.24	17.78	18.53	19.15	19.6	19.74	19.73	19.44	18.65	17.69	16.92		(93)
8. Space hea	ting requ	uirement											
Set Ti to the	mean int	ternal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation		or gains	using Ta	ble 9a							1 1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac					i	ı				 	1		4
(94)m= 0.98	0.97	0.95	0.9	0.81	0.66	0.48	0.53	0.76	0.92	0.97	0.99		(94)
Useful gains,			ŕ								T		(05)
` '		1934.78	<u> </u>		<u> </u>	1108.25	1144.38	1534.52	1592.07	1416.19	1321.77		(95)
Monthly aver		1	i –			40.0	40.4	444	40.0				(06)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	ì	i				- ` 	x [(93)m 1243.11	· ,		4400.47			(07)
(97)m= 5161.6	5020.08	4557.4	3759.9	2887.96	l				3120.22	l	5065.62		(97)
Space heatin (98)m= 2793.98			1213.65	659.79	/vn/mon	$\ln = 0.02$	4 X [(97))m – (95 0	1136.94		2785.43		
(98)11= 2793.98	2229.1	1951.25	1213.65	039.79	0	0		-			\Box	4.47.47.00	7(00)
							lota	l per year	(Kvvn/year) = Sum(9	8)15,912 =	14747.23	(98)
Sp <mark>ace h</mark> eatin	g requ <mark>ir</mark>	ement in	kWh/m²	/year								83.53	(99)
											l l		`
8c. Space co	oling red	quiremer	nt 💮										
8c. Space co Calculated fo				See Tal	ole 10b								
Calculated fo	r June, C	July and Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Calculated for Jan Heat loss rate	r June, C	July and Mar	August. Apr	May	Jun nal temp	perature	and exte						
Calculated fo Jan Heat loss rate (100)m= 0	Feb e Lm (ca	July and Mar Iculated	August. Apr	May	Jun nal temp		and exte						(100)
Calculated fo Jan Heat loss rate (100)m= 0 Utilisation fac	Feb e Lm (ca	Mar Mar llculated 0 oss hm	August. Apr using 25	May 5°C inter 0	Jun nal temp 3533.68	2781.83	and exte 2840.35	ernal ten	nperatur 0	e from T	able 10)		(100)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0	Feb e Lm (ca	Mar Ilculated 0 oss hm	August. Apr using 25	May 5°C inter 0	Jun 3533.68	perature	and exte	ernal ten	nperatur	e from T	able 10)		
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h	r June, Feb e Lm (ca 0 ctor for lo	Mar Ilculated 0 oss hm 0 Vatts) = (August. Apr using 25 0 100)m x	May 5°C inter 0 0	Jun nal temp 3533.68 0.6	2781.83 0.69	and exter 2840.35 0.65	ernal ten 0	o 0	e from T 0	able 10) 0		(100)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0	r June, Feb e Lm (ca 0 ctor for lo nmLm (V	Mar Ilculated 0 oss hm 0 Vatts) = (August. Apr using 25 0 0 (100)m x	May 5°C inter 0 0 (101)m	Jun nal temp 3533.68 0.6	0.69 0.69	and exter 2840.35 0.65	o 0 0	nperatur 0	e from T	able 10)		(100)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar)	r June, Feb e Lm (ca 0 ctor for lo nmLm (V 0 gains ca	Mar Ilculated 0 0 0 Vatts) = (0 Iculated	August. Apr using 25 0 100)m x 0 for appli	May 5°C inter 0 0 (101)m 0 cable we	Jun 7nal temp 3533.68 0.6 2132.14 eather re	0.69 0.69 1917.24 egion, se	and exter 2840.35 0.65 1853.44 e Table	0 0 0 0	o 0 0	e from T 0 0	able 10) 0 0		(100) (101) (102)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar (103)m= 0	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca	Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0	August. Apr using 25 0 (100)m x 0 for appli	May 5°C inter 0 0 (101)m 0 cable we	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47	0.69 1917.24 egion, se	and external 2840.35 0.65 1853.44 e Table 2178.28	0 0 0 10)	o 0 0	e from T 0 0 0	able 10) 0 0 0		(100)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar of the cooling) Space cooling	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	Mar Ilculated 0 oss hm 0 Vatts) = (1 culated 0 cement fo	August. Apr using 25 0 (100)m x 0 for appli 0 r month,	May 5°C inter 0 (101)m 0 cable we 0 whole co	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47	0.69 1917.24 egion, se	and external 2840.35 0.65 1853.44 e Table 2178.28	0 0 0 10)	o 0 0	e from T 0 0 0	able 10) 0 0 0	s (41)m	(100) (101) (102)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar so	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca 0 g require 2 zero if (Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo (104)m <	August. Apr using 25 0 (100)m x 0 for appli 0 r month,	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun 70.1 temp 3533.68 0.6 2132.14 eather re 2421.47 dwelling,	0.69 1917.24 egion, se 2329.23	and exto 2840.35 0.65 1853.44 e Table 2178.28 ous (kW	0 0 10) 0 (h) = 0.0	0 0 0 0 24 x [(10	e from T 0 0 0 0 0 0 03)m – (able 10) 0 0 102)m]>	c (41)m	(100) (101) (102)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar of the cooling) Space cooling	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	Mar Ilculated 0 oss hm 0 Vatts) = (1 culated 0 cement fo	August. Apr using 25 0 (100)m x 0 for appli 0 r month,	May 5°C inter 0 (101)m 0 cable we 0 whole co	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47	0.69 1917.24 egion, se	and external 2840.35 0.65 1853.44 e Table 2178.28	0 0 0 10) 0 0/h) = 0.0	0 0 0 0 24 x [(10	e from T 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 102)m] >		(100) (101) (102) (103)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar so	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca 0 g require 0 zero if (Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo (104)m <	August. Apr using 25 0 (100)m x 0 for appli 0 r month,	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun 3533.68 0.6 2132.14 eather re 2421.47 dwelling,	0.69 1917.24 egion, se 2329.23	and exto 2840.35 0.65 1853.44 e Table 2178.28 ous (kW	0 0 10) 0 /h) = 0.0	0 0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 03)m - (0 104)	able 10) 0 0 102)m]>	548.21	(100) (101) (102) (103)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar so	r June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 g require 0 zero if (Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo (104)m <	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun 3533.68 0.6 2132.14 eather re 2421.47 dwelling,	0.69 1917.24 egion, se 2329.23	and exto 2840.35 0.65 1853.44 e Table 2178.28 ous (kW	0 0 10) 0 /h) = 0.0	0 0 0 0 24 x [(10	e from T 0 0 0 0 03)m - (0 104)	able 10) 0 0 102)m]>		(100) (101) (102) (103)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar of the color) Space cooling set (104)m to the color of the col	r June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 g require 0 zero if (Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo (104)m <	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun 3533.68 0.6 2132.14 eather re 2421.47 dwelling,	0.69 1917.24 egion, se 2329.23	and exto 2840.35 0.65 1853.44 e Table 2178.28 ous (kW	0 0 10) 0 /h) = 0.0	0 0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 03)m - (0 104)	able 10) 0 0 102)m]>	548.21	(100) (101) (102) (103)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar of the color) Space cooling set (104)m to (104)m= 0 Cooled fraction Intermittency for some cooling set (104)m to (104)m= 0	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca 0 zero if (0 n actor (Ta	Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo (104)m < 0	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we whole co)m 0	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47 dwelling,	0.69 1917.24 egion, se 2329.23 continuo 306.52	and exter 2840.35 0.65 1853.44 ee Table 2178.28 ous (kW 241.69	0 0 10) 0 Total f C =	0 0 0 24 x [(10 0 = Sum(0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 102)m] >	548.21	(100) (101) (102) (103)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar of the color) Space cooling set (104)m to (104)m= 0 Cooled fraction Intermittency f	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 zero if (0 n actor (Ta	July and Mar Mar Ilculated 0 pss hm 0 Vatts) = (0 Iculated 0 ement fo (104)m < 0 able 10b 0	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0	May 5°C inter 0 (101)m 0 cable we 0 whole come 0	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47 dwelling, 0	0.69 1917.24 egion, se 2329.23 continue 306.52	and exter 2840.35 0.65 1853.44 ee Table 2178.28 ous (kW 241.69	0 0 10) 0 Total f C =	0 0 0 24 x [(10 0 = Sum(cooled a	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 102)m] >	548.21 0.79	(100) (101) (102) (103) (104) (105)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar of the color) Space cooling set (104)m to (104)m= 0 Cooled fraction Intermittency find (106)m= 0	r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 zero if (0 n actor (Ta	July and Mar Mar Ilculated 0 pss hm 0 Vatts) = (0 Iculated 0 ement fo (104)m < 0 able 10b 0	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0	May 5°C inter 0 (101)m 0 cable we 0 whole come 0	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47 dwelling, 0	0.69 1917.24 egion, se 2329.23 continue 306.52	and exter 2840.35 0.65 1853.44 ee Table 2178.28 ous (kW 241.69	0 0 10) 0 Total f C =	0 0 0 24 x [(10 0 = Sum(cooled a	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 102)m] >	548.21 0.79	(100) (101) (102) (103) (104) (105)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar rate) (103)m= 0 Space cooling set (104)m to (104)m= 0 Cooled fraction Intermittency for (106)m= 0 Space cooling	r June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 zero if (0 n actor (Ta 0	Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo (104)m < 0 able 10b 0 ment for	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0 month =	May 5°C inter 0 0 (101)m 0 cable we 0 whole come 0	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47 dwelling, 0 0.25 × (105)	0.69 1917.24 egion, se 2329.23 continue 306.52 × (106)r	and exter 2840.35 0.65 1853.44 e Table 2178.28 ous (kW 241.69	0 0 10) 0 Total f C = 0 Total	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 1,0,4) area ÷ (4	able 10) 0 0 102)m] >	548.21 0.79	(100) (101) (102) (103) (104) (105)
Calculated for Jan Heat loss rate (100)m= 0 Utilisation fac (101)m= 0 Useful loss, h (102)m= 0 Gains (solar rate) (103)m= 0 Space cooling set (104)m to (104)m= 0 Cooled fraction Intermittency for (106)m= 0 Space cooling	r June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 zero if (0 n actor (Ta 0 requirer 0	July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo 104)m < 0 ment for 0	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0 month =	May 5°C inter 0 (101)m 0 cable we 0 whole com 0 (104)m 0	Jun nal temp 3533.68 0.6 2132.14 eather re 2421.47 dwelling, 0 0.25 × (105)	0.69 1917.24 egion, se 2329.23 continue 306.52 × (106)r	and exter 2840.35 0.65 1853.44 e Table 2178.28 ous (kW 241.69	0 0 10) 0 Total f C = 0 Total	0 0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 1,0,4) area ÷ (4	able 10) 0 0 102)m] > 0 4) = 0 0	548.21 0.79 0	(100) (101) (102) (103) (104) (105)

9b. Energy requirements – Community heating so				
This part is used for space heating, space cooling Fraction of space heat from secondary/suppleme			0	(301)
Fraction of space heat from community system 1	- (301) =		1	(302)
The community scheme may obtain heat from several source includes boilers, heat pumps, geothermal and waste heat from			the latter	-
Fraction of heat from Community boilers			1	(303a)
Fraction of total space heat from Community boile		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c	,	eating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating Annual space heating requirement			kWh/year 14747.23	7
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	15484.59	(307a)
Efficiency of secondary/supplementary heating sy	ystem in % (from Tab	ole 4a or Appendix E)	0	(308
Space heating requirement from secondary/supp	lementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, Electricity for pumps and fans within dwelling (Tamechanical ventilation - balanced, extract or posiwarm air heating system fans pump for solar water heating Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L) 10b. Fuel costs – Community heating scheme	if not enter 0) ble 4f):	$(64) \times (303a) \times (305) \times (306) =$ $01 \times [(307a)(307e) + (310a)(310e)] =$ $= (107) \div (314) =$ $= (330a) + (330b) + (330g) =$	3715.04 3900.79 193.85 4.38 24.84 0 0 0 548.19	(310a) (313) (314) (315) (330a) (330b) (330g) (331) (332)
	Fuel	Fuel Price	Fuel Cost	
	kWh/year	(Table 12)	£/year	
Space heating from CHP	(307a) x	4.24 x 0.01 =	656.55	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	165.39	(342a)
Space cooling (community cooling system)	(315)	Fuel Price 13.19 x 0.01 =	3.28	(348)
Pumps and fans	(331)			(349)
i umpo anu iano	(00.)	13.19 X 0.01 =	0	(349)

(332)

Energy for lighting

Additional standing charges (Table 12)

72.31

120

(350)

(351)

x 0.01 =

13.19

Total energy cost	= (340a)(342e) + (345)((354) =		1017.52	(355)
11b. SAP rating - Community heating	scheme				
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0]	=		1.93	(357)
SAP rating (section12)				73.09	(358)
12b. CO2 Emissions – Community hea	iting scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)		g two fuels repeat (363) to	(366) for the second fu	nel 91	(367a)
CO2 associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	0	= 4601.37	(367)
Electrical energy for heat distribution		[(313) x	0.52	= 100.61	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(372	2)	= 4701.98	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	= 0	(374)
CO2 associated with water from immer	sion heater or instantan	eous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and v	water heating	(373) + (374) + (375) =		4701.98	(376)
CO2 associated with space cooling		(315) x	0.52	= 12.89	(377)
CO2 associated with electricity for pum	nps and fans within dwell	ing (331)) x	0.52	= 0	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	= 284.51	(379)
Total CO2, kg/year	sum of (376)(382) =			4999.38	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			28.32	(384)
El rating (section 14)				69.76	(385)
13b. Primary Energy – Community hea	ting scheme				
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space ar		P)			_
Efficiency of heat source 1 (%)		g two fuels repeat (363) to	(366) for the second fu	51	(367a)
Energy associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	0	= 25989.2	(367)
Electrical energy for heat distribution		[(313) x		= 595.13	(372)
Total Energy associated with communi		(363)(366) + (368)(372		= 26584.33	(373)
if it is negative set (373) to zero (unl	ess specified otherwise,	see C7 in Appendix C	;) 	26584.33	(373)
Energy associated with space heating	(secondary)	(309) x	0	= 0	(374)
Energy associated with water from imn	nersion heater or instanta	aneous heater(312) x	1.22	= 0	(375)
Total Energy associated with space an	d water heating	(373) + (374) + (375) =		26584.33	(376)
Energy associated with space cooling		(315) x	3.07	= 76.26	(377)
Energy associated with electricity for p	umps and fans within dw	relling (331)) x	3.07	= 0	(378)
Energy associated with electricity for light	ghting	(332))) x	3.07	= 1682.94	(379)

Total Primary Energy, kWh/year

sum of (376)...(382) =

28343.52

(383)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.1.24 Property Address: Flat 5 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3.28 (2a) =300.45 (3a) 91.6 First floor (2b) (1b) x (3b) 2.65 225.14 84.96 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)176.56 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =(5) 525.59 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 40 0 1 1 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c) 0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.11 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)15 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.86 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.73 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4

4.3

4.5

4.7

4.9

4.4

4.3

3.8

3.8

3.7

5

(22)m =

5.1

Wind Factor (22a)m = (22)m -	÷ 4											
(22a)m= 1.27 1.25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
		·			(24)	(00.)		Į.	ļ.	ı		
Adjusted infiltration rate (allow 0.94 0.92 0.9	ving for st	nelter an	d wind s	peed) = 0.7	(21a) x 0.68	(22a)m _{0.73}	0.79	0.02	0.00	1		
Calculate effective air change	1				0.00	0.73	0.79	0.83	0.86	J		
If mechanical ventilation:											0	(23a)
If exhaust air heat pump using Ap	pendix N, (2	(23a) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)				0	(23b)
If balanced with heat recovery: eff	iciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					0	(23c)
a) If balanced mechanical v	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
(24a)m = 0 0 0	0	0	0	0	0	0	0	0	0			(24a)
b) If balanced mechanical v	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		1		
(24b)m = 0 0 0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole house extract ve		•	•				F (00)	,				
if $(22b)m < 0.5 \times (23b)$,	tnen (24)	(230) = (230)); otner\ 0	wise (24)	$\frac{c}{0} = (220)$	o) m + 0	.5 × (23b	0	0	1		(24c)
(1,				<u> </u>				U		J		(240)
d) If natural ventilation or w if (22b)m = 1, then (24c							0.5]					
(24d)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87			(24d)
Effective air change rate - e	enter (24a) or (24b	or (24	c) or (24	d) in box	(25)						
(25)m= 0.94 0.92 0.9	0.83	0.81	0.74	0.74	0.73	0.77	0.81	0.84	0.87]		(25)
										•		
3 Heat losses and heat loss	naramet											
3. Heat losses and heat loss			Net Ar	ea	U-valı	ne	AXU		k-value	9	Д.	λΧk
ELEMENT Gross area (m²)	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l			A X k :J/K
ELEMENT Gross	Openin	gs						<) 				
ELEMENT Gross area (m²)	Openin	gs	A ,r	m² x	W/m2	K.	(W/I	<) 				J/K
ELEMENT Gross area (m²) Doors Type 1	Openin	gs	A ,r	m ² x	W/m2	= = = = = = = = = = = = = = = = = = =	4.2	<) 				(26)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2	Openin	gs	A ,r 2.1 2.06	x x x1.	W/m2 2 2	= 0.04] =	4.2 4.12	<) 				(26) (26)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1	Openin	gs	A ,r 2.1 2.06 1.93	x x x x x x x x x x x x x x x x x x x	W/m2 2 2 /[1/(1.5)+	= 0.04] = 0.04] =	4.2 4.12 2.73	<) 				(26) (26) (27)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	Openin	gs	A ,r 2.1 2.06 1.93	x x x 1. x 1. x 1.	W/m2 2 2 /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04] = 0.04] =	4.2 4.12 2.73 2.55	<) 				(26) (26) (27) (27)
ELEMENT Gross area (m²) Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3	Openin	gs	A ,r 2.1 2.06 1.93 1.8	x x x 1. x 1. x 1. x 1. x 1. x 1. x 1.	W/m2 2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] =	4.2 4.12 2.73 2.55 2.55	<) 				(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84	x x x1. x1. x1. x1. x1.	W/m2 2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 2.73 2.55 2.55 2.6	<)				(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43	x x x1. x1. x1. x1. x1. x1.	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 4.2 4.12 2.73 2.55 2.55 2.6 2.02	<)				(26) (26) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	4.2 4.12 2.73 2.55 2.55 2.6 2.02	<)				(26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Openin	gs	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02					(26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor	Openin	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02 1.8					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type 1 110.67	Openin	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.6 2.02 2.02 2.02 1.8 13.734 61.62					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type 1 110.67	Openin m	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 1.8 13.734					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14	Openin m	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+	0.04] = 0.04]	4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 1.8 13.734 61.62 3.58					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 Roof Type1 39.87	33.6 0 0	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.2 68.67 77.03 21.14 48.08 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.2 0.8 0.17 0.8 0.15	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 1.8 13.734 61.62 3.58 38.46 5.98					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Rooflights Floor Walls Type1 110.67 Walls Type2 21.14 Walls Type3 48.08	33.6 0	gs ₁ ²	A ,r 2.1 2.06 1.93 1.8 1.84 1.43 1.43 1.43 1.43 1.43 48.08	x x x x x x x x x x x x x x x x x x x	W/m2 2 /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ /[1/(1.5)+ 0.2 0.8 0.17 0.8	0.04] = 0.04]	(W/I 4.2 4.12 2.73 2.55 2.55 2.6 2.02 2.02 2.02 1.8 13.734 61.62 3.58 38.46					(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

