

## **Energy Statement**

### 36 Lancaster Grove

For Nicholas Taylor and Associates

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XCO2 energy

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#### About us:

XCO2 Energy are a low-carbon consultancy working in the built environment. We are a multi-disciplinary company consisting of both architects and engineers, with specialists including CIBSE low carbon consultants, Code for Sustainable Homes, EcoHomes and BREEAM assessors and LEED accredited professionals.

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#### **Executive Summary**

This report assesses the predicted energy performance and carbon dioxide emissions of the proposed development at 36 Lancaster Grove, based on the information provided by the design team.

The site is located between Lancaster Grove Road, Lambolle Place and Eton Ave within the London Borough of Camden, just north of Primrose Hill. The proposed scheme comprise the change of use, refurbishment and extension of the Grade II Listed former Belsize Park Fire Station Building into 10 units of apartment accommodation. The existing 7 units of residential accommodation will not form part of this application.

As the former Belsize Park Fire Station is a Listed Building located within the Belsize Park conservation area, all of the existing facades, roof, windows and floors will be retained and re-used as far as possible to maintain the character of the existing building.

In line with the 'GLA Guidance on preparing energy assessments' (April 2015) Sections 8.11-8.14, the existing building with it's current fabric and building services systems are used as the baseline condition for the scheme in this Energy Statement. The 7 no. existing residential accommodation, which do not form part of this application, has not been included in this assessment.

The methodology used to determine the  ${\rm CO_2}$  emissions is in accordance with the London Plan's three-step Energy Hierarchy (Policy 5.2) outlined below.

#### 1. Be Lean - use less energy

The first step deals with the reduction in energy use, through the adoption of sustainable design and construction measures. In accordance with this strategy, this development will incorporate a range of energy efficiency measures including the provision of a new and highly efficiency communal space heating and hot water system, electrical

rewiring to include provision of low energy lighting throughout the scheme, and insulation levels meeting Part L1B targets for the any new thermal elements. Insulation will also be provided between and below the rafters at the existing pitched roof. The improvements in the building systems and fabric have reduced regulated CO<sub>2</sub> emissions by 45.8% in comparison to the existing building, thus exceeding the requirements outlined by the Camden Council and London Plan 2015.

#### 2. Be Clean - supply energy efficiently

The second strategy takes into account the efficient supply of energy, by prioritising decentralised energy generation. The feasibility study showed that no district heating network currently exists within close proximity of the site. Due to the nature of the development, a CHP unit would not be an economically viable option. Hence, a high efficiency centralised gas boiler will be installed to provide space heating and hot water to all apartments.

#### 3. Be Green - use renewable energy

The third strategy covers the use of renewable technologies. The feasibility study analysed a number of renewable technologies for their suitability for the site. The analysis included a biomass heating system, ground-source heat pumps, air-source heat pumps, photovoltaic panels, solar thermal and wind turbines.

The analysis demonstrated that due to the conservation requirements of the existing Grade II listed building, it will not be feasible to install renewable technologies without considerable alterations to the former Belsize Park Fire Station.

In total, the development is expected to reduce regulated  $\mathrm{CO}_2$  emissions by 47.9% when compared to the existing baseline building. This meets the London Plan  $\mathrm{CO}_2$  reduction target of 35% set out for all major developments.



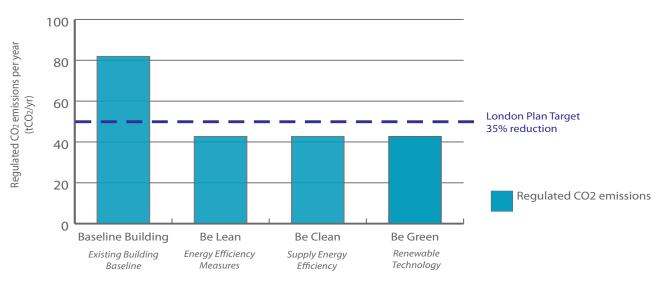


#### **Conclusion**

The graph below provides a summary of the regulated CO<sub>2</sub> savings at each stage of the London Plan Energy Hierarchy. The table below and on the following page detail the regulated and unregulated emissions at each stage of the hierarchy.

It can be seen on the graph below that the development at 36 Lancaster Grove will achieve a regulated CO<sub>2</sub> saving exceeding the required 35% beyond the existing baseline building.