Party wall (32)71.63 0 Party wall (32)118.11 0 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss, $W/K = S(A \times U)$ (33)190.65 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium (35)250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)56.32 if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) =246.97 (37)Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m x (5)Feb May Jul Jan Mar Apr Jun Aug Sep Oct Nov Dec 162.79 159.83 (38)156.94 143.34 140.79 128.95 128.95 126.76 133.51 140.79 145.94 151.32 (38)m =Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =409.76 406.8 403.91 390.31 387.77 375.92 375.92 373.73 380.49 387.77 392.91 398.29 (39)Average = $Sum(39)_{1...12}/12=$ 390.3 Heat loss parameter (HLP), W/m2K (40)m = (39)m \div (4)2.32 (40)m =2.3 2.2 2.13 2.13 2.12 2.15 2.2 2.26 (40)Average = $Sum(40)_{1...12}/12=$ 2.21 Number of days in month (Table 1a) 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 heating energy requirement: kWh/year: Assumed occupancy, N 2.97 (42)if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 104.77 (43)Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =115.24 111.05 106.86 102.67 98.48 94.29 94.29 98.48 102.67 106.86 111.05 115.24 Total = $Sum(44)_{1...12}$ = (44)1257.22 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m =170.9 149.47 154.24 134.47 129.03 111.34 103.18 118.4 119.81 139.63 152.41 165.51 Total = $Sum(45)_{1...12}$ = 1648.41 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)(46)m =25.64 22.42 23.14 20.17 19.35 16.7 15.48 17.76 17.97 20.94 22.86 24.83 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:

 a) If manufacturer's declared loss factor is known (kWh/day): 		0	(48)
Temperature factor from Table 2b		0	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	250	(50)
b) If manufacturer's declared cylinder loss factor is not known		250	(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.04	(51)
If community heating see section 4.3			1
Volume factor from Table 2a		0.78	(52)
Temperature factor from Table 2b		0.6	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	4.91	(54)
Enter (50) or (54) in (55) Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	4.91	(55)
		147.05 450.00	1 (56)
(56)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.2 If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷		147.35 152.26	(56)
			1
(57)m= 152.26 137.52 152.26 147.35 152.26 147.35 152.2	6 152.26 147.35 152.26	147.35 152.26	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	` '	-1-1)	
(modified by factor from Table H5 if there is solar water hea			(59)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (4	1)m		
(61)m= 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7	293.92 289.67 315.15	322.27 341.03	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar contribut	ion to water heating)	
		3,	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		1 (22)
(63)m= 0 0 0 0 0 0		0 0	(63)
(63)m= 0 0 0 0 0 0 0 Output from water heater	appendix G) 0 0	0 0	(63)
(63)m= 0 0 0 0 0 0	ppendix G) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 322.27 341.03	
(63)m= 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7	293.92 289.67 315.15 Output from water heate	0 0 322.27 341.03 r (annual) ₁₁₂	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)]	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)]	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84 e dwelling or hot water is from the second of	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h	3715.04 (64)
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the first term of th	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84 2 dwelling or hot water is fine Aug Sep Oct 6 148.56 148.56 148.56	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h	3715.04 (64)] (65) neating
(63)m= 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the control of the control of the cylinder is in the control of the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder is in the cylinder in the cyli	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84 e dwelling or hot water is from the second se	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h	3715.04 (64)] (65) neating
(63)m= 0 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the standard from th	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84 e dwelling or hot water is file Aug Sep Oct 6 148.56 148.56 148.56 also see Table 5 15.14 20.32 25.81	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h	3715.04 (64) [
(63)m= 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the control of the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder in the cylinder is in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in the cylinder in t	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m] 2 179.78 175.73 186.84 e dwelling or hot water is final so see Table 5 15.14 20.32 25.81 1.13a), also see Table 5	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h	3715.04 (64) [
(63)m= 0 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the conclusion of (65)m only if cylinder is in the conclusion of (65)m only if cylinder is in the conclusion of (65)m only if cylinder is in the conclusion of (66)m only if cylinder is in the conclusion of (66)m only if cylinder is in the conclusion of (65)m	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m 2 179.78 175.73 186.84 e dwelling or hot water is from Aug Sep Oct 6 148.56 148.56 148.56 also see Table 5 15.14 20.32 25.81 13a), also see Table 5 3 256.87 265.97 285.36	0 0 322.27 341.03 r (annual)112 + (57)m + (59)m 186.57 195.45 rom community h Nov Dec 148.56 148.56	3715.04 (64) [] (65) heating (66) [(67)
(63)m= 0 0 0 0 0 0 Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the control of the cylinder is in the cylinder in the cylinder is in the cylinder is in the cylinder is in the cylinder is in the cylinder is in the cylinder in the cylinder is in the cylinder is in the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder is in the cylinder in the cylinder in the cylinder in the cylinder in the cylind	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m 2 179.78 175.73 186.84 e dwelling or hot water is fi Aug Sep Oct 6 148.56 148.56 148.56 also see Table 5 15.14 20.32 25.81 .13a), also see Table 5 3 256.87 265.97 285.36 a), also see Table 5	0 0 322.27 341.03 r (annual)112 + (57)m + (59)m 186.57 195.45 rom community h Nov Dec 148.56 148.56	3715.04 (64) [] (65) heating (66) [(67)
Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)/(65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the final state of the	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m 2 179.78 175.73 186.84 e dwelling or hot water is fi Aug Sep Oct 6 148.56 148.56 148.56 also see Table 5 15.14 20.32 25.81 .13a), also see Table 5 3 256.87 265.97 285.36 a), also see Table 5	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h Nov Dec 148.56 148.56 30.12 32.11	3715.04 (64) [] (65) neating (66) [(67)
Output from water heater (64)m= 346.43 308.01 329.77 304.33 304.55 281.2 278.7 Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 197.24 176.53 191.7 180.6 183.32 172.91 174.7 include (57)m in calculation of (65)m only if cylinder is in the final factor of the factor of the final factor of the final factor of the final factor of the final factor of the factor of t	293.92 289.67 315.15 Output from water heate m + (61)m] + 0.8 x [(46)m 2 179.78 175.73 186.84 e dwelling or hot water is fi Aug Sep Oct 6 148.56 148.56 148.56 also see Table 5 15.14 20.32 25.81 .13a), also see Table 5 3 256.87 265.97 285.36 a), also see Table 5	0 0 322.27 341.03 r (annual) ₁₁₂ + (57)m + (59)m 186.57 195.45 rom community h Nov Dec 148.56 148.56 30.12 32.11	3715.04 (64) [] (65) neating (66) [(67)

Losse	Losses e.g. evaporation (negative values) (Table 5)															
	-118.85		-118.85	-118.85	-118.8		18.85	-118.85	-118	.85 -118.8	35 -11	18.85	-118.85	-118.85	7	(71)
Water	heating	gains (T	able 5)			!				<u> </u>			_!		_	
(72)m=	265.11	262.69	257.67	250.83	246.4	2	40.15	234.84	241	.65 244.0	06 25	51.13	259.12	262.7	7	(72)
Total	nternal	gains =		!	!		(66))m + (67)m	+ (68	B)m + (69)m	+ (70)ı	m + (71)m + (72)	m	_	
(73)m=	712.11	709.81	690.49	658.8	625.58	3 5	94.35	574.54	581	.23 597.9	93 62	29.87	666.63	695.2	7	(73)
6. So	lar gain:	s:				-				•						
Solar	gains are	calculated u	using sola	ar flux from	Table 6	a and	d assoc	iated equa	tions	to convert to	o the ap	oplica	able orientat	ion.		
Orient		Access F	actor	Area m²	ì		Flu			g_ Table 6	e b	_	FF		Gains	
	-	Table 6d		III*			га	ble 6a		rable	u	,	Table 6c		(W)	
North	0.9x	0.77	×	1.	84	X		10.63	X	0.85		X	0.7	=	16.14	(74)
North	0.9x	0.77	×	1.	43	X		10.63	X	0.85		X	0.7	=	18.81	(74)
North	0.9x	0.77	×	1.	84	X		20.32	X	0.85		X	0.7	=	30.83	(74)
North	0.9x	0.77	×		43	X	_	20.32	X	0.85		X	0.7	=	35.95	(74)
North	0.9x	0.77	×		84	X		34.53	X	0.85		X	0.7	=	52.4	(74)
North	0.9x	0.77	×		43	X	\vdash	34.53	X	0.85		X	0.7	_ =	61.08	(74)
North	0.9x	0.77	×		84	X	 	55.46	X	0.85		X	0.7		84.16	(74)
North	0.9x	0.77	¥ ×		43	X	⊨	55.46	X	0.85		X	0.7	= -	98.11	(74)
North North	0.9x	0.77	×		84	X	_	74.72	X	0.85		X	0.7	=	113.37	(74)
North	0.9x	0.77	×		43	X	_	74.72	X	0.85		X	0.7	=	132.17	(74)
North	0.9x	0.77	×		84	X	_	79.99	X	0.85	_	X [0.7	=	121.37	(74)
North	0.9x	0.77	×		43	X	\vdash	79.99	Х	0.85		X [0.7	╡ -	141.49	(74)
North	0.9x	0.77	×		84	X	-	74.68	X	0.85		X	0.7	_ =	113.31	(74)
North	0.9x 0.9x	0.77	×		43	X		74.68	X	0.85		x [0.7	_ =	132.1	(74)
North	0.9x	0.77	×		84	X	_	59.25	X	0.85		х [., [0.7	=	89.9	(74)
North	0.9x	0.77	x		43	x		59.25	x	0.85		x x	0.7	┥:	104.8	(74)
North	0.9x	0.77	$=$ $\stackrel{}{}$		43	X	_	41.52 41.52	^ x	0.85 0.85	_	^ [x [0.7	╡ -	73.44	(74)
North	0.9x	0.77	^ ^		84	X	_	24.19	^ x	0.85	_	^ L x [0.7	\dashv	36.7	(74)
North	0.9x	0.77	^ ^		43	X	_	24.19	^ x	0.85		^ [x [0.7	= -	42.79	(74)
North	0.9x	0.77	^		84	X	_	13.12	l ^ l x	0.85		^ L x [0.7	╡ -	19.9	(74)
North	0.9x	0.77	x	-	43	X	_	13.12	l x	0.85	_	^ L	0.7	= =	23.2	(74)
North	0.9x	0.77	×		84	X	_	8.86	x	0.85		^ L	0.7	╡.	13.45	(74)
North	0.9x	0.77	^		43	X		8.86	x	0.85		^ L x [0.7	\dashv	15.68	(74)
East	0.9x	3	×		.8	X	_	19.64	X	0.65		x [0.7	╡.	33.44	(76)
East	0.9x	2	x		43	X	_	19.64	X	0.85		x	0.7	╡.	23.16	(76)
	Ţ			<u> </u>	. •				!	0.00		Ļ				(- /

X

X

X

1.8

1.43

1.8

1.43

X

X

X

38.42

38.42

63.27

63.27

X

X

X

0.65

0.85

0.65

0.85

X

X

X

0.7

0.7

0.7

0.7

=

East

East

East

East

0.9x

0.9x

0.9x

0.9x

3

2

3

2

(76)

(76)

(76)

(76)

65.42

45.31

107.74

74.62

	_						ı						_
East	0.9x	3	X	1.8	X	92.28	X	0.65	X	0.7	=	157.13	(76)
East	0.9x	2	X	1.43	X	92.28	X	0.85	X	0.7	=	108.82	(76)
East	0.9x	3	X	1.8	X	113.09	X	0.65	X	0.7	=	192.56	(76)
East	0.9x	2	X	1.43	x	113.09	x	0.85	X	0.7	=	133.37	(76)
East	0.9x	3	X	1.8	X	115.77	x	0.65	X	0.7	=	197.12	(76)
East	0.9x	2	X	1.43	X	115.77	x	0.85	X	0.7	=	136.53	(76)
East	0.9x	3	X	1.8	x	110.22	x	0.65	X	0.7	=	187.67	(76)
East	0.9x	2	X	1.43	x	110.22	x	0.85	X	0.7	=	129.98	(76)
East	0.9x	3	X	1.8	X	94.68	x	0.65	X	0.7	=	161.2	(76)
East	0.9x	2	X	1.43	x	94.68	x	0.85	X	0.7	=	111.65	(76)
East	0.9x	3	X	1.8	x	73.59	x	0.65	X	0.7	=	125.3	(76)
East	0.9x	2	X	1.43	x	73.59	x	0.85	X	0.7	=	86.78	(76)
East	0.9x	3	x	1.8	x	45.59	x	0.65	x	0.7	=	77.62	(76)
East	0.9x	2	x	1.43	x	45.59	x	0.85	x	0.7	=	53.76	(76)
East	0.9x	3	X	1.8	x	24.49	x	0.65	X	0.7	=	41.7	(76)
East	0.9x	2	X	1.43	x	24.49	x	0.85	x	0.7	=	28.88	(76)
East	0.9x	3	x	1.8	x	16.15	x	0.65	x	0.7	=	27.5	(76)
East	0.9x	2	X	1.43	X	16.15	X	0.85	X	0.7	=	19.05	(76)
South	0.9x	0.77	x	1.93	x	46.75	×	0.65	x	0.7	=	56.9	(78)
South	0.9x	0.77	x	1.8	х	46.75	×	0.65	x	0.7	=	106.14	(78)
South	0.9x	0.77	x	1.43	X	46.75	x	0.85	x	0.7	=	82.7	(78)
South	0.9x	0.77	x	1.93	x	76.57	X	0.65	x	0.7	=	93.19	(78)
South	0.9x	0.77	x	1.8	x	76 <mark>.57</mark>	X	0.65	x	0.7	=	173.83	(78)
South	0.9x	0.77	X	1.43	х	76.57	x	0.85	x	0.7	=	135.44	(78)
South	0.9x	0.77	X	1.93	x	97.53	x	0.65	X	0.7	=	118.71	(78)
South	0.9x	0.77	X	1.8	X	97.53	x	0.65	X	0.7	=	221.43	(78)
South	0.9x	0.77	X	1.43	x	97.53	x	0.85	X	0.7	=	172.53	(78)
South	0.9x	0.77	X	1.93	x	110.23	x	0.65	X	0.7	=	134.17	(78)
South	0.9x	0.77	X	1.8	x	110.23	x	0.65	X	0.7	=	250.26	(78)
South	0.9x	0.77	X	1.43	x	110.23	x	0.85	X	0.7	=	195	(78)
South	0.9x	0.77	X	1.93	x	114.87	x	0.65	X	0.7	=	139.81	(78)
South	0.9x	0.77	X	1.8	x	114.87	x	0.65	X	0.7	=	260.79	(78)
South	0.9x	0.77	X	1.43	x	114.87	x	0.85	X	0.7	=	203.2	(78)
South	0.9x	0.77	X	1.93	X	110.55	x	0.65	X	0.7	=	134.55	(78)
South	0.9x	0.77	X	1.8	X	110.55	x	0.65	X	0.7	=	250.97	(78)
South	0.9x	0.77	x	1.43	x	110.55	x	0.85	x	0.7	=	195.55	(78)
South	0.9x	0.77	x	1.93	x	108.01	x	0.65	x	0.7	=	131.46	(78)
South	0.9x	0.77	x	1.8	x	108.01	x	0.65	x	0.7	=	245.22	(78)
South	0.9x	0.77	x	1.43	x	108.01	x	0.85	x	0.7	j =	191.06	(78)
South	0.9x	0.77	x	1.93	x	104.89	x	0.65	X	0.7	=	127.67	(78)
South	0.9x	0.77	x	1.8	x	104.89	X	0.65	X	0.7	=	238.14	(78)