#### **36 Lancaster Grove Energy Hierarchy**



#### CO, Emissions Breakdown from each stage of the energy hierarchy

	Carbon Dioxide Emissions (tonnes CO <sub>2</sub> per annum)			
	Regulated Total			
Existing building baseline	81.9	95.5		
After energy demand reduction	42.7	56.3		
After CHP	42.7	56.3		
After renewable technologies	42.7	56.3		





### ${ m CO}_2$ Savings Breakdown from each stage of the energy hierarchy

	Regulated Carbon Dioxide Savings Tonnes CO <sub>2</sub> / year  % over baseline		
Savings from energy demand reduction	39.2	47.9%	
Savings from CHP	0.0	0.0%	
Savings from renewable energy	0.0	0.0%	
Cumulative savings	39.2	0.0%	





#### Introduction

The proposed Belsize Park Fire Station development located at Lancaster, is a five-storey high Grade II listed building. It is a change of use development from a fire station to domestic units.

The site is located between Lancaster Grove Road, Lambolle Place and Eton Ave within the London Borough of Camden, just north of Primrose Hill. The proposed scheme comprise the change of use, refurbishment and extension of the Grade II Listed former Belsize Park Fire Station Building into 10 units of apartment accommodation. The existing 7 units of residential accommodation will not form part of this application.

This document demonstrates how the proposed development addresses the relevant energy policies of the London Plan 2015 (Further Alterations to the London Plan) and the requirements of Camden Council as outlined in their Core Strategy 2010-2025.

In particular this report responds to the energy policies of section 5 in the London Plan, including:

- Policy 5.2 Minimising Carbon Dioxide Emissions
- Policy 5.3 Sustainable Design and Construction
- Policy 5.5 Decentralised Energy Networks
- Policy 5.6 Decentralised Energy in Development proposals
- Policy 5.7 Renewable Energy where feasible.

and the Policy CS13 of the Camden's Core Strategy 2010-2025, which states the following in relation to sustainable redevelopment in the local area:

Camden Core Strategy 2010-2025: CS13 - Tackling climate change through promoting high environmental standards

## Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

- ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;
- promoting the efficient use of land and buildings;
- minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:
- 1. ensuring developments use less energy,
- making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;
- 3. generating renewable energy on-site; and
- ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions

#### Local energy generation

The Council will promote local energy generation and networks by:

 working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of:





- 1. housing estates with community heating or the potential for community heating and other uses with large heating loads;
- 2. the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn:
- 3. schools to be redeveloped as part of Building Schools for the Future programme;
- 4. existing or approved combined heat and power/ local energy networks;

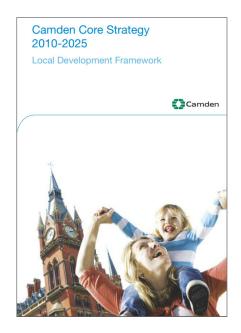
and other locations where land ownership would facilitate their implementation.

 protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

#### Camden's carbon reduction measures

The Council will take a lead in tackling climate change by:

- taking measures to reduce its own carbon emissions;
- triallng new energy efficient technologies, where feasible; and
- raising awareness on mitigation and adaptation measures



Furthermore, the Camden Core Strategy recommends that:

Given the large proportion of development in the borough that relates to existing buildings, we will expect proportionate measures to be taken to improve their environmental sustainability, where possible.

The methodology employed in this Energy Statement to determine the potential CO<sub>2</sub> savings for this development, is in accordance with the three step Energy Hierarchy outlined in the London Plan:

- Be Lean Improve the energy efficiency of the scheme
- Be Clean Supply as much of the remaining energy requirement with low-carbon technologies such as combined heat and power (CHP)
- Be Green Offset a proportion of the remaining carbon dioxide emissions by using renewable technologies.

It should be noted that due to the change-ofuse and refurbishment nature of the proposed development, the baseline conditions for the development are calculated based on the existing fabric and services of the retained building.

Energy calculations were carried out using the SAP (Standard Assessment Procedure) methodology. This is in line with Building Regulations Part L 2013. The SAP sheets for the existing building baseline is presented in Appendix A, while those for the proposed development is presented in Appendix B.





#### **Demand Reduction (Be Lean)**

#### **Passive Design Measures**

#### **Enhanced Building Fabric**

The heat loss of different building elements is dependent upon their U-value. The lower the U-value, the better the level of insulation of a particular element. A building with low U-values has a reduced heating demand during the cooler months.