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South	0.9x	0.77		X	1.4	3	X	1	04.89		x	0.85	X		0.7		=	185.55	(78)
South	0.9x	0.77		X	1.9	3	X	1	01.89]	x	0.65	X		0.7		=	124.01	(78)
South	0.9x	0.77		X	1.8	3	X	1	01.89		x	0.65	X		0.7		=	231.31	(78)
South	0.9x	0.77		X	1.4	3	X	1	01.89		x	0.85	X		0.7		=	180.23	(78)
South	0.9x	0.77		x	1.9	3	X	8	32.59]	x	0.65	X		0.7		=	100.52	(78)
South	0.9x	0.77		x	1.8	3	X	8	32.59]	x	0.65	X		0.7		=	187.49	(78)
South	0.9x	0.77		x	1.4	3	X	8	32.59]	x	0.85	X	Ī	0.7		=	146.09	(78)
South	0.9x	0.77		x	1.9	3	X	5	55.42	Ī:	x \lceil	0.65	= x	Ī	0.7		=	67.45	(78)
South	0.9x	0.77		x	1.8	3	X	5	55.42	1	x F	0.65	X	Ī	0.7		=	125.81	(78)
South	0.9x	0.77		x	1.4	3	X	5	55.42]	x	0.85	X	Ī	0.7		=	98.03	(78)
South	0.9x	0.77		x	1.9	3	X		40.4	Ī:	x \lceil	0.65	= x	Ī	0.7		=	49.17	(78)
South	0.9x	0.77		x	1.8	3	X		40.4	1	x F	0.65	X	Ī	0.7		=	91.71	(78)
South	0.9x	0.77		x	1.4	3	X		40.4	٦.	x	0.85	X	Ī	0.7		=	71.46	(78)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		26	1	x $\overline{\ }$	0.65	×	Ī	0.7		=	12.78	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		54	1	x F	0.65	×	Ī	0.7		=	26.54	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		96	Ī:	x $lacksquare$	0.65	X	Ī	0.7		=	47.17	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		150]	x	0.65	X	Ī	0.7		=	73.71	(82)
Roofligh	nts 0.9x	1		X	1.2	2	X		192		х	0.65	X	Ī	0.7		=	94.35	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	Х		200	1	x $$	0.65	X	Ī	0.7		-	98.28	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	Х		189	٦,	×	0.65	X	Ī	0.7		=	92.87	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		157		x	0.65	X	Ī	0.7		=	77.15	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		115		х	0.65	X	Ī	0.7		=	56.51	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		66]	×	0.65	X	Ī	0.7		=	32.43	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	х		33]	x	0.65	X	Ī	0.7		=	16.22	(82)
Roofligh	nts _{0.9x}	1		x	1.2	2	X		21]	x	0.65	x	Ī	0.7		=	10.32	(82)
										_									
Solar g	ains in	watts, ca	alcula	ated	for eacl	n mont	h_			(83	3)m =	Sum(74)m .	(82)r	n					
(83)m=	350.07	606.51	855.						1223.67	1	096.0	940.57	677.	41	421.19	298	.34		(83)
		nternal a		_	<u>` </u>	. ,	<u> </u>			_					, ,			1	
(84)m=	1062.17	1316.31	1546	.16	1760.15	1895.1	9 1	870.21	1798.22	2 10	677.2	1538.5	1307	.27	1087.82	993	.54		(84)
7. Me	an inter	nal temp	perati	ıre (heating	seaso	n)												
Temp	erature	during h	neatin	ıg pe	eriods ir	the liv	/ing	area	from Tal	ble	9, -	Γh1 (°C)						21	(85)
Utilisa	ation fac	tor for g	ains f	for li	ving are	a, h1,ı	m (s	ee Ta	ble 9a)	_								1	
	Jan	Feb	M	ar	Apr	May	<u> </u>	Jun	Jul	╙	Aug	g Sep	O	ct	Nov	D	ec		
(86)m=	1	0.99	0.9	9	0.97	0.93		0.85	0.73		0.77	0.91	0.9	8	0.99	1			(86)
Mean	interna	l temper	ature	in li	iving are	ea T1 (follo	w ste	ps 3 to 7	7 ir	n Ta	ble 9c)							
(87)m=	18.46	18.7	19.0	9	19.66	20.18	:	20.63	20.84	2	20.81	20.45	19.7	7	19.05	18.	48		(87)
Temp	erature	during h	neatin	ıg pe	eriods ir	rest o	of dv	velling	from Ta	abl	e 9,	Th2 (°C)							
(88)m=	19.13	19.14	19.1	15	19.2	19.21		19.25	19.25		19.26	19.23	19.2	21	19.19	19.	17		(88)
Utilisa	ation fac	tor for g	ains f	for r	est of d	welling	, h2	,m (se	ee Table	98	a)							=	
(89)m=	1	0.99	0.9		0.95	0.89	\neg	0.73	0.51	$\overline{}$	0.57	0.84	0.9	7	0.99	1			(89)
Mean	interna	l temner	ature	in t	he rest	of dwe	llinc	T2 (f	ollow sta	<u> </u>	2 7 t	o 7 in Tabl	_ Qc)		•			•	

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m= 15.91 16.25 16.83 17.67 18.4 19 19.2 19.18 18.8 17.85 16.8 15.94	(90)
$fLA = Living area \div (4) = 0.31$	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 16.69 17 17.52 18.28 18.95 19.5 19.7 19.68 19.3 18.44 17.49 16.72	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m= 16.69 17 17.52 18.28 18.95 19.5 19.7 19.68 19.3 18.44 17.49 16.72	(93)
8. Space heating requirement	
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)m= 0.99 0.99 0.97 0.94 0.88 0.75 0.58 0.63 0.84 0.96 0.99 0.99	(94)
Useful gains, hmGm, W = (94)m x (84)m	(05)
(95)m= 1054.4 1298 1504.36 1660.35 1668.95 1411.28 1042.5 1060.12 1299.64 1251.4 1074.18 987.75	(95)
Monthly average external temperature from Table 8	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	(07)
(97)m= 5076.74 4922.01 4452.46 3660.5 2810.2 1841.88 1166.67 1226.59 1980.27 3039.14 4081.37 4986.74	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 2992.62 2435.33 2193.39 1440.11 849.09 0 0 1330.08 2165.18 2975.25	
	7(00)
Total per year (kWh/year) = Sum(98) _{15,912} = 16381.04	(98)
Space heating requirement in kWh/m²/year 92.78	(99)
8c. Space cooling requirement	
col chade coming requirement	
Calculated for June, July and August. See Table 10b	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Calculated for June, July and August. See Table 10b	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(100)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm	, ,
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0	(100)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m	(101)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0	, ,
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10)	(101)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0	(101)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m	(101)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m	(101)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(101) (102) (103)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 0 254.31 0 0 0 0 0 Total = Sum(104) = 254.31	(101) (102) (103)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 0 254.31 0 0 0 0 0 0 Total = Sum(10.4) = 254.31 Cooled fraction	(101) (102) (103)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 0 254.31 0 0 0 0 0 Total = Sum(104) = 254.31	(101) (102) (103)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 0 254.31 0 0 0 0 0 Total = Sum(1,04) = 254.31 Cooled fraction f C = cooled area ÷ (4) = 0.79	(101) (102) (103)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 0 3533.68 2781.83 2840.35 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.58 0.66 0.63 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2032.64 1840.74 1776.79 0 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 0 2268.71 2182.56 2046.2 0 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 0 254.31 0 0 0 0 0 Total = Sum(1,04) = 254.31 Cooled fraction f C = cooled area ÷ (4) = 0.79 Intermittency factor (Table 10b) (106)m= 0 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0	(101) (102) (103) (104) (105)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(101) (102) (103) (104) (105)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(101) (102) (103) (104) (105)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(101) (102) (103) (104) (105)

9b. Energy requirements – Community heating schem	ne				
This part is used for space heating, space cooling or vertication of space heat from secondary/supplementary	vater heating provided	•	me.	0	(301)
Fraction of space heat from community system 1 – (30	,			1	(302)
The community scheme may obtain heat from several sources. The includes boilers, heat pumps, geothermal and waste heat from pow	e procedure allows for CHP a		urces; the l	atter	」 `
Fraction of heat from Community boilers				1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a)	=	1	(304a)
Factor for control and charging method (Table 4c(3)) f	or community heating	system		1	(305)
Distribution loss factor (Table 12c) for community hear	ting system			1.05	(306)
Space heating Annual space heating requirement			Г	kWh/year 16381.04	7
Space heat from Community boilers	(98)	x (304a) x (305) x (306) =		17200.09	(307a)
Efficiency of secondary/supplementary heating system	n in % (from Table 4a	or Appendix E)		0	(308
Space heating requirement from secondary/suppleme	ntary system (98)	x (301) x 100 ÷ (308) =		0	(309)
Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not Electricity for pumps and fans within dwelling (Table 4 mechanical ventilation - balanced, extract or positive i warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme	$0.01 \times [(300)]$ enter 0) = (100) f): nput from outside	$x (303a) \times (305) \times (306) =$ $(307a)(307e) + (310a)(316)$ $(314) =$ $(314) =$ $(30a) + (330b) + (330g) =$	0e)] =	3715.04 3900.79 211.01 4.38 11.52 0 0 0 551.74	(310a) (313) (314) (315) (330a) (330b) (330g) (331) (332)
	Energy kWh/ye	Emission fa ar kg CO2/kW		nissions CO2/year	
CO2 from other sources of space and water heating (In Efficiency of heat source 1 (%)	not CHP) is CHP using two fuels repe	at (363) to (366) for the sec	ond fuel	91	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷	(367b) x 0	= [5008.56	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [109.51	(372)
Total CO2 associated with community systems	(363)(366) + ((368)(372)	= [5118.08	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [0	(374)
CO2 associated with water from immersion heater or i	instantaneous heater	(312) x 0.22	= [0	(375)
Total CO2 associated with space and water heating	(373) + (374) +	(375) =	[5118.08	(376)

CO2 associated with space cooling		(315) x	0.52	=	5.98	(377)
CO2 associated with electricity for pum	ps and fans with	nin dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	=	286.35	(379)
Total CO2, kg/year	sum of (376)(38	82) =			5410.41	(383)
Dwelling CO2 Emission Rate	$(383) \div (4) =$				30.64	(384)
El rating (section 14)					67.28	(385)

SAP Input

Property Details: Flat 3

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 28 October 2015
Date of certificate: 30 October 2015

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

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

PCDF Version: 383

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2015

Floor Location: Floor area:

Storey height:

Floor 0 40.62 m^2 3.2 m Floor 1 110.03 m^2 2.65 m

Living area: 69.89 m² (fraction 0.464)

Front of dwelling faces: Unspecified

Opening types:

RFI2

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
D1		Manufacturer	Solid			Wood
W1		Manufacturer	Windows	Single-glazed	No	Wood
W2		Manufactur <mark>er</mark>	Windows	Single-glazed	No	
W3		Manufacturer	Windows	Single-glazed	No	
W4		Manufacturer	Windows	Single-glazed	No	
w5		Manufacturer	Windows	Single-glazed	No	
RF1		Manufacturer	Roof Windows	low-E, $En = 0.2$, hard coat	No	PVC-U
RFI2		Manufacturer	Roof Windows	low-E, En = 0.2 , hard coat	No	PVC-U

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	2	2.1	1
W1		0.7	0.65	4.5	1.86	3
W2	16mm or more	0.7	0.65	4.5	0.75	4
W3	16mm or more	0.7	0.65	4.5	1.2	2
W4	16mm or more	0.7	0.85	4.5	1.2	2
w5	16mm or more	0.7	0.85	4.5	8.4	1
RF1	16mm or more	0.7	0.65	1.5	2.49	1

0.65

1.5

3.35

1

0.7

Name: D1	Type-Name:	Location: corridor	Orient:	Width: 1	Height: 2.1
W1		External wall GF	South	1.161	1.6
W2		External FF	South	1	0.75
W3		External FF	West	1	1.2
W4		External FF	North	1	1.2
w5		External FF	East	4	2.1
RF1		Flat roof 2	Horizontal	1.868	1.331
RFI2		Flat roof 2	Horizontal	1.83	1.83

16mm or more

SAP Input

Overshading:		More th	nan average				
Opaque Elements:	:						
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elements		E EQ	20.40	0.0	0	Foloo	NI/A
External wall GF corridor GF	26.056 21.14	5.58 0	20.48 21.14	0.8 0.2	0 0.9	False False	N/A N/A
External FF	80.03	16.2	63.83	0.2	0.9	False False	N/A N/A
flat roof 1	110.03	0	110.03	0.15	0	i aise	N/A N/A
Internal Elements		J	110.00	0.10	J		19/75
Party Elements							
party GF	48.104						N/A
Party wall FF	22.83						N/A
Thermal bridges:							
Thermal bridges:		No info	rmation on thern	mal bridging (y=0.	.15) (y =0.15)		
Ventilation:							
Pressure test:		No (Ass	sumed) Eventilation (extra	east fanc)			
Ventilation: Number of chimner	vouc.		n: 0, secondary: (•			
Number of chimn Number of open f		0	1. U, Securidary. C	J, Utilet . 1)			
Number of fans:	nues.	4					
Number of passiv	ve stacks:	0					
Number of sides s		2					
Pres <mark>sure test:</mark>		15					
Main heating syste	em:						
Main heating syst	tem:	Commu	unity heating sche	emes			
ividii riodiii g ojo:	·CIII.		urce: Community				
					tion 1, efficiency 9	1	
				lated, low temp, v			
Main heating Cont	trol:						
Main heating Con	ıtrol:	Chargir	ng system linked	to use of commur	nity heating, progr	ammer and at least tv	vo room ther
		Control	code: 2312				
Secondary heating	g system:						
Secondary heating		None			<u> </u>		
Space cooling syst	tem:						
Space cooling sys	stem:		ultiple systems				
			data to EN 1451	1:			
			/Model: TBC`				
		EER: 3					
				stems with On/Off	f control		
Water heating:		Coolea	area: 140 (fraction	on 0.929)			
		From n	se's beeting evet				
Water heating:			nain heating syste code: 901	em			
			eat from boilers -	maine das			
			eat from bollers - ter cylinder	- IIIaii is yas			
			er volume: 310 liti	ros			
		•	er insulation: Jack				
		-	y pipework insula				
		-	rstat: True				
		•	r in booted chac	a. Tm., a			

Cylinder in heated space: True

Solar panel: False

SAP Input

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

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



		User Details:				
Assessor Name: Software Name:	Stroma FSAP 2012	Stroma No		Versio	n: 1.0.1.24	
	P	roperty Address: Flat	t 3			
Address :						
1. Overall dwelling dimens	ions:					
		Area(m²)	Av. Height(m)		Volume(m³)	
Ground floor		40.62 (1a)	x 3.2	(2a) =	129.98	(3a)
First floor		110.03 (1b)	x 2.65	(2b) =	291.58	(3b)
Total floor area TFA = (1a)+	-(1b)+(1c)+(1d)+(1e)+(1n	150.65 (4)				_
Dwelling volume		(3a)	+(3b)+(3c)+(3d)+(3e)+	(3n) =	421.56	(5)
2. Ventilation rate:						
	main secondar heating heating	y other	total		m³ per hour	
Number of chimneys	0 + 0	+ 1	= 1 x	40 =	40	(6a)
Number of open flues	0 + 0	+ 0	= 0 x	20 =	0	(6b)
Number of intermittent fans			4 ×	10 =	40	(7a)
Number of passive vents			0 x	10 =	0	(7b)
Number of flueless gas fires	3		0 x	40 =	0	(7c)
	flux and favo (Sc) (Sh) (7	0) (7b) (7c) -			anges per ho	_
	flues and fans = (6a)+(6b)+(7 n carried out or is intended, proceed		80 ue from (9) to (16)	÷ (5) =	0.19	(8)
Number of storeys in the	dw <mark>elling</mark> (ns)				0	(9)
Additional infiltration)-1]x0.1 =	0	(10)
	for steel or timber frame or	•		L	0	(11)
if both types of wall are prese deducting areas of openings,	ent, use the value corresponding to): if equal user 0.35	the greater wall area (after	er			
	or, enter 0.2 (unsealed) or 0.	1 (sealed), else ente	er O	Γ	0	(12)
If no draught lobby, enter		, ,		Ì	0	(13)
• .	nd doors draught stripped			Ī	0	(14)
Window infiltration	5	0.25 - [0.2 x (14	l) ÷ 100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11)) + (12) + (13) + (15) =	Ī	0	(16)
Air permeability value, q5	0, expressed in cubic metre	s per hour per squar	e metre of envelope	e area	15	(17)
	value, then $(18) = [(17) \div 20] + (8)$		·	Ī	0.94	(18)
Air permeability value applies if	a pressurisation test has been don	e or a degree air permeal	bility is being used	_		_
Number of sides sheltered					2	(19)
Shelter factor		(20) = 1 - [0.075]	5 x (19)] =	[0.85	(20)
Infiltration rate incorporating		$(21) = (18) \times (20)$	0) =		0.8	(21)
Infiltration rate modified for			<u> </u>			
Jan Feb Ma	ar Apr May Jun	Jul Aug S	ep Oct Nov	Dec		
Monthly average wind spee	d from Table 7					