The extended portions of the development at 36 Lancaster Grove will incorporate insulation meeting building regulation Part L1B threshold U-values and high efficiency glazing where possible in order to reduce the demand for space heating (see tables below).

Insulation would be installed to between and below the rafters of the existing pitched roof of the building, to achieve a u-value of circa 0.28 W/m2.K. However, it must be noted that since the building is a Grade II listed structure of heritage interest, alteration of the existing fabric elements (external walls, floors, roofs and such) will impact the original character of the building, no changes apart from addition of roof insulation will be made to the existing fabric elements.

Heating and hot water to the apartments will be supplied by a communal heating system with a centralised high efficiency gas boiler.

#### **Air Tightness**

Heat loss may also occur due to air infiltration. Although this cannot be eliminated altogether, good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration into a building.

Current Part L Building Regulations (2013) sets a maximum air permeability rate of 10m³/m² at 50Pa for new build dwellings. The development will achieve this air tightness as a minimum, through draught proofing and the application of best practice construction techniques.

#### **Daylight**

The development will aim to maintain the existing good sized windows to provide satisfactory levels of daylighting in all habitable spaces such as living rooms, as a way of improving the health and wellbeing of its occupants.

#### **Active Design Measures**

#### **High Efficacy Lighting**

The development intends to incorporate low energy lighting fittings throughout the dwellings and communal spaces. All light fittings will be specified as low energy lighting to minimise energy demand. Internal and external areas which are not frequently used will be fitted with occupant sensors, whereas daylit areas will be fitted with daylight sensors and timers.





#### **Energy Demand**

The table below shows a breakdown of energy demand for space conditioning and electricity. These figures indicate baseline and Lean demand after energy efficiency measures have been applied.

The table below demonstrates the energy savings achieved through energy efficiency measures (Lean stage of the Energy Hierarchy).

#### Breakdown of Energy Consumption and CO<sub>2</sub> Emissions

	Baseline Building				Lean	
	Energy (kWh/year)	CO <sub>2</sub> emissions (kgCO <sub>2</sub> /year)	CO <sub>2</sub> (kgCO <sub>2</sub> / m <sup>2</sup> )	Energy (kWh/year)	CO <sub>2</sub> emissions (kgCO <sub>2</sub> /year)	CO <sub>2</sub> (kgCO <sub>2</sub> / m <sup>2</sup> )
Hot Water	23,100	7,780	10.5	21,000	5,150	6.9
Space Heating	210,590	71,100	95.8	145,830	35,760	48.1
Cooling	0	0	0.0	0	0	0.0
Auxiliary	0	0	0.0	0	0	0.0
Lighting	5,810	3,010	4.1	3,420	1,770	2.4
Equipment (not incl. in Part L)	26,310	13,660	18.4	26,310	13,660	18.4
Total Part L	239,490	81,900	110.4	170,250	42,680	57.4
Total (incl. Equip)	265,800	95,650	128.7	196,560	56,330	75.8

#### CO, Emissions

The table below shows the regulated and unregulated carbon dioxide emissions for the baseline scheme and the emissions after the passive

and active lean measures have been implemented. A saving exceeding the required 35% is expected from the regulated CO<sub>2</sub> emission over the existing building.

#### CO<sub>2</sub> Emissions Breakdown at Lean stage

	Carbon Dioxide emissions (tonnes CO <sub>2</sub> per annum)					
	Regulated Unregulated Total					
Baseline building	81.9	13.7	95.5			
After energy demand reduction (Lean)	13.7 56.3					

	Carbon dioxide savings (tonnes CO <sub>2</sub> per annum)			e savings from ne (%)
	Regulated Total		Regulated	Total
Savings from energy demand reduction	39.2 39.1		47.9%	41.0%





## **Heating and Cooling Infrastructure (Be Clean)**

#### **Energy System Hierarchy**

The energy system for the development has been selected in accordance with the London Plan decentralised energy hierarchy. The hierarchy listed in Policy 5.6 states that energy systems should consider:

- 1. Connection to existing heating and cooling networks
- 2. Site wide CHP network
- 3. Communal heating and cooling

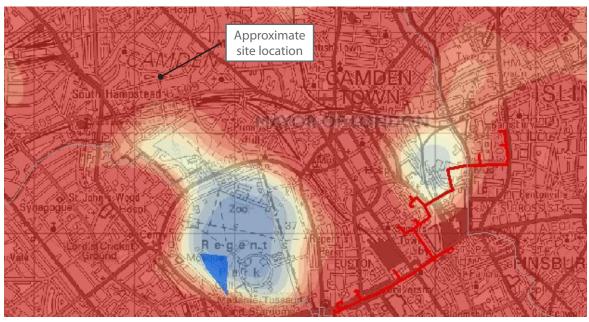
Local supply of heat and power minimise distribution losses, thereby achieving a greater efficiency and reducing CO<sub>2</sub> emissions, when compared to the individual systems.