4.3

3.8

3.8

3.7

4.3

4.5

4.7

22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	1	<u>!</u>			ļ	!	ļ	ļ	<u>!</u>	<u>I</u>	<u>!</u>	l	
Adjusted infilt	ration rat	ı `			1	i ´	`´	ì	1	T	1	I	
1.02 Calculate effe	ective air	0.98 Change	0.88 rate for t	0.86 he appli	0.76 cable ca	0.76 Se	0.74	0.8	0.86	0.9	0.94		
If mechanic		•										() (2
If exhaust air	heat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			() (2
If balanced wi	th heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =				() (2
a) If balance	ed mech	anical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	MV) (24b	o)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole if (22b)	house ex m < 0.5 ×				•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
,	l ventilation m = 1, the	en (24d)	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	_	0.0	0.04		(2:
44d)m= 1.02	1	0.98	0.89	0.87	0.79	0.79	0.77	0.82	0.87	0.9	0.94		(2
				10.41	\ (0.4	\ (0/4	1/ 1						
Effective ai	_			` `	<u> </u>	<u> </u>		` '	0.97	0.0	0.04		(2)
Effective ai	r change	rate - er 0.98	oter (24a 0.89) or (24k 0.87	0) or (24 0.79	c) or (24 0.79	(d) in box	0.82	0.87	0.9	0.94		(2
25)m= 1.02	1	0.98	0.89	0.87	0.79	0.79		` '		0.9	0.94	Ц	
25)m= 1.02 3. Heat loss	1 es and he	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79	0.79 ea	0.77 U-val	0.82 ue	AXU		k-value		AXk
25)m= 1.02 3. Heat loss ELEMENT	1 es and he	0.98 eat loss p	0.89	0.87 er:	0.79	0.79 ea	0.77	0.82 ue					
3. Heat loss ELEMENT	es and he Gros area	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar	0.79	U-val W/m2	0.82 ue 2K	A X U (W/F		k-value		A X k kJ/K
3. Heat loss ELEMENT Doors Vindows Typ	1 Gros	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86	0.79 rea m² x1	U-val W/m2	0.82 ue 2K = 0.04] =	A X U (W/H 4.2 7.09		k-value		A X k kJ/K (2
3. Heat loss ELEMENT Doors Vindows Typ	des and he Gros area	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75	0.79 rea m² x1 x1	U-val W/m2 2 /[1/(4.5)+	0.82 ue 2K - 0.04] = - 0.04] =	A X U (W/I 4.2 7.09 2.86		k-value		A X k kJ/K (2)
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ	des and he Gros area	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75	0.79 rea m² x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+	0.82 0.82 0.04] = 0.04] = 0.04] =	A X U (W/I 4.2 7.09 2.86 4.58		k-value		A X k kJ/K (2) (2) (2) (2)
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ	gros area ee 1 ee 2 ee 3 ee 4	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2	0.79 rea m² x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.82 0.82 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 4.2 7.09 2.86 4.58		k-value		A X k kJ/K (2) (2) (2) (2) (2)
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ	Gros area ee 1 ee 2 ee 3 ee 4 ee 5	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4	0.79 rea m² x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.82 0.82 0.04] = 0.	A X U (W/I 4.2 7.09 2.86 4.58 4.58		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat oss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ	Gros area ee 1 ee 2 ee 3 ee 4 ee 5 pe 1	0.98 eat loss p	0.89 Darameto Openin	0.87 er:	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49	0.79 rea x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	0.82 0.04] = -0.04]	A X U (W/k 4.2 7.09 2.86 4.58 4.58 32.03 3.735		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Rooflights Ty	gros area de 1 de 2 de 3 de 4 de 5 de 5 de 2	0.98 eat loss r	0.89 Darametr Openin m	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4 2.49 3.35	0.79 rea m² x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) +	0.82 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Rooflights Ty Rooflights Ty Valls Type1	gros area ee 1 ee 2 ee 3 ee 4 ee 5 pee 1 pee 2	0.98 eat loss part (m²)	0.89 Openin m	0.87 gs ₁₂	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4 2.49 3.35 20.48	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) +	0.82 0.82 0.04] = -	A X U (W/N 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat loss ELEMENT Doors Vindows Typ Vin	1 1 es and he Gros area e 1 e 2 e 3 e 4 e 5 e 5 e 2 26.0 21.1	0.98 eat loss pass (m²)	0.89 Openin m 5.58	0.87 er: gs ₁ 2	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4 2.49 3.35 20.48	0.79 rea x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5) + 0.8	0.82 UUE 2K = 0.04] = -0.04	A X U (W/N 4.2 7.09 2.86 4.58 32.03 3.735 5.025 16.38 3.58		k-value		A X k kJ/K (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Valls Type1 Valls Type2 Valls Type3	1 1 es and he Gros area e 1 e 2 e 3 e 4 e 5 e 5 e 1 e 2 2 1.1 80.0	0.98 eat loss (m²)	0.89 Openin m 5.58 0 16.2	0.87 er: gs ₁ 2	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) + 0.8 0.17	0.82 UUE 2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] =	A X U (W/N 4.2 7.09 2.86 4.58 32.03 3.735 5.025 16.38 3.58 51.06		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat oss ELEMENT Ooors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Rooflights Ty Rooflights Ty Valls Type1 Valls Type2 Valls Type3 Roof	1 1 es and he Gros area e 1 e 2 e 3 e 4 e 5 e 5 e 2 26.0 21.1 80.0 110.	0.98 eat loss part (m²)	0.89 Openin m 5.58	0.87 er: gs ₁ 2	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5) + 0.8	0.82 UUE 2K = 0.04] = -0.04	A X U (W/N 4.2 7.09 2.86 4.58 32.03 3.735 5.025 16.38 3.58		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat loss ELEMENT Ooors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vooflights Ty Valls Type1 Valls Type2 Valls Type3 Roof Total area of	1 1 es and he Gros area e 1 e 2 e 3 e 4 e 5 e 5 e 2 26.0 21.1 80.0 110.	0.98 eat loss part (m²)	0.89 Openin m 5.58 0 16.2	0.87 er: gs ₁ 2	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) + 0.8 0.17	0.82 0.82 0.82 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = =	A X U (W/N 4.2 7.09 2.86 4.58 32.03 3.735 5.025 16.38 3.58 51.06 16.5		k-value		A X k kJ/K (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
3. Heat loss ELEMENT Doors Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vindows Typ Vooflights Ty Valls Type1 Valls Type2 Valls Type3 Roof	1 1 es and he Gros area e 1 e 2 e 3 e 4 e 5 e 5 e 2 26.0 21.1 80.0 110.	0.98 eat loss part (m²)	0.89 Openin m 5.58 0 16.2	0.87 er: gs ₁ 2	0.79 Net Ar A ,r 2.1 1.86 0.75 1.2 8.4 2.49 3.35 20.48 21.14 63.83	0.79 rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) + 0.8 0.17	0.82 UUE 2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] =	A X U (W/N 4.2 7.09 2.86 4.58 32.03 3.735 5.025 16.38 3.58 51.06		k-value		A X k kJ/K (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2

(26)...(30) + (32) =

Fabric heat loss, $W/K = S (A \times U)$

183.06

(33)

Heat capacity Cm	= S(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass para	ameter (TMF	= Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assessment can be used instead of			constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		`
Thermal bridges:	S (L x Y) cal	culated (using Ap	pendix I	<						36.78	(36)
if details of thermal brid	lging are not kn	nown (36) =	= 0.15 x (3	1)								
Total fabric heat lo	ss						(33) +	(36) =			219.84	(37)
Ventilation heat los	ss calculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)			
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 141.69 138	3.91 136.16	123.26	120.85	109.61	109.61	107.53	113.94	120.85	125.73	130.84		(38)
Heat transfer coeff	icient, W/K						(39)m	= (37) + (3	38)m		•	
(39)m= 361.52 358	3.74 356	343.1	340.68	329.45	329.45	327.37	333.78	340.68	345.57	350.67		
Heat loss paramet	er (HLP), W	/m²K						Average = = (39)m ÷		12 /12=	343.08	(39)
(40)m= 2.4 2.3	38 2.36	2.28	2.26	2.19	2.19	2.17	2.22	2.26	2.29	2.33		
Number of days in	month (Tab	le 1a)			•		,	Average =	Sum(40) ₁	12 /12=	2.28	(40)
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m= 31 2	8 31	30	31	30	31	31	30	31	30	31		(41)
											J	
4. Water heating	eneray reall	irement:								kWh/y	aar:	
4. Water fleating	cricigy requ	irement.						_		1 (V V I I / Y V	car.	
Assumed occupan if TFA > 13.9, N	$= 1 + 1.76 \times$	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		94		(42)
if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76 x = 1			·		, , , 		ΓFA -13.	9)			
if TFA > 13.9, N	= 1 + 1.76 x = 1 ot water usag rage hot water	ge in litre	es per da 5% if the o	ay Vd,av	erage = designed t	(25 x N)	+ 36		9)	3.91		(42)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual ave not more that 125 litres	= 1 + 1.76 x = 1 ot water usage rage hot water per person per	ge in litre usage by r day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed ((25 x N) to achieve	+ 36 a water us	se target o	9) 10:	3.91		
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual ave not more that 125 litres	= 1 + 1.76 x = 1 ot water usag rage hot water per person per eb Mar	ge in litre usage by r day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed to	(25 x N) to achieve	+ 36		9)			
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average not more that 125 litres Jan F Hot water usage in litre	= 1 + 1.76 x = 1 ot water usage rage hot water per person per eb Mar s per day for ea	ge in litre usage by a r day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fa	ay Vd,av Iwelling is not and co	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	se target o	9) 10:	3.91		
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average not more that 125 litres Jan F Hot water usage in litre	= 1 + 1.76 x = 1 ot water usage rage hot water per person per eb Mar s per day for ea	ge in litre usage by r day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed to	(25 x N) to achieve	+ 36 a water us Sep	se ta <mark>rget o</mark> Oct	9) 10: Nov 110.15	Dec 114.3	1246.93	
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average not more that 125 litres Jan F Hot water usage in litre	= 1 + 1.76 x = 1 ot water usage hot water per person per eb Mar s per day for ea	ge in litre usage by a r day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fac 97.68	y Vd,av lwelling is not and co Jun ctor from 1	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep	Oct 105.99 Total = Su	9) Nov 110.15 m(44) ₁₁₂ =	Dec 114.3	1246.93	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual ave not more that 125 litres Jan F Hot water usage in litre (44)m= 114.3 110	= 1 + 1.76 x = 1 ot water usac rage hot water per person per eb Mar s per day for ea 0.15 105.99	ge in litre usage by a r day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fac 97.68	y Vd,av lwelling is not and co Jun ctor from 1	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep	Oct 105.99 Total = Su	9) Nov 110.15 m(44) ₁₁₂ =	Dec 114.3	1246.93	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average had reduce the annual average in the second more that 125 litres Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w (45)m= 169.51 148	= 1 + 1.76 x = 1 ot water usage hot water per person per eb Mar s per day for ea 0.15 105.99 vater used - cal 3.25 152.98	ge in litre usage by a r day (all w Apr ach month 101.83	es per da 5% if the da 5% if th	Jun ctor from 1 93.52	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 97.68 117.43	+ 36 a water us Sep 101.83 0 kWh/mor 118.83	Oct 105.99 Total = Sunth (see Ta	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17	Dec 114.3 c, 1d) 164.16	1246.93	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average had reduce the annual average in the second more that 125 litres Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w	= 1 + 1.76 x = 1 ot water usage hot water per person per eb Mar s per day for ea 0.15 105.99 vater used - cal 3.25 152.98	ge in litre usage by a r day (all w Apr ach month 101.83	es per da 5% if the da 5% if th	Jun ctor from 1 93.52	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 97.68 117.43	+ 36 a water us Sep 101.83 0 kWh/mor 118.83	Oct 105.99 Total = Surath (see Tail 138.49)	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17	Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average had reduce the annual average in litre Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w (45)m= 169.51 148 If instantaneous water in the instantaneous water in	= 1 + 1.76 x = 1 ot water usage hot water per person per eb Mar s per day for ea 0.15 105.99 vater used - cal 3.25 152.98 heating at point	ge in litre usage by a r day (all w Apr ach month 101.83	es per da 5% if the da 5% if th	Jun ctor from 1 93.52	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 97.68 117.43	+ 36 a water us Sep 101.83 0 kWh/mor 118.83	Oct 105.99 Total = Surath (see Tail 138.49)	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17	Dec 114.3 c, 1d) 164.16		(43)
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if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average had reduce the annual average in litre Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w (45)m= 169.51 148 If instantaneous water water water water storage loss Storage volume (literature)	= 1 + 1.76 x = 1 It water usage hot water per person per son per son per son per son per son per son per son per son per son son son son son son son son son son	ge in litre usage by a day (all was Apr ach month 101.83 culated me 133.37 for use (not 20.01) and any set of use any set of u	es per da 5% if the orater use, I May Vd,m = far 97.68 onthly = 4. 127.98 o hot water 19.2	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage),	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Su 138.49 Total = Su 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average had reduce the annual average in the second more that 125 litres Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w (45)m= 169.51 148 If instantaneous water in the second more that 125 litres Annual average had reduced to the second more that 125 litres Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w (45)m= 25.43 22 Water storage loss Storage volume (little formmunity heating the second more than 125 litres If community heating the second more than 125 litres If instantaneous water in the second more than 125 litres If it is in the second more	= 1 + 1.76 x = 1 Interpretation of the second of the seco	ge in litre usage by r day (all w Apr ach month 101.83 culated mo 133.37 t of use (no 20.01 and any so	es per da 5% if the of water use, I May Vd,m = factor 97.68 97.68 127.98 o hot water 19.2 olar or Water velling, e	Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage),	erage = designed to lid) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 1 to (61) 17.82 ame ves	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
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if TFA > 13.9, N if TFA £ 13.9, N Annual average had reduce the annual average in litres Jan F Hot water usage in litre (44)m= 114.3 110 Energy content of hot w (45)m= 169.51 148 If instantaneous water in the instantaneous water in t	= 1 + 1.76 x = 1 It water usage hot water per person per son	ge in litre usage by a day (all was Apr ach month 101.83 deulated me 20.01 and ank in dwar (this in oss factors 2b	es per da 5% if the of 5% if the of 5% if the of May Vd,m = factor 97.68 97.68 127.98 o hot water 19.2 olar or Water velling, each of the or is known.	y Vd,av lwelling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 storage), 16.56 /WHRS nter 110	erage = designed to lid) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage Ditres in neous con/day):	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47) ombi boil	+ 36 a water us Sep 101.83 118.83 10 (61) 17.82 ame vess ers) enter	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62 310		(43) (44) (45) (46) (47) (48) (49)
if TFA > 13.9, N if TFA £ 13.9, N Annual average how receive the annual average how receive the annual average in litres. Jan F Hot water usage in litres. (44)m= 114.3 110 Energy content of hot w (45)m= 169.51 148 If instantaneous water in the instantaneous wa	= 1 + 1.76 x = 1 It water usage hot water per person per day for each of the second person per day for each of the second person per day for each of the second person per day for each of the second person person per day for each of the second person per	ge in litre usage by a day (all we have month ach month 101.83 deulated me 133.37 de of use (not ank in dwer (this in oss factors 2b e, kWh/ye	es per da 5% if the of the off the off May Vd,m = far 97.68 onthly = 4. 127.98 o hot water 19.2 olar or Water velling, eacludes in the or is known per is known	y Vd,av welling is not and co Jun ctor from 1 93.52 190 x Vd,r 110.43 r storage), 16.56 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 118.83 10 (61) 17.82 ame vess ers) enter	Oct 105.99 Total = Sunth (see Tail 138.49) Total = Sunth 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46) (47)

Hot water storage loss factor from Table 22 (KWh/Riter/day) 10				
Volume factor from Table 2a Energy lost from water storage, kWhylear Fine (50) or (64) in (55) Water storage loss calculated for each month (56)me; (57,574) (58,754) (70,07) (75,74) (70,	` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` `		0.04	(51)
Energy lost from water storage, kWhylys (47) k(51) x(52) x(53) 5.67 (53) Energy (sol from water storage, kWhylys (47) k(51) x(52) x(53) 5.67 (54) Energy (sol for Water storage) cost calculated for each month (86)m = (85) x(41)m Water storage loss calculated for each month (86)m = (85) x(41)m Water storage loss calculated for each month (86)m = (85) x(41)m Water storage loss calculated for each month (87)m = (86)m x(80) - (111)) + (80), eise (87)m = (86)m where (111) is from Appendix H Water storage (87)m = (86)m x(80) - (111)) + (80), eise (87)m = (80)m where (111) is from Appendix H Water storage (88)m x(80) + (111) + (110)	•			(50)
Energy lost from water storage, kWhylyear				` ′
Company Comp		(47) × (51) × (52) × (52) -		, , ,
Water storage Loss Calculated for each month (166)m = (65) × (41)m (175.74 170.07 175.74		(47) X (31) X (32) X (33) =		` '
Company Comp		$((56)m = (55) \times (41)m$	3.07	(00)
Provincing Pro			170.07 175.74	(56)
175.74 158.73 175.74 170.07 175.74 1	` '			` '
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)me 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)me 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				Ī
Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (45)m + (46)m + (57)m + (59)m + (61)m Combi loss calculated for each month (61)m = (60) + 365 × (45)m + (46)m + (46)m + (57)m + (59)m + (61)m Combi loss calculated for each month (61)m = (60) + 365 × (45)m + (46)m + (46)m + (46)m + (57)m + (59)m + (61)m Combi loss calculated for each month (61)m = (60) + 365 × (45)m + (46)m + (46)m + (46)m + (46)m + (57)m + (59)m + (61)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (61)m = (60) + 365 × (41)m Combi loss calculated for each month (62)m = 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (45)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m + 0.85 × (41)m + (46)m +	(57)m= 175.74 158.73 175.74 170.07 175.74 170.07 1	75.74 175.74 170.07 175.74	170.07 175.74	(57)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)me 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m (61)m	· · · · · · · · · · · · · · · · · · ·		0	(58)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)me		, , ,	-1-1)	
Combi loss calculated for each month (61)m = (60) + 365 × (41)m (61)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				(50)
(61)ms 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 2	23.26 23.26 22.51 23.26	22.51 23.26	(59)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 368.51 327.99 351.98 325.95 326.98 303.01 301.33 316.43 311.41 337.49 343.75 363.16 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Combi loss calculated for each month (61)m = (60) \div 365	× (41)m		•
(62) m= 368.51 327.99 351.98 325.95 326.98 303.01 301.33 316.43 311.41 337.49 343.75 363.16 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water healing) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63) m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)m= 0 0 0 0 0 0	0 0 0 0	0 0	(61)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter 0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Total heat required for water heating calculated for each n	nonth (62)m = $0.85 \times (45)$ m +	(46)m + (57)m +	(59)m + (61)m
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(62)m= 368.51 327.99 351.98 325.95 326.98 303.01 3	01.33 316.43 311.41 337.49	343.75 363.16	(62)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Solar DHW input calculated using Appendix G or Appendix H (negative of	quantity) (enter '0' if no solar contributi	on to water heating)	
Output from water heater (64)m= 368.51 327.99 351.98 325.95 326.98 303.01 301.33 316.43 311,41 337.49 343.75 363.16 Output from water heater (annual)	(add additional lines if FGHRS and/or WWHRS applies, se	ee Appendix G)		
Color Colo	(63)m =	0 0 0 0	0 0	(63)
Couput from water heater (annual)iz 3977.99 (64)	Output from water heater			
Heat gains from water heating, kWh/month 0.25 ' [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m= 215.56 193.09 210.07 198.41 201.75 190.78 193.23 198.25 193.58 205.25 204.33 213.78 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(64)m= 368.51 327.99 351.98 325.95 326.98 303.01 3	01.33 316.43 311,41 337.49	343.75 363.16	
(65)m= 215.56 193.09 210.07 198.41 201.75 190.78 193.23 198.25 193.58 205.25 204.33 213.78 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		Output from water heater	(annual) ₁₁₂	3977.99 (64)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Heat gains from water heating, kWh/month 0.25 [0.85 x	(45)m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m]
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(65)m= 215.56 193.09 210.07 198.41 201.75 190.78 1	93.23 198.25 193.58 205.25	204.33 213.78	(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 176.11	include (57)m in calculation of (65)m only if cylinder is in	n the dwelling or hot water is fr	om community h	eating
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	5. Internal gains (see Table 5 and 5a):			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Metabolic gains (Table 5). Watts			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 71.59 63.59 51.71 39.15 29.27 24.71 26.7 34.7 46.58 59.14 69.03 73.58 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 479.45 484.42 471.88 445.19 411.5 379.84 358.68 353.71 366.24 392.93 426.63 458.29 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Jul Aug Sep Oct	Nov Dec	
(67) m= 71.59 63.59 51.71 39.15 29.27 24.71 26.7 34.7 46.58 59.14 69.03 73.58 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68) m= 479.45 484.42 471.88 445.19 411.5 379.84 358.68 353.71 366.24 392.93 426.63 458.29 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69) m= 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 (69) Pumps and fans gains (Table 5a) (70) m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(66)m= 176.11 176.11 176.11 176.11 176.11 1	76.11 176.11 176.11 176.11	176.11 176.11	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 479.45	Lighting gains (calculated in Appendix L, equation L9 or L	9a), also see Table 5		
(68)m= 479.45 484.42 471.88 445.19 411.5 379.84 358.68 353.71 366.24 392.93 426.63 458.29 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(67)m= 71.59 63.59 51.71 39.15 29.27 24.71	26.7 34.7 46.58 59.14	69.03 73.58	(67)
(68)m= 479.45 484.42 471.88 445.19 411.5 379.84 358.68 353.71 366.24 392.93 426.63 458.29 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Appliances gains (calculated in Appendix L, equation L13	or L13a), also see Table 5	<u> </u>	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 55.55 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			426.63 458.29	(68)
(69)m=		I 15a) also see Table 5	<u> </u>	1
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			55.55 55.55	(69)
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				
Losses e.g. evaporation (negative values) (Table 5) (71)m= -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 (71) Water heating gains (Table 5)			0 0	(70)
(71)m= -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 -117.41 (71) Water heating gains (Table 5)			ŭ j ŭ	1
Water heating gains (Table 5)		17.41 -117.41 -117.41 117.44	-117 /11 -117 /11	(71)
	` '	11.41	117.71 -117.41	(**)
(12)111 = 209.13 201.33 202.33 213.31 211.11 204.98 239.11 200.40 208.80 275.81 283.79 287.34 (72)		50.74 266.46 269.90 275.27	202 70 207 24	(72)
	(12)III= 209.13 201.03 202.03 213.51 211.11 204.98 2	200.40 200.80 2/5.8/	203.18 281.34	(12)