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network to surrounding residencies and commercial units.

## Connection to Existing Low Carbon Heat Distribution Networks

The London Heat Map identifies existing and potential opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study. An excerpt from the London Heat Map below shows the energy demand for different areas. Darker shades of red signify areas where energy demand is high. The map also highlights any existing and proposed district heating network (DHN) within the vicinity of the development.

A review of the map shows that the closest existing or proposed heat networks approximately 1.4 miles to the south-east of the site. The scale of the development does not make it economically viable for connection with networks located at a distance from the site. For this reason connection to district heat networks are not currently considered feasible.



London Heat Map with proposed district heat network outlined in red





#### **Combined Heat and Power (CHP)**

CHP, or Co-generation is the production of electricity and useful heat from a single engine. Unlike conventional electricity generation, heat is re-used in a CHP system, primarily for hot water, thereby improving the overall energy conversion from 25-35% to around 80%.

Due to the type and size of the development, this technology would not be suitable for this site. The hot water load of the site would not be sufficient to justify the use of this technology.

Hence, this technology is deemed to be unsuitable for the development at 36 Lancaster Grove. The proposed development will be served by a communal heating network with a centralised gas boiler.

There will be no further reduction in  $CO_2$  emissions at the Clean Stage.



An example of a CHP engine (courtesy of Baxi)

#### CO<sub>2</sub> Emissions Breakdown at Clean stage

	Carbon Dioxide emissions (tonnes CO <sub>2</sub> per annum)				
	Regulated Unregulated Total				
Baseline building	81.9	13.7	95.5		
After energy demand reduction (Lean)	42.7 13.7 56.3				
After CHP (Clean)	42.7 13.7 56.3				

	Carbon dioxide savings (tonnes CO <sub>2</sub> per annum)  Regulated Total		Carbon dioxide savings fro baseline (%)	
			Regulated	Total
Savings from energy demand reduction	39.1	39.2	47.9%	41.0%
Savings from clean technologies	0.0	0.0	0.0%	0.0%





#### **Renewable Energy (Be Green)**

Once the energy demand has been minimised, methods of generating low and zero carbon energy can be assessed. The renewable technologies to be considered for the development are:

- Biomass
- Photovoltaic panels
- Solar thermal panels
- Ground/water source heat pumps
- Air source heat pump
- Wind energy

The table below summarises the factors taken into account in determining the appropriate renewable technology for this project. This includes estimated lifetime, level of maintenance, and level of impact on external appearance. The final column indicates the feasibility of the technology in relation to the site conditions (10 being the most feasible and 0 being infeasible).

The analysis demonstrated that due to the conservation requirements of the existing Grade II listed building, it will not be feasible to install renewable technologies without considerable construction and alterations to the former Belsize Park Fire Station building.

	36 Lancaster Grove					
	Comments	Lifetime	Maintenance	Impact on External Appearance	Site Feasibility	
Biomass	Not adopted -burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location.	20yrs	High	High	1	
A	Not adopted - PV panels mounted on the pitched roof would significantly alter the appearance and character of the Listed Building.	25yrs	Low	Med	3	
Solar	Not adopted - Solar thermal array mounted on the pitched roof would significantly alter the appearance and character of the Listed Building.	25yrs	Low	Med	3	
GSHP	Not adopted -the installation of ground loops require significant space, additional time at the beginning of the construction process and very high capital costs.	20yrs	Med	Low	1	
ASHP	Not adopted -ASHP evaporator units are located externally and produce noise which can be an issue in a residential location, especially at night.	20yrs	Med	Med	3	
Wind	Not adopted - Wind turbines located at the site will have a significant visual impact on the existing building within the Conservation Area.	25yrs	Med	High	1	





#### CO<sub>2</sub> Emissions

The table below shows the regulated and unregulated carbon dioxide emissions for the baseline scheme and the emissions after the lean, clean and green measures have been implemented.