Total in	ternal gains =					(66)m + (67)m	+ (68	3)m + (69)m + (70)m +	(71)m + (72)ı	m		
(73)m=	955.02 949.59	920.2	874.17	826.19	78	3.77 759.34	769	.12 795.93	842.19	893.69	933.47	ı	(73)
6. Sola	ır gains:												
Solar ga	ins are calculated us	sing sola	r flux from T	Table 6a a	and a	associated equa	tions	to convert to the	e applic	able orientati	on.		
Orientat	ion: Access Fa Table 6d	ctor	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 1	X	1.2		x [10.63	x	0.85	x	0.7	=	13.67	(74)
North	0.9x 1	X	1.2		x [20.32	x	0.85	x	0.7	=	26.12	(74)
North	0.9x 1	X	1.2		x [34.53	x	0.85	X	0.7	= [44.38	(74)
North	0.9x 1	х	1.2		x [55.46	x	0.85	X	0.7	=	71.28	(74)
North	0.9x 1	X	1.2		x [74.72	x	0.85	X	0.7	= [96.02	(74)
North	0.9x 1	X	1.2		x [79.99	X	0.85	X	0.7	= [102.8	(74)
North	0.9x 1	X	1.2		x [74.68	X	0.85	X	0.7	=	95.97	(74)
North	0.9x 1	X	1.2		x L	59.25	X	0.85	×	0.7	=	76.14	(74)
North	0.9x 1	X	1.2	:	x L	41.52	X	0.85	X	0.7	=	53.36	(74)
North	0.9x 1	X	1.2		x L	24.19	X	0.85	X	0.7	=	31.09	(74)
North	0.9x 1	X	1.2		x L	13.12	X	0.85	X	0.7	=	16.86	(74)
North	0.9x 1	X	1.2		x	8.86	x	0.85	X	0.7	=	11.39	(74)
East	0.9x 1	X	8.4		x	19.64	x	0.85	X	0.7	=	88.35	(76)
East	0.9x 1	X	8.4		x	38.42	X	0.85	X	0.7	=	172.82	(76)
East	0.9x 1	X	8.4		x	63.27	X	0.85	X	0.7	= [284.62	(76)
East	0.9x 1	X	8.4		× [92.28	Х	0.85	X	0.7	= [415.09	(76)
East	0.9x 1	X	8.4		x [113.09	X	0.85	x	0.7	= [508.71	(76)
East	0.9x 1	X	8.4		x	115.77	X	0.85	X	0.7	= [520.76	(76)
East	0.9x 1	X	8.4		x	110.22	X	0.85	X	0.7	=	495.78	(76)
East	0.9x 1	X	8.4		x	94.68	X	0.85	X	0.7	= [425.87	(76)
East	0.9x 1	X	8.4		x	73.59	X	0.85	X	0.7	= [331.02	(76)
East	0.9x 1	X	8.4		x [45.59	X	0.85	X	0.7	=	205.07	(76)
East	0.9x 1	X	8.4		x	24.49	X	0.85	X	0.7	= [110.16	(76)
East	0.9x 1	X	8.4		x	16.15	X	0.85	X	0.7	= [72.65	(76)
South	0.9x 1	X	1.86	3	x	46.75	X	0.65	X	0.7	= [106.83	(78)
South	0.9x 1	Х	0.75	5	x [46.75	X	0.65	х	0.7	=	57.43	(78)
South	0.9x 1	X	1.86	3	x [76.57	X	0.65	X	0.7	=	174.96	(78)
South	0.9x 1	X	0.75	5	x [76.57	x	0.65	X	0.7	=	94.06	(78)
South	0.9x 1	X	1.86	6	x	97.53	X	0.65	X	0.7	=	222.87	(78)
South	0.9x 1	X	0.75	5	x	97.53	X	0.65	X	0.7	=	119.82	(78)
South	0.9x 1	X	1.86	6	x [110.23	x	0.65	X	0.7	= [251.89	(78)
South	0.9x 1	X	0.75	5	x	110.23	x	0.65	X	0.7	=	135.42	(78)
South	0.9x 1	X	1.86	3	x [114.87	x	0.65	X	0.7	=	262.48	(78)
South	0.9x 1	x	0.75	5	x [114.87	x	0.65	X	0.7	=	141.12	(78)
		,		_	_								

			_		_		_				_		_
South	0.9x	1	X	1.86	X	110.55	X	0.65	X	0.7	=	252.6	(78)
South	0.9x	1	X	0.75	x	110.55	x	0.65	x	0.7	=	135.81	(78)
South	0.9x	1	X	1.86	X	108.01	X	0.65	X	0.7	=	246.81	(78)
South	0.9x	1	X	0.75	X	108.01	X	0.65	x	0.7	=	132.69	(78)
South	0.9x	1	X	1.86	X	104.89	X	0.65	X	0.7	=	239.69	(78)
South	0.9x	1	X	0.75	x	104.89	x	0.65	x	0.7	=	128.86	(78)
South	0.9x	1	X	1.86	x	101.89	x	0.65	x	0.7] =	232.81	(78)
South	0.9x	1	X	0.75	x	101.89	x	0.65	x	0.7	=	125.17	(78)
South	0.9x	1	X	1.86	X	82.59	X	0.65	x	0.7	=	188.71	(78)
South	0.9x	1	X	0.75	x	82.59	x	0.65	X	0.7	=	101.46	(78)
South	0.9x	1	X	1.86	X	55.42	X	0.65	X	0.7	=	126.63	(78)
South	0.9x	1	X	0.75	X	55.42	x	0.65	X	0.7	=	68.08	(78)
South	0.9x	1	X	1.86	x	40.4	x	0.65	x	0.7	=	92.31	(78)
South	0.9x	1	X	0.75	X	40.4	x	0.65	x	0.7	=	49.63	(78)
West	0.9x	1	X	1.2	x	19.64	X	0.65	x	0.7	=	19.3	(80)
West	0.9x	1	X	1.2	x	38.42	x	0.65	x	0.7	=	37.76	(80)
West	0.9x	1	X	1.2	x	63.27	x	0.65	x	0.7	=	62.18	(80)
West	0.9x	1	X	1.2	X	92.28	Х	0.65	X	0.7	=	90.69	(80)
West	0.9x	1	x	1.2	x	113.09	x	0.65	x	0.7	=	111.15	(80)
West	0.9x	1	X	1.2	x	115.77] ×	0.65	x	0.7] =	113.78	(80)
West	0.9x	1	x	1.2	x	110.22	x	0.65	x	0.7	=	108.32	(80)
West	0.9x	1	x	1.2	x	94.68	Х	0.65	x	0.7	=	93.05	(80)
West	0.9x	1	X	1.2	x	73.59	X	0.65	x	0.7	=	72.32	(80)
West	0.9x	1	x	1.2	х	45.59	x	0.65	x	0.7	=	44.81	(80)
West	0.9x	1	X	1.2	x	24.49	x	0.65	x	0.7	=	24.07	(80)
West	0.9x	1	X	1.2	x	16.15	x	0.65	x	0.7] =	15.87	(80)
Rooflight	ts 0.9x	1	X	2.49	x	26	x	0.65	x	0.7] =	26.51	(82)
Rooflight	ts 0.9x	1	X	3.35	x	26	x	0.65	x	0.7	=	35.67	(82)
Rooflight	ts 0.9x	1	X	2.49	x	54	x	0.65	x	0.7	=	55.06	(82)
Rooflight	ts 0.9x	1	x	3.35	x	54	x	0.65	x	0.7	=	74.08	(82)
Rooflight	ts _{0.9x}	1	X	2.49	x	96	x	0.65	x	0.7	=	97.89	(82)
Rooflight	ts _{0.9x}	1	X	3.35	x	96	x	0.65	x	0.7	=	131.7	(82)
Rooflight	ts 0.9x	1	X	2.49	x	150	x	0.65	x	0.7	=	152.95	(82)
Rooflight	ts _{0.9x}	1	X	3.35	x	150	x	0.65	x	0.7	=	205.77	(82)
Rooflight	ts _{0.9x}	1	X	2.49	x	192	x	0.65	x	0.7	=	195.77	(82)
Rooflight	ts _{0.9x}	1	X	3.35	x	192	x	0.65	x	0.7] =	263.39	(82)
Rooflight	s 0.9x	1	x	2.49	x	200	x	0.65	x	0.7] =	203.93	(82)
Rooflight	s 0.9x	1	x	3.35	x	200	x	0.65	x	0.7	j =	274.36	(82)
Rooflight	s _{0.9x}	1	x	2.49	×	189	x	0.65	x	0.7] =	192.71	(82)
Rooflight	s 0.9x	1	x	3.35	x	189	x	0.65	x	0.7] =	259.27	(82)
Rooflight	s 0.9x	1	x	2.49	x	157	x	0.65	x	0.7	j =	160.09	(82)
	-		_		-		-				-		_

Rooflights _{0.9x}	1	X	3.3	35	x	157	,	×	0.65	X	0.7	=	215.38	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	115	i	x	0.65	x	0.7	=	117.26	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	115	i	x	0.65	x	0.7	=	157.76	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	66		×	0.65	x [0.7	=	67.3	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	66		x [0.65	x [0.7	=	90.54	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	33		x	0.65	x	0.7	=	33.65	(82)
Rooflights 0.9x	1	Х	3.3	35	x	33		×	0.65	x	0.7	=	45.27	(82)
Rooflights _{0.9x}	1	х	2.4	19	x	21		×	0.65	x	0.7	=	21.41	(82)
Rooflights 0.9x	1	X	3.3	35	x	21		x	0.65	x	0.7	=	28.81	(82)
_								_						
Solar gains in v	vatts, ca	alculated	for eac	h month				(83)m	= Sum(74)m	(82)m			_	
(83)m= 347.76	634.86	963.45	1323.1	1578.65	160	04.04 15	31.57	1339.	07 1089.7	728.97	424.71	292.08		(83)
Total gains – in	iternal a	nd solar	(84)m =	= (73)m ·	+ (8	33)m , w	atts						_	
(84)m= 1302.78	1584.45	1883.64	2197.27	2404.84	238	87.81 22	290.91	2108.	19 1885.62	1571.16	1318.4	1225.55		(84)
7. Mean interr	nal temp	erature	(heating	season)									
Temperature of	during h	eating p	eriods ir	n the livii	ng a	area fror	m Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fact	or for g	ains for I	living are	ea, h1,m	(se	ee Table	9a)							
Jan	Feb	Mar	Apr	May	Ť,	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.97	0.93	0.85	0	.71 (0.57	0.62	0.83	0.95	0.99	0.99		(86)
Mean internal	temper	ature in	living an	ea T1 (fo	ollov	w stens	3 to 7	in Ta	able 9c)			•		
(87)m= 18.59	18.85	19.29	19.91	20.41			20.92	20.8		19.94	19.19	18.6]	(87)
` ' -	ما به مراب		ا ماماد ا	- root of	ما الم		- To						J	
Temperature (88)m= 19.08	19.09	19.1	19.15	19.16			9.21	19.2		19.16	19.14	19.12	1	(88)
` '						<u> </u>		L	2 10.15	10.10	10.14	10.12		(55)
Utilisation fact					$\overline{}$	$\overline{}$			0.70	1 0 00	1 0 00	1 000	1	(00)
(89)m= 0.99	0.98	0.95	0.89	0.77	0	0.57 (0.36	0.42	0.72	0.92	0.98	0.99		(89)
Mean internal	temper	ature in	the rest	of dwelli	ng [·]	T2 (follo	w ste	ps 3	to 7 in Tab	ole 9c)	_		1	
(90)m= 16.06	16.45	17.09	17.98	18.65	19	9.09 1	9.19	19.1	9 18.92	18.05	16.97	16.1		(90)
										fLA = Livi	ng area ÷ ((4) =	0.46	(91)
Mean internal	temper	ature (fo	r the wh	ole dwe	lling	g) = fLA	× T1	+ (1 -	- fLA) × T2	2				
(92)m= 17.24	17.56	18.11	18.87	19.47	19	9.87 1	9.99	19.9	8 19.71	18.93	18	17.26		(92)
Apply adjustm	ent to t	ne mean	interna	temper	atur	re from	Table	4e, v	vhere app	ropriate	-	_		
(93)m= 17.24	17.56	18.11	18.87	19.47	19	9.87 1	9.99	19.9	8 19.71	18.93	18	17.26		(93)
8. Space heat	ing requ	uirement												
Set Ti to the m			•		ed	at step	11 of	Table	9b, so th	at Ti,m=	(76)m an	nd re-cald	culate	
the utilisation					Ι	1	I. I	۸		T 0at	l Nov	Daa	1	
Jan Utilisation fact	Feb	Mar	Apr	May		Jun	Jul	Au	g Sep	Oct	Nov	Dec	J	
(94)m= 0.98	0.97	0.94	0.89	0.79	0	0.63	0.46	0.51	0.75	0.92	0.97	0.99	1	(94)
Useful gains, l			l				-	0.0		0.02	1 0.01	1 0.00	J	, ,
(95)m= 1280.39				1893.97	149	96.84 10	53.59	1081.	27 1419.09	1443.67	7 1281.84	1208]	(95)
Monthly avera			l .	l	<u> </u>					1	1	1	J	
(96)m= 4.3	4.9	6.5	8.9	11.7			16.6	16.4	1 14.1	10.6	7.1	4.2]	(96)
Heat loss rate	for mea	an intern	al temp	erature,	Lm	, W =[(3	39)m :	x [(93)m- (96)m	า]	_!	!	1	
(97)m= 4676.41			<u>_</u>		_			- `	18 1871.28	-	3767.77	4580.06]	(97)
						!			· ·				1	

Space heating requirer	ment fo	or each m	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95	5)m] x (4 ⁻	1)m			
(98)m= 2526.64 2020.02			559.09	0	0	0	0	í - `	1789.87	2508.81		
		•				Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	13252.22	(98)
Space heating requirer	ment in	kWh/m²	/year								87.97	(99)
8c. Space cooling requ	iiremer	nt										
Calculated for June, Ju			See Tal	ble 10b								
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate Lm (cald	culated	using 25	5°C inte	rnal tem	perature	and ext	ernal ter	nperatur	e from T	able 10)		
(100)m = 0 0	0	0	0	3096.83	2437.93	2488.01	0	0	0	0		(100)
Utilisation factor for los	s hm											
(101)m= 0 0	0	0	0	0.65	0.73	0.69	0	0	0	0		(101)
Useful loss, hmLm (Wa	atts) = ((100)m x	(101)m	l								
(102)m = 0 0	0	0	0	2017.89		<u> </u>	0	0	0	0		(102)
Gains (solar gains cald	ulated	for appli	cable w	 	1		10)					
(103)m = 0 0	0	0	0	2387.81	l	2108.19	0	0	0	0		(103)
Space cooling requirer set (104)m to zero if (1				dwelling,	continu	ous (kW	h') = 0.0	24 x [(10	03)m – (102)m] x	c (41)m	
(104)m= 0 0	0	0	0	0	374.79	287.7	0	0	0	0		
							Tota	l = Sum(104)	=	662.48	(104)
Cooled fraction							f C =	cooled	area ÷ (4	1) =	0.93	(105)
Intermittency factor (Tab	ole 10b)										_
(106)m= 0 0	0	0	0_	0.25	0.25	0.25	0	0	0	0		
							Tota	I = Sum(1.04)	= [0	(106)
Space cooling requirem		month =				1						
(107)m= 0 0	0	0	0	0	87.07	66.84	0	0	0	0		_
								I = Sum(107)	= [153.91	(107)
Space cooling requirem		•					(107) ÷ (4) =			1.02	(108)
9b. Energy requirement			Ĭ									
This part is used for spa Fraction of space heat f									unity sch	neme.	0	(301)
Fraction of space heat f	rom co	mmunity	system	1 – (30	1) =					[1	(302)
The community scheme may	obtain he	eat from se	everal soul	rces. The _l	procedure	allows for	CHP and	up to four	other heat	sources; th	ne latter	
includes boilers, heat pumps,	-			from powe	r stations.	See Appe	ndix C.			Г		¬,,,,
Fraction of heat from Co	ommun	ity boiler	S								1	(303a)
Fraction of total space h	eat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for control and ch	narging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distribution loss factor (Table 1	12c) for c	commun	ity heati	ng syste	m					1.05	(306)
Space heating Annual space heating re	auiron	nont								ſ	kWh/yea	r ¬
	•						(09) + (0	04a) v (20)	5) v (20e)	_ 	13252.22	(2075)
Space heat from Comm	•		h a = 4' ·	a t	im 0/ /f	T-!!		04a) x (30		= [[13914.83	(307a)
Efficiency of secondary/		•	_	•	,				,	[0	(308
Space heating requirem	ent fro	m secon	dary/su _l	pplemen	itary sys	tem	(98) x (3	01) x 100 -	÷ (308) =	l	0	(309)