The proposed Energy Strategy outlined in this document achieved significant  ${\rm CO_2}$  savings for this development. The savings achieved through sustainable design measures alone are significant.

The figures below show a CO<sub>2</sub> reduction in regulated emissions exceeding the required 35% when compared to the building with its existing fabric and systems.

#### CO<sub>2</sub> Emissions Breakdown

	Carbon Dioxide emissions (tonnes CO <sub>2</sub> per annum)					
	Regulated Unregulated Total					
Baseline building	81.9	13.7	95.5			
After energy demand reduction (Lean)	42.7	13.7	56.3			
After CHP (Clean)	42.7	13.7	56.3			
After renewable technologies (Green)	42.7 13.7 56.3					

#### CO<sub>3</sub> Savings Breakdown at all stages for the energy hierarchy

	Carbon dioxide savings (tonnes CO <sub>2</sub> per annum)		Carbon dioxide savings ov baseline (%)	
	Regulated Total		Regulated	Total
Savings from energy demand reduction	39.2	39.2	47.9%	41.0%
Savings from CHP	0.0 0.0		0.0%	0.0%
Savings from renewable energy	0.0	0.0	0.0%	0.0%
Cumulative savings	39.2	39.2	47.9%	41.0%





#### **Conclusion**

In line with the London Plan's three step energy hierarchy, the regulated CO<sub>2</sub> emission savings for this development will exceed 35% when energy efficiency measures are taken into account.

The tables on the following page provide a breakdown of the CO<sub>2</sub> savings made at each stage of the Energy Hierarchy. The reductions made through each step have been outlined below:

#### 1. Be Lean - use less energy

The first step deals with the reduction in energy use, through the adoption of sustainable design and construction measures. In accordance with this strategy, this development will incorporate a range of energy efficiency measures including the provision of a new and highly efficiency communal space heating and hot water system, electrical rewiring to include provision of low energy lighting throughout the scheme, and insulation levels meeting Part L1B targets for the any new thermal elements.

Insulation will also be provided between and below the rafters at the existing pitched roof. The improvements in the building systems and fabric have reduced regulated CO<sub>2</sub> emissions by 47.9% in comparison to the existing building, thus exceeding the requirements outlined by the Camden Council and London Plan 2015.

#### 2. Be Clean - supply energy efficiently

The second strategy takes into account the efficient supply of energy, by prioritising decentralised energy generation. The feasibility study showed that no district heating network currently exists within close proximity of the site. Due to the nature of the development, a CHP unit would not be an economically viable option. Hence, a high efficiency centralised gas boiler will be installed to provide space heating and hot water to all apartments.

#### 3. Be Green - use renewable energy

The feasibility study analysed a number of renewable technologies for their suitability for the site. The analysis included a biomass heating system, ground-source heat pumps, air-source heat pumps, photo voltaic panels, solar thermal and wind turbines.

The analysis demonstrated that due to the conservation requirements of the existing Grade II listed building, it will not be feasible to install renewable technologies without considerable alterations to the former Belsize Park Fire Station.

In total, the development is expected to reduce regulated CO<sub>2</sub> emissions by 47.9% when compared to the existing baseline building. This meets the London Plan CO<sub>2</sub> reduction target of 35% set out for all major developments.





### CO<sub>2</sub> Emissions Breakdown at all stages for the energy hierarchy

	Carbon Dioxid	de emissions (tonnes CC	D <sub>2</sub> per annum)
	Regulated	Unregulated	Total
Baseline building	81.9	13.7	95.5
After energy demand reduction (Lean)	42.7	13.7	56.3
After district heating system (Clean)	42.7	13.7	56.3
After renewable technologies (Green)	42.7	13.7	56.3

### ${\rm CO_2}$ Savings Breakdown at all stages for the energy hierarchy

		xide savings per annum)	Carbon dioxide savings over baseline (%)			
	Regulated	Total	Regulated	Total		
Savings from energy demand reduction	39.2	39.2	47.9%	41.0%		
Savings from district heating system	0.0	0.0	0.0%	0.0%		
Savings from renewable energy	0.0	0.0	0.0%	0.0%		
Cumulative savings	39.2	39.2	47.9%	41.0%		





# Appendix A - SAP outputs for the existing building baseline

The DER from the FSAP modelling of the proposed development with the existing fabric and building services systems were used to calculate the baseline CO<sub>2</sub> emissions of the existing building.



		User De	staile:						
A N					L				
Assessor Name: Stroma FSAF	2012		Stroma				Maraia	on: 1.0.3.4	
Software Name: Stroma FSAF	-		Softwa .ddress:		SION:		VEISIG	)II. 1.0.3. <del>4</del>	
Address: , london, NW3		perty A	iduless.	Offic 1					
1. Overall dwelling dimensions:	41 0								
		Area	(m²)		Av. Hei	ight(m)		Volume(m³	)
Basement			<u>`</u>	(1a) x		.25	(2a) =	74.25	(3a)
Ground floor		1	19	(1b) x	1.	.65	(2b) =	31.35	(3b)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)$	)+(1e)+(1n)		52	(4)			_		
Dwelling volume				(3a)+(3b	)+(3c)+(3d	)+(3e)+	.(3n) =	105.6	(5)
2. Ventilation rate:									
main heating	secondary heating	•	other		total			m³ per hou	r
Number of chimneys 0	+ 0	+	0	= [	0	X ·	40 =	0	(6a)
Number of open flues 0	+ 0	+	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fans				, <u> </u>	2	x	10 =	20	(7a)
Number of passive vents				Ī	0	X.	10 =	0	(7b)
Number of flueless gas fires				Ī	0	X -	40 =	0	(7c)
									_
							Air Ci	nanges per ho	_
Infiltration due to chimneys, flues and fans				ontinuo fr	20		÷ (5) =	0.19	(8)
Number of storeys in the dwelling (ns)	піспаеа, ргосееа	10 (17), 01	rierwise c	onunue II	om (9) to (	16)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or tir	nber frame or (	).35 for	masonr	y constr	uction	• ,		0	(11)
if both types of wall are present, use the value	corresponding to t								`
deducting areas of openings); if equal user 0.3  If suspended wooden floor, enter 0.2 (u		(sealed	d) else (	enter 0				0	(12)
If no draught lobby, enter 0.05, else ent	ŕ	(000.00	a), 0.00 ·	511101 0				0	(13)
Percentage of windows and doors drau								0	(14)
Window infiltration	9 ٥	O	).25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(	8) + (10) +	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
Air permeability value, q50, expressed i	n cubic metres	per hou	ur per so	uare m	etre of e	nvelope	area	20	(17)
If based on air permeability value, then (18		•	•	•				1.19	(18)
Air permeability value applies if a pressurisation t	est has been done	or a degr	ee air per	meability	is being us	sed			`
Number of sides sheltered								1	(19)
Shelter factor		(	20) = 1 - [	0.075 x (1	19)] =			0.92	(20)
Infiltration rate incorporating shelter factor		(:	21) = (18)	x (20) =				1.1	(21)
Infiltration rate modified for monthly wind	speed								
Jan Feb Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind speed from Table 7	,							_	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