Water heating				
Annual water heating requirement			3977.99	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	4176.89	(310a)
Electricity used for heat distribution	0.01	× [(307a)(307e) + (310a)(310e)] =	180.92	(313)
Cooling System Energy Efficiency Ra	tio		4.38	(314)
Space cooling (if there is a fixed cooling	ng system, if not enter 0)	= (107) ÷ (314) =	35.18	(315)
Electricity for pumps and fans within c mechanical ventilation - balanced, ext	, ,		0	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appe	endix L)		505.75	(332)
10b. Fuel costs – Community heating	g scheme			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	589.99	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	177.1	(342a)
Space cooling (community cooling sys	stem) (315)	Fuel Price 13.19 × 0.01 =	4.64	(348)
Pumps and fans	(331)	13.19 x 0.01 =	0	(349)
Energy for lighting	(332)	13.19 × 0.01 =	66.71	(350)
Additional standing charges (Table 12	2)		120	(351)
Total energy cost	= (340a)(342e) + (345)(354) =		958.44	(355)
11b. SAP rating - Community heating	g scheme			1
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	$[(355) \times (356)] \div [(4) + 45.0] =$		2.06	(357)
SAP rating (section12)			71.3	(358)
12b. CO2 Emissions – Community he	ating scheme			
	Ene kWł	rgy Emission factor n/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)	• , ,	repeat (363) to (366) for the second fu	el 91	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	00 ÷ (367b) x 0	4294.3	(367)
Electrical energy for heat distribution	[(313) x	0.52	93.9	(372)
Total CO2 associated with community	/ systems (363)(36	6) + (368)(372)	4388.2	(373)
CO2 associated with space heating (s	secondary) (309) x	0	= 0	(374)
CO2 associated with water from imme	ersion heater or instantaneous hea	ter (312) x 0.22	= 0	(375)

Total CO2 associated with space and	water heating	(373) + (374) + (375) =			4388.2	(376)
CO2 associated with space cooling		(315) x	0.52	=	18.26	(377)
CO2 associated with electricity for pur	nps and fans within dw	velling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for light	ting	(332))) x	0.52] =	262.49	(379)
Total CO2, kg/year	sum of (376)(382) =				4668.94	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				30.99	(384)
El rating (section 14)					68.02	(385)
13b. Primary Energy – Community hea	ating scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space ar Efficiency of heat source 1 (%)		CHP) using two fuels repeat (363) to	(366) for the secon	nd fuel	91	(367a)
Energy associated with heat source 1	[(307	7b)+(310b)] x 100 ÷ (367b) x	0] = [24254.84	(367)
Electrical energy for heat distribution		[(313) x		=	555.42	(372)
Total Energy associated with commun	ity systems	(363)(366) + (368)(37	2)	=	24810.26	(373)
if it is negative set (373) to zero (unl	ess specified otherwis	e, see C7 in Appendix C	()		24810.26	(373)
Energy associated with space heating	(secondary)	(309) x	0	=	0	(374)
Energy associated with water from imm	nersion heater or insta	antaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space an	nd water heating	(373) + (374) + (375) =			24810.26	(376)
Energy associated with space cooling		(315) x	3.07	=	108	(377)
						_
Energy associated with electricity for p	umps and fans within	dwelling (331)) x	3.07	_ =	0	(378)

sum of (376)...(382) =

Total Primary Energy, kWh/year

26470.92

		Hear Datailar			
		User Details:			
Assessor Name:	0. 5045.0040	Stroma Nu			
Software Name:	Stroma FSAP 2012	Software \	0.0.0	Version: 1.0.1.24	
	Pi	roperty Address: Flat	3		
Address :					
1. Overall dwelling dimens	ions:				
0 10		Area(m²)	Av. Height(m)	Volume(m	<u> </u>
Ground floor		40.62 (1a)	x 3.2	2a) = 129.98	(3a)
First floor		110.03 (1b)	x 2.65	2b) = 291.58	(3b)
Total floor area TFA = (1a)+	+(1b)+(1c)+(1d)+(1e)+(1n	150.65 (4)			
Dwelling volume		(3a)+	(3b)+(3c)+(3d)+(3e)+(3	3n) = 421.56	(5)
2. Ventilation rate:					
	main secondar heating heating	y other	total	m³ per ho	ur
Number of chimneys	0 + 0	+ 1 =	1 x 40	= 40	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20	= 0	(6b)
Number of intermittent fans			4 x 10	= 40	(7a)
Number of passive vents			0 × 10	= 0	(7b)
Number of flueless gas fires	3		0 x 40	= 0	(7c)
				Air changes per h	our
Infiltration due to chimneys	flues and fans = $(6a)+(6b)+(7a)$	a)+(7h)+(7c) =			
	n carried out or is intended, proceed			(5) = 0.19	(8)
Number of storeys in the	dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]	x0.1 = 0	(10)
Structural infiltration: 0.25	for steel or timber frame or	0.35 for masonry cor	struction	0	(11)
	ent, use the value corresponding to	the greater wall area (after	r		
deducting areas of openings	or, enter 0.2 (unsealed) or 0.	1 (sealed) else enter	0	0	(12)
If no draught lobby, enter	,	1 (dealed), cloc effici		0	(13)
• • • • • • • • • • • • • • • • • • • •	nd doors draught stripped				(14)
Window infiltration	ina adors araagin sirippea	0.25 - [0.2 x (14)	÷ 1001 =	0	
Infiltration rate			+ (12) + (13) + (15) =	0	(15)
	0, expressed in cubic metre			0	(16)
	value, then $(18) = [(17) \div 20] + (8)$		mene or envelope a		(17)
	a pressurisation test has been don		ility is heina used	0.94	(18)
Number of sides sheltered	a pressurisation test has been don	e or a degree an permeasi	ity is being asca	2	(19)
Shelter factor		(20) = 1 - [0.075	x (19)] =	0.85	(20)
Infiltration rate incorporating	shelter factor	$(21) = (18) \times (20)$		0.85	(21)
Infiltration rate modified for				0.0	(/
Jan Feb M		Jul Aug Se	p Oct Nov	Dec	
		34. / tag 36	P 301 1407		
Monthly average wind spee	u nom rable /				

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ation rat	o (allowi	na for ol	oltor on	ط سنمط م	nood)	(246) 1	(22a)m	•	!	•	•	
1.02	1	e (allowi	0.88	0.86	0.76	0.76	0.74	(22a)III 0.8	0.86	0.9	0.94	1	
Calculate effe		change i				1 -	1		0.00		0.0	<u>. </u>	
If mechanica													0 (23a)
If exhaust air h) = (23a)				0 (23b)
If balanced with		-	-	_					21.) (001) [4 (00.)		0 (23c)
a) If balance (24a)m= 0	ea mech	anicai ve	entilation 0	with nea	at recove	ery (MV)	HR) (248	$\frac{a)m = (22)}{0}$	2b)m + (0	23b) × [1 – (23c)) ÷ 100]]	(24a)
b) If balance			<u> </u>	<u> </u>					<u> </u>		0	j	(244)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h	<u> </u>	ļ	ļ	<u> </u>	<u> </u>	ventilatio	on from (outside		<u> </u>		J	, ,
,		(23b), t			•				5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural													
	n = 1, th	en (24d)			·	· ·		<u> </u>		0.0	0.04	1	(24d)
(24d)m= 1.02	ab an ma	0.98	0.89	0.87	0.79	0.79	0.77	0.82	0.87	0.9	0.94	J	(240)
Effective air	change	0.98	0.89	0.87	0.79	0.79	0.77	0.82	0.87	0.9	0.94	1	(25)
()			0.00	0.07	0.75	0.70	0.77	0.02	0.07	0.0	0.04	J	(=5)
									_		_		
3. Heat losse									A 24.11				A 3/ I
3. Heat losse	Gros area	SS	oaramet Openir m	igs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value		A X k kJ/K
	Gros	SS	Openir	igs						K)			
ELEMENT	Gros area	SS	Openir	igs	A ,r	m² x	W/m2	2K	(W/I	K)			kJ/K
ELEMENT Doors	Gros area	SS	Openir	igs	A ,r	m ² x	W/m2	2K = [- 0.04] = [4.2	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area	SS	Openir	igs	A ,r 2.1 1.86	m ² x x1 x1	W/m2 2 /[1/(4.5)+	$2K$ $= \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	4.2 7.09	<) 			kJ/K (26) (27)
Doors Windows Type Windows Type	Gros area	SS	Openir	igs	A ,r 2.1 1.86	x x1 x1 x1	W/m2 2 /[1/(4.5)+ /[1/(4.5)+	$ \begin{array}{ccc} 2K & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ \end{array} $	7.09 2.86	K)			kJ/K (26) (27) (27)
Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4	SS	Openir	igs	A ,r 2.1 1.86 0.75	x1 x1 x1 x1	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	$\begin{array}{c} 2K \\ \hline \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \\ 0.04] = \\ \\ 0.04] = \\ \end{array}$	(W/l 4.2 7.09 2.86 4.58	K)			kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5	SS	Openir	igs	A ,r 2.1 1.86 0.75 1.2	x1 x1 x1 x1 x1	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	$\begin{array}{c} 2 K \\ $	(W/l 4.2 7.09 2.86 4.58 4.58	<) 			kJ/K (26) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 1	SS	Openir	igs	A ,r 2.1 1.86 0.75 1.2 1.2 8.4	x1 x1 x1 x1 x1 x1	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	$ \begin{array}{cccc} 2K & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ 0.04] & = & \\ 0.04] & = & \\ \end{array} $	(W/l 4.2 7.09 2.86 4.58 4.58 32.03	k)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area e 1 e 2 e 3 e 4 e 5 e 1	ss (m²)	Openir	gs 1 ²	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49	x1 x1 x1 x1 x1 x1 x1	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+	$ \begin{array}{cccc} 2K & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ 0.04] & = & \\ 0.04] & = & \\ \end{array} $	(W/l 4.2 7.09 2.86 4.58 4.58 32.03 3.735	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2	os (m²)	Openir n	gs 1 ²	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) +	$ \begin{array}{cccc} 2K & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ -0.04] & = & \\ 0.04] & = & \\ 0.04] & = & \\ 0.04] & = & \\ \end{array} $	(W/l 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1	Gros area 2 2 2 3 3 4 4 5 5 5 5 6 1 5 6 2 2 6 6 2	06 14	Openir n	ggs ₁₂	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) +	$ \begin{array}{cccc} 2K & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & =$	(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025	K)			kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1 Walls Type2	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2 26.0	06 04	Openir m	ggs ₁₂	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + /[1/(1.5) + 0.8 0.17	2 K	(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38 3.58	k)			kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (29)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1 Walls Type2 Walls Type3	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2 26.0 110.	06 04 03	5.58 0	ggs ₁₂	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 2.49 20.48 21.14 63.83	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5) + 0.8 0.17 0.8	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- 0.04] = [- 0.04] = [0.04] = [0.04] = [- 0	(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38 3.58 51.06	K)			kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (29) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1 Walls Type2 Walls Type3 Roof	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2 26.0 110.	06 04 03	5.58 0	ggs ₁₂	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5)+ /[1/(1.5) + 0.8 0.17 0.8	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- 0.04] = [- 0.04] = [0.04] = [0.04] = [- 0	(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38 3.58 51.06				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (29) (29) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2 26.0 110.	06 04 03	5.58 0	ggs ₁₂	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83 110.0 245.2	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x2 x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.8 0.17 0.8 0.15	2K = 0.04] = [-0.04] = [-0.04] = [-0.04] = [-0.04] = [0.04] = [0.04] = [= = [= = [(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38 3.58 51.06	k)			kJ/K (26) (27) (27) (27) (27) (27b) (27b) (29) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall Party wall * for windows and	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2 26.0 110. 110. 1roof wind.	06 4 03 03 03 0, m ²	5.58 0 16.2 0	ggs 3 2 2	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83 110.0 245.2 48.1 22.83 alue calcul	m² x x1 x1 x1 x1 x1 x1 x2 x x3 x x3 x x4 x x4 x x4 x x4 x x4 x x4 x x5 x x6 x x7 x x6 x x7 x x8 x x8 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.8 0.17 0.8 0.15	2K = [0.04]	(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38 3.58 51.06 16.5		kJ/m²-	K [kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (29) (29) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Walls Type1 Walls Type2 Walls Type3 Roof Total area of e Party wall	Gros area e 1 e 2 e 3 e 4 e 5 e 1 e 2 26.0 110. 110. elements	06 14 03 03 03 ows, use e	5.58 0 16.2 0	ggs 3 2 2	A ,r 2.1 1.86 0.75 1.2 1.2 8.4 2.49 3.35 20.48 21.14 63.83 110.0 245.2 48.1 22.83 alue calcul	m² x x1 x1 x1 x1 x1 x1 x2 x x3 x x3 x x4 x x4 x x4 x x4 x x4 x x4 x x5 x x6 x x7 x x6 x x7 x x8 x x8 x	W/m ² 2 /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(4.5)+ /[1/(1.5) + 0.8 0.17 0.8 0.15	2 K	(W/I 4.2 7.09 2.86 4.58 4.58 32.03 3.735 5.025 16.38 3.58 51.06 16.5		kJ/m²-	K [kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (29) (29) (30) (31) (32)