(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 infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
1.4	1.38	1.35	1.21	1.18	1.05	1.05	1.02	1.1	1.18	1.24	1.29	]	
Calculate effect		•	rate for t	he appli	cable ca	ise	!	!	!			,	
If mechanica			andiv N. (2	12h) - (22a	) v Emy (	nguation (f	VEVV othor	nuico (22h	) - (222)			0	(23a
If balanced with									) = (23a)			0	(23b
a) If balance		•	-	_					2h\m + /:	23h) v [	1 (220)	0	(230
(24a)m= 0	0	o 0	0	0	0	0	0	0	0	0	0	]	(24a
b) If balance			<u> </u>	<u> </u>								J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24)
c) If whole h			ļ	ļ	ļ	ventilatio	n from c	L outside		<u> </u>		J	
if (22b)m				•	•				.5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
d) If natural									•	•	•	•	
if (22b)m					· ·	· ·	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 1.4	1.38	1.35	1.21	1.18	1.05	1.05	1.02	1.1	1.18	1.24	1.29		(240
Effective air				i ì		· `		· ·				,	
(25)m= 1.4	1.38	1.35	1.21	1.18	1.05	1.05	1.02	1.1	1.18	1.24	1.29		(25)
3. Heat losses	s and he	at loss r	oaramete	er:									
ELEMENT	Gros		Openin	_	Net Ar		U-valu		AXU		k-value		AXk
Doors Type 1	area	(m²)	m	)²	A ,r	m²	W/m2	.K	(VV/I	()	kJ/m²-	K	kJ/K
Doors Type 2					7.0		4.4		40.00				(26)
Doors Type 2					7.3	X	1.4	= [	10.22				(26)
Windows Type	. 1				4.3	x	1.4	= [	6.02				(26)
Windows Type					4.3	x x1	1.4	0.04] =	6.02 3.1				(26) (27)
Windows Type					4.3 1.6 1.97	x x1 x1	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+	= [ 0.04] = [ 0.04] = [	6.02 3.1 3.82				(26) (27) (27)
Windows Type Floor	2				4.3	x x1 x1	1.4	0.04] =	6.02 3.1				(26) (27) (27) (28)
Windows Type Floor Walls Type1			15.1	7	4.3 1.6 1.97	x x1 x1 x1 x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+	= [ 0.04] = [ 0.04] = [	6.02 3.1 3.82				(26) (27) (27) (28) (29)
Windows Type Floor Walls Type1 Walls Type2	2	=	15.1	7	4.3 1.6 1.97 34.3	x x1 x1 x x1 x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22	0.04] = [ 0.04] = [ 0.04] = [	6.02 3.1 3.82 7.546				(26) (27) (27) (28) (29)
Windows Type Floor Walls Type1 Walls Type2 Roof	29.44.1	1		7	4.3 1.6 1.97 34.3 14.23	x x1 x1 x x1 x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28	= [ 0.04] = [ 0.04] = [ = [ = [	6.02 3.1 3.82 7.546 3.98				(26) (27) (27) (28) (29)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e	29.44.1	1	0	7	4.3 1.6 1.97 34.3 14.23 44.1	x x1 x1 x1 x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28	= [ 0.04] = [ 0.04] = [ = [ = = [	6.02 3.1 3.82 7.546 3.98 12.35				(26) (27) (27) (28) (29) (29) (30)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall	29.4 44.1 19	, m²	0		4.3 1.6 1.97 34.3 14.23 44.1 19 126.8	x x1 x1 x1 x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28 0.28 0.16	= [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	6.02 3.1 3.82 7.546 3.98 12.35 3.04				(26) (27) (27) (28) (29) (29) (30) (31)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e	29.4 44.1 19	, m²	0 0	indow U-va	4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul	x x1 x1 x1 x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28 0.28 0.16	= [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	6.02 3.1 3.82 7.546 3.98 12.35 3.04	s given ir	n paragraph	1 3.2	(26) (27) (27) (28) (29) (29) (30) (31)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and	29.4 44.1 19 elements	, m² ows, use e sides of in	0 0 effective winternal wall	indow U-va	4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul	x x1 x1 x1 x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28 0.28 0.16	= [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [ ] = [	6.02 3.1 3.82 7.546 3.98 12.35 3.04	as given ir	ı paragraph	1 3.2 50.07	(26) (27) (27) (28) (29) (29) (30) (31)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area	29.4 44.1 19 llements, roof windows on both as, W/K =	, m²  ows, use e sides of in = S (A x	0 0 effective winternal wall	indow U-va	4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul	x x1 x1 x1 x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+		6.02 3.1 3.82 7.546 3.98 12.35 3.04				(26) (27) (27) (28) (29) (30) (31) (32)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	29.4 44.1 19 Ilements, roof windows on both as, W/K = Cm = S(	, m²  ows, use e sides of in = S (A x A x k)	0 0 effective winternal walk	indow U-va	4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculatitions	x x1 x1 x1 x x1 x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+		6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] a	2) + (32a)		50.07	(26) (27) (27) (28) (29) (30) (31) (32)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	29.4 44.1 19 Ilements, roof windown so on both ss, W/K = Cm = S( parame sments who	, m²  bws, use e sides of in = S (A x A x k)  ter (TMF ere the decomposition)	0 0 offective with ternal walk U) $P = Cm \div tails of the$	indow U-va Is and pan	4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculatitions	x x x1 x1 x x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ /[1/( 2.1 )+	= [ 0.04] = [ 0.04] = [	6.02 3.1 3.82 7.546 3.98 12.35 3.04  0 ue)+0.04] a	2) + (32a) : High	(32e) =	50.07	(26) (27) (27) (28) (29) (30) (31) (32) (33) (34)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass	29.4 44.1 19 llements, roof windo as on both as, W/K = Cm = S( parame and of a det	ows, use e sides of in = S (A x A x k ) ter (TMF ere the dec	o o o o o o o o o o o o o o o o o o o	indow U-valls and part	4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculatitions	x x1 x1 x1 x x x x x x x x x x x x x x	1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ /[1/( 2.1 )+	= [ 0.04] = [ 0.04] = [	6.02 3.1 3.82 7.546 3.98 12.35 3.04  0 ue)+0.04] a	2) + (32a) : High	(32e) =	50.07	(26) (27) (27) (28) (29) (29) (30) (31) (32) (33) (34) (35)