Heat capacity Cm = S	S(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass param	,	P = Cm ÷	- TFA) ir	ı kJ/m²K				tive Value:	, , ,	, ,	250	(35)
For design assessments w	`		,			ecisely the				able 1f	230	(66)
can be used instead of a d	etailed calc	ulation.				•						
Thermal bridges : S (I	x Y) cal	culated (using Ap	pendix I	<						36.78	(36)
if details of thermal bridging	g are not kn	own (36) =	= 0.15 x (3	1)			(22)	(20)				
Total fabric heat loss	-1- 1-(-)	1					(33) +	, ,	05) (5)		219.84	(37)
Ventilation heat loss of						Α.		= 0.33 × (T	1	
(38)m= Jan Feb 138.91	Mar 136.16	Apr 123.26	May 120.85	Jun 109.61	Jul 109.61	Aug 107.53	Sep 113.94	Oct 120.85	Nov 125.73	130.84	-	(38)
` '		123.20	120.00	109.01	109.01	107.55				130.04]	(30)
Heat transfer coefficie	_							= (37) + (3			1	
(39)m= 361.52 358.74	356	343.1	340.68	329.45	329.45	327.37	333.78	340.68	345.57	350.67	0.40.00	(20)
Heat loss parameter (HLP). W	/m²K						Average = = (39)m ÷		12 /12=	343.08	(39)
(40)m= 2.4 2.38	2.36	2.28	2.26	2.19	2.19	2.17	2.22	2.26	2.29	2.33]	
· · · L	1	ļ			!		,	Average =	Sum(40) ₁ .	12 /12=	2.28	(40)
Number of days in mo	onth (Tab	le 1a)										
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 heating end	ergy requi	irement:								kWh/y	ear:	
Assumed occupancy	N									0.4	1	(42)
Ass <mark>umed</mark> occupancy, if TFA > 13.9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	-A -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		94]	(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1	+ 1.76 x			·				ΓFA -13.		94]	(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w	+ 1.76 x ater usaç	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		9)	3.91]	(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1	+ 1.76 x ater usage hot water	ge in litre	es per da 5% if the o	y Vd,av	erage =	(25 x N)	+ 36		9)]	` ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x rater usage to hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	y Vd,av	erage =	(25 x N) to achieve	+ 36 a water us	se ta <u>rget o</u> i	9) 103]	` ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x vater usage hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	y Vd,av welling is not and co	erage = designed to	(25 x N) to achieve	+ 36		9)	3.91]	` ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x ater usage hot water person per Mar er day for ea	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	y Vd,av welling is not and co	erage = designed to	(25 x N) to achieve	+ 36 a water us	se ta <u>rget o</u> i	9) 103	3.91]]]]	` ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15	+ 1.76 x vater usage hot water person per Mar arer day for each	ge in litre usage by s r day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fac 97.68	y Vd,av welling is not and co Jun ctor from 7	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep	Oct 105.99 Total = Sui	Nov 110.15 m(44) ₁₁₂ =	Dec 114.3	1246.93	` ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per	+ 1.76 x vater usage hot water person per Mar arer day for each	ge in litre usage by s r day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fac 97.68	y Vd,av welling is not and co Jun ctor from 7	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep	Oct 105.99 Total = Sui	Nov 110.15 m(44) ₁₁₂ =	Dec 114.3	1246.93	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15	+ 1.76 x vater usage hot water reperson per Mar ar day for each 105.99 r used - calculater and a calcula	ge in litre usage by s r day (all w Apr ach month	es per da 5% if the da vater use, I May Vd,m = fac 97.68	y Vd,av welling is not and co Jun ctor from 7	erage = designed and designed a	(25 x N) to achieve Aug (43) 97.68	+ 36 a water us Sep	Oct 105.99 Total = Sui	Nov 110.15 m(44) ₁₁₂ =	Dec 114.3	1246.93	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25	ter usage hot water person per Mar 105.99 152.98	ge in litre usage by a day (all which worth ach month 101.83 culated month 133.37	es per da 5% if the of 5% if th	Jun ctor from 7 93.52	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 97.68 117.43	+ 36 a water us Sep 101.83 0 kWh/mon 118.83	Oct 105.99 Fotal = Suith (see Ta	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17	3.91 Dec 114.3 c, 1d) 164.16	1246.93	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25	ting at point	Apr Apr ach month 101.83 culated mo to fuse (no	es per da 5% if the o ater use, I May Vd,m = far 97.68 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 93.52 190 x Vd,r 110.43	erage = designed to do do do do do do do do do do do do do	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43 boxes (46)	+ 36 a water us Sep 101.83 0 kWh/more 118.83	Oct 105.99 Fotal = Sunth (see Tail 138.49) Fotal = Sunth (see Tail 138.49)	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ =	3.91 Dec 114.3		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24	ter usage hot water person per Mar 105.99 152.98	ge in litre usage by a day (all which worth ach month 101.83 culated month 133.37	es per da 5% if the of 5% if th	Jun ctor from 7 93.52	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 97.68	+ 36 a water us Sep 101.83 0 kWh/mon 118.83	Oct 105.99 Fotal = Sur 138.49	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17	3.91 Dec 114.3 c, 1d) 164.16		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25	ter usage hot water person per Mar 105.99 152.98 152.98	ge in litre usage by a day (all we have ach month 101.83 culated month 133.37 for use (not 120.01)	es per da 5% if the orater use, I May Vd,m = fa 97.68	y Vd,av welling is not and co Jun ctor from 7 93.52 190 x Vd,r 110.43	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 07m / 3600 117.43 boxes (46) 17.61	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres)	ter usage hot water reperson per Mar 105.99 152.98 152.98 152.95	Apr Apr ach month 101.83 culated mo 133.37 for use (no	es per da 5% if the off ater use, I May Vd,m = far 97.68 onthly = 4. 127.98 o hot water 19.2	y Vd,av welling is not and co Jun g3.52 190 x Vd,r 110.43 storage), 16.56	erage = designed to do do do do do do do do do do do do do	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa	+ 36 a water us Sep 101.83 0 kWh/mor 118.83 0 to (61) 17.82	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss:	ater usage hot water reperson per Mar 105.99 152.98 152.95 1 including and no tage hot water reperson per day for each per da	Apr Apr 101.83 Culated mo 133.37 cof use (no	es per da 5% if the of 5% if the of 65% if the of May Vd,m = fact 97.68 97.68 127.98 19.2 plar or Water velling, e	y Vd,av welling is not and co Jun ctor from 7 93.52 190 x Vd,r 110.43 r storage), 16.56	erage = designed to lid) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage litres in	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 118.83 10 to (61) 17.82 ame vess	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres of the storage volume) If community heating Otherwise if no stored water storage loss:	tater usage hot water reperson per Mar 105.99 105.99 152.98 152.98 152.95 1 including at hot water and no tall hot water sections.	Apr Apr Ach month 101.83 culated mo 133.37 for use (no	es per da 5% if the off 5% if the off May Vd,m = factor 97.68 97.68 127.98 19.2 Diar or Water velling, eached in	y Vd,av welling is not and co Jun ctor from 7 93.52 190 x Vd,r 110.43 r storage), 16.56 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 118.83 10 to (61) 17.82 ame vess	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres) If community heating Otherwise if no stored Water storage loss: a) If manufacturer's of	ater usage hot water reperson per Mar 105.99 105.99 152.98 152.95 1 including and no tall hot water leclared leclared leclared leclared leclared lectared le	Apr ach month 101.83 culated mo 133.37 of use (no 20.01 ng any so ank in dw er (this in	es per da 5% if the off 5% if the off May Vd,m = factor 97.68 97.68 127.98 19.2 Diar or Water velling, eached in	y Vd,av welling is not and co Jun ctor from 7 93.52 190 x Vd,r 110.43 r storage), 16.56 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 118.83 10 to (61) 17.82 ame vess	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = sbles 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water hear (46)m= 25.43 22.24 Water storage loss: Storage volume (litres If community heating Otherwise if no stored Water storage loss: a) If manufacturer's of Temperature factor from	tater usage hot water person per Mar 105.99 152.98 152.95 1 including and no tall hot water per Table per Table	Apr Apr Apr 101.83 Culated mo 133.37 Tof use (not ank in dwer (this in oss factors)	es per da 5% if the of 5% if the of 5% if the of 97.68 97.68 97.68 127.98 o hot water 19.2 color or Water relling, eacludes in	y Vd,av welling is not and co Jun ctor from 7 93.52 190 x Vd,r 110.43 r storage), 16.56 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 93.52 m x nm x E 102.33 enter 0 in 15.35 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 118.83 10 to (61) 17.82 ame vess	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62		(43) (44) (45) (46) (47)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 114.3 110.15 Energy content of hot water (45)m= 169.51 148.25 If instantaneous water head (46)m= 25.43 22.24 Water storage loss: Storage volume (litres) If community heating Otherwise if no stored Water storage loss: a) If manufacturer's community heating	ater usage hot water reperson per Mar 105.99 105.99 152.98 152.95 1 including and no tall hot water lectared le	ach month 101.83 culated mo 133.37 of use (no 20.01 ng any so ank in dw er (this in oss facto 2b c, kWh/ye	es per da 5% if the of ater use, I May Vd,m = far 97.68 onthly = 4. 127.98 o hot water 19.2 olar or Water relling, eacludes in the or is known.	y Vd,av Jun ctor from 5 93.52 190 x Vd,r 110.43 r storage), 16.56 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 97.68 117.43 boxes (46) 17.61 within sa (47)	+ 36 a water us Sep 101.83 118.83 10 to (61) 17.82 17.82 19 errs) enter	Oct 105.99 Total = Sur 138.49 Total = Sur 20.77	Nov 110.15 m(44) ₁₁₂ = ables 1b, 1 151.17 m(45) ₁₁₂ = 22.68	3.91 Dec 114.3 c, 1d) 164.16 24.62 310		(43) (44) (45) (46) (47)

Hot water storage loss factor from	om Table 2 (kW	h/litre/da	ıv)					04	1	(51)
If community heating see section	0.	04		(01)						
Volume factor from Table 2a							0.	73		(52)
Temperature factor from Table	2b						0	.6		(53)
Energy lost from water storage,	kWh/year			(47) x (51)	x (52) x (53) =	5.	67		(54)
Enter (50) or (54) in (55)							5.	67		(55)
Water storage loss calculated for	or each month			((56)m = (55) × (41)ı	m 			,	
(56)m= 175.74 158.73 175.74	170.07 175.74	170.07	175.74	175.74	170.07	175.74	170.07	175.74		(56)
If cylinder contains dedicated solar stor	age, (57)m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m= 175.74 158.73 175.74	170.07 175.74	170.07	175.74	175.74	170.07	175.74	170.07	175.74		(57)
Primary circuit loss (annual) fro	m Table 3							0		(58)
Primary circuit loss calculated for	,		` '	, ,						
(modified by factor from Table	-							i	1	
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 36	65 × (41))m					-	
(61)m= 0 0 0	0 0	0	0	0	0	0	0	0		(61)
Total heat required for water he	eating calculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	า
(62)m= 368.51 327.99 351.98	325.95 326.98	303.01	301.33	316.43	311.41	337.49	343.75	363.16		(62)
Solar DHW input calculated using Appe	endix G or Appendix	H (negati	ve quantity	v) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional lines if FGHRS	and/or WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0		(63)
Output from water heater										
(64)m= 368.51 327.99 351.98	325.95 326.98	303.01	301.33	316.43	311.41	337.49	343.75	363.16		_
				Outp	out from wa	ater heate	r (annual)₁	12	3977.99	(64)
Heat gains from water heating,	kWh/month 0.2	5 ′ [0.85	× (45)m	+ (61)m	1] + 0.8 >	د [(4 <mark>6)m</mark>	+ (57)m	+ (59)m]	
(65)m= 215.56 193.09 210.07	198.41 201.75	190.78	193.23	198.25	193.58	205.25	204.33	213.78		(65)
include (57)m in calculation of	of (65)m only if o	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Internal gains (see Table 5	and 5a):									
Metabolic gains (Table 5), Watt	s								-	
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 146.76 146.76 146.76	146.76 146.76	146.76	146.76	146.76	146.76	146.76	146.76	146.76		(66)
Lighting gains (calculated in Ap	pendix L, equat	ion L9 o	r L9a), a	lso see	Table 5				-	
(67)m= 28.72 25.51 20.75	15.71 11.74	9.91	10.71	13.92	18.69	23.73	27.69	29.52		(67)
Appliances gains (calculated in	Appendix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5			_	
(68)m= 321.23 324.56 316.16	298.28 275.71	254.49	240.32	236.98	245.38	263.27	285.84	307.06		(68)
Cooking gains (calculated in Ap	pendix L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m= 37.68 37.68 37.68	37.68 37.68	37.68	37.68	37.68	37.68	37.68	37.68	37.68		(69)
Pumps and fans gains (Table 5	a)	-	-			-	-	-		
(70)m= 0 0 0	0 0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporation (negati	ive values) (Tab	le 5)							•	
(71)m= -117.41 -117.41 -117.41	-117.41 -117.41	-117.41	-117.41	-117.41	-117.41	-117.41	-117.41	-117.41		(71)
Water heating gains (Table 5)	·	•							•	
(72)m= 289.73 287.33 282.35	275.57 271.17	264.98	259.71	266.46	268.86	275.87	283.79	287.34		(72)
· · · · · · · · · · · · · · · · · · ·	·	•				•	•			

Total in	nternal gains	S =				(66)m + (67)m	n + (68	3)m + (69)m + (70)m +	(71)m + (72)	m		
(73)m=	706.71 704.4	3 686.29	656.59	625.65	5 5	96.41 577.77	584	.39 599.95	629.8	9 664.35	690.95		(73)
6. Sola	ar gains:												
_		_	ar flux from	Table 6a	a and	l associated equa	tions	to convert to th	e applic		on.		
Orienta	tion: Access Table 6		Area m²	l		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.	77	1	.2	X	10.63	x	0.85	×	0.7	=	10.52	(74)
North	0.9x 0.	77	1	.2	X	20.32	x	0.85	×	0.7	=	20.11	(74)
North	0.9x 0.	77	1	.2	X	34.53	x	0.85	X	0.7	=	34.17	(74)
North	0.9x 0.	77	1	.2	X	55.46	X	0.85	X	0.7	=	54.89	(74)
North	0.9x 0.	77	1	.2	X	74.72	x	0.85	X	0.7	=	73.94	(74)
North	0.9x 0.	77	1	.2	X	79.99	X	0.85	X	0.7	=	79.15	(74)
North	0.9x 0.	77	1	.2	X	74.68	X	0.85	X	0.7	=	73.9	(74)
North	0.9x 0.	77	1	.2	X	59.25	X	0.85	X	0.7	=	58.63	(74)
North	0.9x 0.	77	1	.2	X	41.52	X	0.85	X	0.7	=	41.08	(74)
North	0.9x 0.	77	1	.2	X	24.19	X	0.85	X	0.7	=	23.94	(74)
North	0.9x 0.	77	1.	.2	X	13.12	Х	0.85	X	0.7		12.98	(74)
North	0.9x 0.	77	1	.2	Х	8.86	x	0.85	X	0.7		8.77	(74)
East	0.9x	1 >	8	.4	Х	19.64] x	0.85	X	0.7	=	68.03	(76)
East	0.9x	1 >	8	.4	x	38.42] x	0.85	x	0.7	=	133.07	(76)
East	0.9x	1 >	8	.4	x	63.27	x	0.85	x	0.7	=	219.15	(76)
East	0.9x	1	8	.4	x	92.28	Х	0.85	x	0.7	=	319.62	(76)
East	0.9x	1 >	8	.4	Х	113.09	x	0.85	x	0.7	=	391.71	(76)
East	0.9x	1 >	8	.4	X	115.77	x	0.85	X	0.7	=	400.98	(76)
East	0.9x	1 >	8	.4	X	110.22	X	0.85	X	0.7	=	381.75	(76)
East	0.9x	1 >	8	.4	X	94.68	x	0.85	X	0.7	=	327.92	(76)
East	0.9x	1 >	8	.4	X	73.59	X	0.85	X	0.7	=	254.88	(76)
East	0.9x	1 >	8	.4	X	45.59	x	0.85	X	0.7	=	157.9	(76)
East	0.9x	1 >	8	.4	X	24.49	X	0.85	X	0.7	=	84.82	(76)
East	0.9x	1 >	8	.4	X	16.15	X	0.85	X	0.7	=	55.94	(76)
South	0.9x 0.	77	1.	86	X	46.75	X	0.65	X	0.7	=	82.26	(78)
South	0.9x 0.	77	0.	75	X	46.75	X	0.65	X	0.7	=	44.22	(78)
South	0.9x 0.	77	1.	86	X	76.57	X	0.65	X	0.7	=	134.72	(78)
South	0.9x 0.	77	0.	75	X	76.57	x	0.65	X	0.7	=	72.43	(78)
South	0.9x 0.	77	1.	86	X	97.53	x	0.65	X	0.7	=	171.61	(78)
South	0.9x 0.	77	0.	75	X	97.53	x	0.65	×	0.7	=	92.26	(78)
South	0.9x 0.	77	1.	86	X	110.23	x	0.65	×	0.7	=	193.95	(78)
South	0.9x 0.	77	0.	75	X	110.23	x	0.65	x	0.7	=	104.28	(78)
South	0.9x 0.	77	1.	86	X	114.87	x	0.65	x	0.7	=	202.11	(78)
South	0.9x 0.	77	0.	75	X	114.87	x	0.65	×	0.7	=	108.66	(78)
									_				_

South	0.9x	0.77	x	1.86	X	110.55	x	0.65	x	0.7	=	194.5	(78)
South	0.9x	0.77	x	0.75	x	110.55	x	0.65	x	0.7	=	104.57	(78)
South	0.9x	0.77	X	1.86	X	108.01	x	0.65	x	0.7	=	190.04	(78)
South	0.9x	0.77	x	0.75	X	108.01	x	0.65	x	0.7	=	102.17	(78)
South	0.9x	0.77	x	1.86	x	104.89	x	0.65	x	0.7	=	184.56	(78)
South	0.9x	0.77	X	0.75	X	104.89	x	0.65	x	0.7	=	99.22	(78)
South	0.9x	0.77	X	1.86	X	101.89	x	0.65	x	0.7	=	179.26	(78)
South	0.9x	0.77	X	0.75	X	101.89	x	0.65	X	0.7	=	96.38	(78)
South	0.9x	0.77	x	1.86	X	82.59	x	0.65	X	0.7	=	145.31	(78)
South	0.9x	0.77	X	0.75	X	82.59	X	0.65	X	0.7] =	78.12	(78)
South	0.9x	0.77	x	1.86	X	55.42	x	0.65	x	0.7	=	97.5	(78)
South	0.9x	0.77	X	0.75	X	55.42	X	0.65	x	0.7	=	52.42	(78)
South	0.9x	0.77	x	1.86	X	40.4	x	0.65	x	0.7	=	71.08	(78)
South	0.9x	0.77	х	0.75	X	40.4	X	0.65	X	0.7	=	38.21	(78)
West	0.9x	0.77	x	1.2	X	19.64	X	0.65	X	0.7	=	14.86	(80)
West	0.9x	0.77	X	1.2	X	38.42	X	0.65	X	0.7	=	29.07	(80)
West	0.9x	0.77	x	1.2	X	63.27	X	0.65	X	0.7	=	47.88	(80)
West	0.9x	0.77	X	1.2	X	92.28	Х	0.65	X	0.7	=	69.83	(80)
West	0.9x	0.77	X	1.2	Х	113.09	×	0.65	X	0.7	=	85.58	(80)
West	0.9x	0.77	X	1.2	X	115.77	×	0.65	X	0.7	=	87.61	(80)
West	0.9x	0.77	X	1.2	X	110.22	X	0.65	X	0.7	=	83.41	(80)
West	0.9x	0.77	X	1.2	×	94.68	Х	0.65	X	0.7	=	71.65	(80)
West	0.9x	0.77	X	1.2	X	73.59	Х	0.65	X	0.7	=	55.69	(80)
West	0.9x	0.77	X	1.2	Х	45.59	X	0.65	X	0.7	=	34.5	(80)
West	0.9x	0.77	X	1.2	X	24.49	X	0.65	X	0.7	=	18.53	(80)
West	0.9x	0.77	X	1.2	X	16.15	X	0.65	X	0.7	=	12.22	(80)
Rooflight		1	X	2.49	X	26	X	0.65	X	0.7	=	26.51	(82)
Rooflight	<u> </u>	1	X	3.35	X	26	X	0.65	X	0.7	=	35.67	(82)
Rooflight	<u> </u>	1	X	2.49	X	54	X	0.65	X	0.7	=	55.06	(82)
Rooflight		1	X	3.35	X	54	X	0.65	X	0.7	=	74.08	(82)
Rooflight	<u> </u>	1	X	2.49	X	96	X	0.65	X	0.7	=	97.89	(82)
Rooflight		1	X	3.35	X	96	X	0.65	X	0.7	=	131.7	(82)
Rooflight		1	X	2.49	X	150	X	0.65	X	0.7	=	152.95	(82)
Rooflight	<u> </u>	1	X	3.35	X	150	X	0.65	X	0.7	=	205.77	(82)
Rooflight		1	X	2.49	X	192	X	0.65	X	0.7	=	195.77	(82)
Rooflight	L	1	X	3.35	X	192	X	0.65	X	0.7	=	263.39	(82)
Rooflight	<u> </u>	1	X	2.49	X	200	X	0.65	X	0.7	=	203.93	(82)
Rooflight		1	X	3.35	X	200	X	0.65	X	0.7	=	274.36	(82)
Rooflight		1	X	2.49	X	189	X	0.65	X	0.7	=	192.71	(82)
Rooflight		1	X	3.35	X	189	X	0.65	X	0.7	=	259.27	(82)
Rooflight	IS 0.9x	1	X	2.49	X	157	X	0.65	X	0.7	=	160.09	(82)

Rooflights _{0.9x}	1	X	3.3	35	x	15	57	x	0.6	65	x	0.7	=	215.38	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	11	15	x	0.6	65	x	0.7	=	117.26	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	11	15	x	0.6	65	x	0.7	=	157.76	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	6	6	x	0.6	65	x	0.7	=	67.3	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	6	6	x	0.6	65	x [0.7	=	90.54	(82)
Rooflights _{0.9x}	1	X	2.4	19	x	3	3	x	0.6	65	x	0.7	=	33.65	(82)
Rooflights 0.9x	1	X	3.3	35	x	3	3	х	0.6	65	x	0.7	=	45.27	(82)
Rooflights 0.9x	1	X	2.4	19	x	2	:1	х	0.6	65	x	0.7	=	21.41	(82)
Rooflights _{0.9x}	1	X	3.3	35	x	2	:1	х	0.6	65	x	0.7	=	28.81	(82)
					_			_							
Solar gains in w	atts, ca	alculated	for eac	h month				(83)m	= Sum(7	74)m .	(82)m			_	
(83)m= 282.07	518.55	794.66	1101.29	1321.17	134	45.12	1283.27	1117.	.44 90	2.32	597.61	345.18	236.45		(83)
Total gains – int	ternal a	nd solar	(84)m =	= (73)m ·	+ (8	33)m , ı	watts							_	
(84)m= 988.79	1222.98	1480.94	1757.88	1946.82	194	41.53	1861.04	1701.	.83 150)2.27	1227.5	1009.53	927.4		(84)
7. Mean interna	al temp	erature	(heating	season)										
Temperature d	luring h	eating p	eriods ir	n the livii	ng a	area fro	om Tab	ole 9,	Th1 (°	C)				21	(85)
Utilisation factor	or for ga	ains for I	living are	ea, h1,m	(se	e Tab	le 9a)								
Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Au	ıg S	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.96	0.9	0.	.79	0.66	0.7	1 0	.89	0.97	0.99	1		(86)
Mean internal	temper	ature in	living are	2a T1 (fc		w sten	s 3 to 7	in Ta	able 90	·)				_	
(87)m= 18.43	18.68	19.11	19.72	20.26			20.88	20.8		0.49	19.78	19.04	18.45	1	(87)
` '	ما به مانوریا		o vio alo in	Took of	مادده	الممال	то то			·C\				_	
Temperature d	19.09	eating p	19.15	19.16		9.21	19.21	19.2		0.19	19.16	19.14	19.12	1	(88)
										<i>y.</i> 10	10.10	10.14	10.12		(55)
Utilisation facto						$\overline{}$		<u> </u>			0.00			7	(00)
(89)m= 0.99	0.99	0.97	0.94	0.84	0.	.66	0.44	0.5) ().8	0.96	0.99	1		(89)
Mean internal	tempera	ature in	the rest	of dwelli	ng ⁻	T2 (fol	low ste	ps 3	to 7 in	Tabl	e 9c)	•		7	
(90)m= 15.84	16.2	16.83	17.73	18.48	19	9.03	19.18	19.1	7 18	3.81	17.84	16.75	15.88		(90)
										f	LA = Livir	ng area ÷ (4	4) =	0.46	(91)
Mean internal	tempera	ature (fo	r the wh	ole dwe	lling	g) = fL <i>i</i>	A × T1	+ (1 -	- fLA) :	× T2					
(92)m= 17.04	17.35	17.88	18.66	19.31	19	9.8	19.97	19.9	95 19	9.59	18.74	17.81	17.07		(92)
Apply adjustme	ent to th	ne mean	internal	temper	atur	re from	n Table	4e, v	where a	appro	priate			_	
(93)m= 17.04	17.35	17.88	18.66	19.31	19	9.8	19.97	19.9	95 19	9.59	18.74	17.81	17.07		(93)
8. Space heati	ng requ	uirement													
Set Ti to the m			•		ed	at step	11 of	Table	e 9b, s	o tha	t Ti,m=(76)m an	d re-cal	culate	
the utilisation f	Feb					lum T	Jul	Δ.		Con	Oct	Nov	Dec	7	
Jan Utilisation factor		Mar ains hm	. Apr	May		Jun	Jui	Au	19 3	Sep	Oct	INOV	Dec	J	
(94)m= 0.99	0.98	0.97	0.93	0.85	0.	0.71	0.54	0.6	i 0	.82	0.95	0.99	0.99	1	(94)
Useful gains, h							0.0 .	0.0			0.00	1 0.00	0.00	J	· /
		1432.26	<u> </u>	1651.49	13	74.4	1008.07	1020.	.42 123	39.08	1168.25	994.91	920.89	7	(95)
Monthly average											<u> </u>	1		_	
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.4	4 1	4.1	10.6	7.1	4.2]	(96)
Heat loss rate	for mea	an intern	al tempe	erature,	Lm	, W =[(39)m :	x [(93	3)m- (9	 96)m]			_	
(97)m= 4606.48 4	4465.21	4052.83	3347.5	2591.76	171	13.35	1109.48	1160.	.67 183	33.26	2773.87	3702.47	4514.64		(97)
					•				•			•		-	

Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 2697.95 2192.04 1949.7 1236.6 699.56 0 0 0 1194.58 1949.44 2	673.75
Total per year (kWh/year) = Sum(98) ₁	5,912 = 14593.62 (98)
Space heating requirement in kWh/m²/year	96.87 (99)
8c. Space cooling requirement	
Calculated for June, July and August. See Table 10b	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Tal	ole 10)
(100)m= 0 0 0 0 0 3096.83 2437.93 2488.01 0 0 0	0 (100)
Utilisation factor for loss hm	
(101)m= 0 0 0 0 0 0.63 0.71 0.67 0 0 0	0 (101)
Useful loss, hmLm (Watts) = (100)m x (101)m	
(102)m= 0 0 0 0 1954.12 1740.23 1672.92 0 0 0	0 (102)
Gains (solar gains calculated for applicable weather region, see Table 10)	
(103)m= 0 0 0 0 0 2275.31 2183.03 2011.93 0 0 0	0 (103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (10 set (104)m to zero if (104)m < 3 × (98)m	2)m] x (41)m
(104)m= 0 0 0 0 0 0 329.45 252.23 0 0 0	0
Total = Sum(104) =	581.68 (104)
Cooled fraction $f C = cooled area \div (4)$	= 0.93 (105)
Intermittency factor (Table 10b)	
(106)m= 0 0 0 0 0 0.25 0.25 0 0 0	0
$Total = \frac{Sum(1.04)}{1}$	0 (106)
Space cooling requirement for month = (104)m × (105) × (106)m	
(107)m= 0 0 0 0 0 76.54 58.6 0 0 0 Table Comp(407)	0
Total = Sum(107) =	135.14 (107)
Space cooling requirement in kWh/m²/year $(107) \div (4) =$	0.9 (108)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community sche Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	me. 0 (301)
Fraction of space heat from community system 1 – (301) =	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat so includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	urces; the latter
Fraction of heat from Community boilers	1 (303a)
Fraction of total space heat from Community boilers (302) x (303a)	
Tradition of total space float from Community Solliers	= 1 (304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 (304a) 1 (305)
Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating	1 (305)
Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement	1 (305) 1.05 (306) kWh/year 14593.62
Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community boilers (98) × (304a) × (305) × (306) =	1 (305) 1.05 (306) kWh/year 14593.62 15323.31 (307a)
Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement	1 (305) 1.05 (306) kWh/year 14593.62

Water heating	r		7
Annual water heating requirement		3977.99	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	4176.89	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	195	(313)
Cooling System Energy Efficiency Ratio		4.38	(314)
Space cooling (if there is a fixed cooling system, if not enter	er 0) = (107) ÷ (314) =	30.89	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	0	(330a)	
warm air heating system fans		0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)	Ī	507.25	(332)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor		
	kWh/year kg CO2/kWh	kg CO2/year	
	CHP) P using two fuels repeat (363) to (366) for the second fuel		(367a)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3)	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x		(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	CHP) P using two fuels repeat (363) to (366) for the second fuel	91	」 `
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x	91 4628.62	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x 0 = [(313) x 0.52 = (363)(366) + (368)(372) = (309) x 0	91 4628.62 101.21	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x 0 = [(313) x 0.52 = (363)(366) + (368)(372) = (309) x 0	91 4628.62 101.21 4729.83	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x 0 = [(313) x 0.52 = (363)(366) + (368)(372) = (309) x 0	91 4628.62 101.21 4729.83	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instal	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x 0 = [(313) x 0.52 = (363)(366) + (368)(372) = (309) x 0 = ntaneous heater (312) x 0.22	91 4628.62 101.21 4729.83 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instal Total CO2 associated with space and water heating	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x 0 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 1 1 1 1 1 1 1 1 1 1 1 1	91 4628.62 101.21 4729.83 0 0 4729.83	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with space cooling	CHP) P using two fuels repeat (363) to (366) for the second fuel 807b)+(310b)] x 100 ÷ (367b) x 0 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 1 1 1 1 1 1 1 1 1 1 1 1	91 4628.62 101.21 4729.83 0 0 4729.83 16.03	(367) (372) (373) (374) (375) (376) (377)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instal Total CO2 associated with space and water heating CO2 associated with space cooling CO2 associated with electricity for pumps and fans within or	CHP) P using two fuels repeat (363) to (366) for the second fuel (307b)+(310b)] x 100 ÷ (367b) x (363)(366) + (368)(372) (309) x 0 1 (309) x 0 (373) + (374) + (375) = (315) x 0.52 4 dwelling (331)) x 0.52 = (332))) x 0.52	91 4628.62 101.21 4729.83 0 0 4729.83 16.03	(367) (372) (373) (374) (375) (376) (377) (378)

El rating (section 14)

(385)

65.69

Appendix C - Renewable Technologies; Description, Benefits and Limitations

Domestic Solar Hot Water Heating



Solar thermal or solar hot water (SHW) systems use a collector which is generally mounted on the roof, and typically contains a water glycol mixture which is heated by the sun. The heated liquid is then passed through a coil in a hot water storage cylinder. The water in the cylinder is then further heated (if required) by a boiler or electric immersion heater. The free energy obtained from the sun can be used to offset the amount of energy required for providing domestic hot water, and will

reduce both running costs (due to the fuel being displaced electricity, natural gas, Liquefied Petroleum Gas (LPG) or oil) and the associated CO₂ emissions.

These systems are not good enough to provide space heating in the UK due to the climate but are among the most cost-effective renewable energy systems that can be installed to assist with domestic hot water demand.

Solar water heating could be installed by utilising either evacuated tube type panels or flat plate collectors mounted on the roof of the building.

Reasons for Excluding this Technology for this Site

SHW only contributes to the water heating demand of the property and has reduced effectiveness during the winter months. Consequently they do not supply sufficient carbon reduction. This technology is not considered suitable for this project and is not investigated further.

The technology cannot produce a material contribution to the energy needs of a commercial development such as this, as the demand for hot water is for occasional hand washing which represents a very small proportion of the total demand. It is quite possible that the energy consumed by the solar circuit pump would be greater than the energy used by instantaneous water heaters to provide the same amount of hot water. For these reasons solar thermal panels are only suitable for specific commercial applications which have a quantifiable demand for hot water that can be matched to the output characteristic of a solar thermal system.

Photovoltaic Panels (PV)



PV systems convert energy from the sun into electricity through semi-conductor cells. A cell consists of two thin layers of different semi-conducting materials, usually based on silicon. When light shines on the cell, a difference in energy is created – otherwise known as voltage. This voltage is used to produce a direct current (DC), which can be used directly or converted into alternating current (AC). AC can be exported to

the local electricity network/national grid. The brighter the sunlight, the more power is produced. Shading from other objects (such as nearby buildings and trees) will affect performance and PV cells are more likely to show a drop in output than solar thermal panels. As with solar hot water, the panels should face as close to due south as possible and be unshaded for most of the day. An individual PV cell only produces a small amount of power, therefore they are usually connected together to form a module. Modules can then be linked to form an array and sized to meet the required demand.

The size of a photovoltaic (PV) installation is expressed by its kilowatt peak (kWp) potential, which is an indication of how much electricity the system could generate at peak/optimum conditions. The electricity generated on-site by photovoltaic cells would be a direct saving on electricity otherwise sourced from the national grid. The electricity generated would be a direct saving on electricity required for power, lighting, heating and hot water (depending on systems installed). Whilst expensive it should be noted that PV technology off-sets 3 times the carbon dioxide from grid supplied electricity compared to technology which reduces natural gas consumption therefore as a single simplistic solution it compares favourably.

Reasons for Excluding this Technology for this Site

The dwellings will be required to be fitted with a PV array and this would have significant visual impact. The proposed development is located within a conservation. Therefore it is not considered appropriate to include such technology.

Air Source Heat Pump



A heat pump extracts heat from the ground, air or water and transfers it to a heating system. Often coupled to underfloor heating, as the temperatures involved are usually lower (around 40 degrees where a boiler will be 80 degrees), an electric pump circulates the water in the system. Ground source heat pumps (GSHP) and air source heat pumps (ASHP) are currently the most common type of heat pump used in the UK, and use technology which is essentially the same as a

fridge. A typical GSHP system will include a ground heat exchanger (for extracting heat from the ground), the heat pump itself and a heating system.

The overall efficiency of a heat pump is determined by the difference in temperature between the heat source itself (the ground, air or water) and the temperature of the area or environment to be heated. The smaller the temperature difference the higher the coefficient of performance (COP) will be.

Typical COPs will be in the range 2-4 depending upon operating conditions. Heat pumps can supply 100 per cent of heat demand, but it will usually only pre-heat domestic hot water, so an additional method of heating the hot water (e.g. an immersion heater) may be needed. GSHP systems will have a higher capital cost due to the groundworks involved in laying the required pipework which can be quite extensive. An ASHP will be cheaper as the external unit is usually pre- packaged and only requires mounting in position.

Reasons for Excluding this Technology for This Site

Air Source Heat Pumps can be connected in series and thus provide heating and cooling system, modules only work as and when demand requires thus providing excellent efficiencies. The use of this technology will adversely affect the setting of the conservation.

For these reasons heat pumps are deemed not suitable for this project and have not been considered further.

Biomass Boilers



Biomass heating is the combustion of a biomass fuel such as wood in a boiler to supply space heating and hot water. Biomass fuel is biological in origin and, when from sustainable sources, is regarded as renewable.

The most common fuel is wood, supplied in three forms; logs, chips and compressed wood pellets.

Any biomass heating system requires the following main components:

- Fuel storage;
- · One or more boilers;
- One or more heat accumulators;
- A chimney stack or flue;
- A heat meter.

Sufficient fuel must be stored on-site to maintain operations in between deliveries. The amount will depend on circumstances, but is typically not less than a week of operation at full load.

The store must keep the fuel dry. Wet fuel will cause the boiler to malfunction.

The design of the store will depend on the fuel selected; logs can be kept in a simple shed, chips in a storage bay and pellets in an enclosed hopper. Typical solutions are silos similar to animal feed storage or partitioned sections in an enclosed barn, outhouse or commodity store.

Access is needed for deliveries and some is needed to convey the fuel to the boiler on demand.

There are two main types of boiler – continuously fuelled and batch fuelled. Continuously fuelled boilers use wood chip or pellet fuels and can be made fully automatic.

The space requirement for biomass plant, equipment and associated fuel storage is significant and given the footprint of the building and its central London location the site has limited off-street loading and delivery areas. Biomass requires frequent and regular deliveries of fuel which would impact on local transportation due to site servicing constraints and would therefore not be suitable for this redevelopment.

Reasons for Excluding this Technology for this Site

There are many discussions at this time with regards to the suitability of biomass within the GLA region due to the Clean Air Act Requirements and the viability of clean biomass systems has not yet been proven.

Therefore the inclusion of biomass has not been deemed appropriate and is not considered further.

Storage limitations dictate whether it is physically feasible to include within the development's renewable energy strategy; a large dry space for storing the fuel would be required to hold several months' worth of fuel. In addition, a fuel supplier would need to be within reasonable vicinity; otherwise the emissions associated with delivery will significantly reduce the onsite carbon savings.

Biomass boilers do not operate in the same way as gas and oil boilers. They have a more limited operating range and cannot respond as rapidly to changes in demand. Short operating cycles are not recommended. The use of a hot water tank or accumulator in the system to balance the output of the boiler and the demand of the heating system is highly recommended. The necessary volume depends on the type of boiler and the character of the heating system. Pellet boilers have a good operating range and a relatively small tank would be used. Log boilers have little range and a large tank that can absorb the energy contained within one or more charges of wood is necessary.

Biomass boilers are combustion appliances and are subject to regulation on placing height and the quantity of pollutant emissions. This should be discussed with the environmental health officer of the Local Authority.

Ground Source Heat Pumps



Ground source heat pumps can be used to provide heating and or cooling to the building. Whilst ground source does rely on fossil fuels (indirectly) to provide the energy source, they are considered renewable given their high coefficient of performance and hence reduced fossil fuel reliance.

This can be one of four methods:

- 1. Closed horizontal loops, generally comprising a number of flow and return horizontal coiled loops sometimes called "slinkies".
- 2. Closed vertical loops, generally comprising a number of flow and return vertical loops to approximately 100m.
- 3. Open loop, generally comprising of an abstraction and rejection well.
- 4. Abstraction only open loop, comprising of an abstraction well with water rejected to either the local sewer systems or river/water course.

Reasons for Excluding this Technology for this Site

In order to provide the anticipated heating and cooling boreholes would be required with sufficient distance needed between them. With the site having limited external areas, ground source heat pumps are deemed not suitable for this project and have not been considered further.

Existing services within the ground would prohibit the installation of a borehole type heat pump. Space limitations prohibit the installation of a slinky type heat pump.

Wind Turbines

This section covers both large scale and micro wind solutions.

Large scale wind generation systems have capacities over 100kW and are usually used to power larger developments such as, larger scale housing, industrial estates and hotels with many rooms. These systems cannot be roof mounted due to their size and weight.

Reasons for Excluding this Technology for this Site

Due to the large capital cost and surroundings, large scale wind turbine systems are not considered viable at this project.

It is difficult to obtain predictable or large amounts of wind energy in city centre locations, as they require non-turbulent, horizontal air streams to be most effective. Surrounding buildings, trees, etc can cause significant issues with regards to micro and large scale installations unless the rotors are positioned at a considerable height.

Micro wind turbine technology has been found to be extremely difficult to achieve a contribution economically. A significant number of units would be required to provide any reasonable energy savings which would have serious visual impact implications.

Tall buildings give their own specific problems in that the building act as a spoiler, pushing wind upwards and over the turbine, reducing effectiveness considerably.

Additional considerations with large and micro wind solutions are the potential issues from stroboscopic light, topple distance, noise, impact on wildlife and structural enhancements which all raise major concerns given the building central London location.

Given the building location in central London and its close proximity to nearby buildings, achieving an acceptable solution that will provide sufficient renewable contribution as well as overcome the installation impacts is unlikely and therefore has not been considered for this project.