if details of therma	0 0	are not kn	own (36) =	= 0.15 x (3	1)								_
Total fabric he								` '	(36) =	(a-) (-)		70.07	(37)
Ventilation hea		1	· ·	<u> </u>	I .	Ι	I .	<del>` ` ´</del>	·	(25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 48.88	47.92	46.97	42.17	41.21	36.42	36.42	35.46	38.34	41.21	43.13	45.05		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (	38)m		-	
(39)m= 118.96	118	117.04	112.25	111.29	106.5	106.5	105.54	108.41	111.29	113.21	115.12		_
Haatlaaa saas	1 /1	II D) \ \	/ 21 <i>C</i>						_	Sum(39) <sub>1</sub>	12 /12=	112.01	(39)
Heat loss para	<del></del>	<del></del>	r —	0.44	0.05	1 0.05	0.00	·	= (39)m ÷	r –	L 0.04	1	
(40)m= 2.29	2.27	2.25	2.16	2.14	2.05	2.05	2.03	2.08	2.14	2.18	2.21	2.15	(40)
Number of day	s in mo	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub>	12 /12=	2.15	(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	ting ene	rgy requi	irement:								kWh/ye	ear:	
Accumed coo	in an air	N I										1	(40)
Assumed occu if TFA > 13.9			:[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)1 + 0.0	0013 x ( <sup>-</sup>	TFA -13.		.75		(42)
if TFA £ 13.9			i oxb	( 0.0000	/ 10 X (11	7. 10.0	/2/]	00.07(		,			
Annual averag											5.74		(43)
Redu <mark>ce the</mark> annuanot more that 125	\					-	to achieve	a water us	se target o	f			
								-				1	
Jan Hot water usage i	Feb	Mar r day for or	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
							· /					1	
(44)m= 83.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		<b>—</b> (44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		908.89	(44)
(45)m= 123.55	108.06	111.51	97.22	93.28	80.49	74.59	85.59	86.62	100.94	110.19	119.65		
	I		I				I		Total = Su	m(45) <sub>112</sub> =	=	1191.69	(45)
If instantaneous v	/ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					_
(46)m= 18.53	16.21	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(46)
Water storage			-					-			-	1	
Storage volum	, ,		•			_		ame ves	sel		160		(47)
If community h	•			•			` '		(01 : - /	(47)			
Otherwise if no Water storage		not wate	er (this ir	iciudes i	nstantar	neous co	mbi boli	ers) ente	er o in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day).					0	]	(48)
Temperature f				51 10 INITO	(	"aay).							(49)
Energy lost fro				oor			(49) v (40)	\ _			0	]	
b) If manufact		_	-		or is not		(48) x (49)	, =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	-											_	•
Volume factor										1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m water	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or	(54) in (5	55)								1.	.03		(55)

Water storage loss ca	lculated t	for each	month			((56)m = (	55) × (41)ı	m				
(56)m= 32.01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dedicate	ed solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit loss (a	nnual) fro	om Table	e 3							0		(58)
Primary circuit loss ca	lculated	for each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by factor	from Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss 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 fo	r water h	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 178.83 157.99	166.79	150.71	148.56	133.99	129.87	140.87	140.11	156.22	163.68	174.93		(62)
Solar DHW input calculated	l using App	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 V	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water hea	ater			-	-				-	-		
(64)m= 178.83 157.99	166.79	150.71	148.56	133.99	129.87	140.87	140.11	156.22	163.68	174.93		
	•					Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	1842.53	(64)
Heat gains from wate	heating,	kWh/mo	onth 0.2	5 [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	]	
(65)m= 59.69 52.74	55.69	50.33	49.63	44.77	43.41	47.07	46.81	52.17	EAGE	58.4		(65)
(***)	00.00	00.00	75.05	77.11	43.4	47.07	40.01	32.17	54.65	36.4		(00)
include (57)m in ca				_							eating	(55)
` '	culation	of (65)m	only if c	_							eating	(00)
include (57)m in ca 5. Internal gains (se	culation e Table 5	of (65)m	only if c	_							eating	(30)
include (57)m in ca	culation e Table 5	of (65)m	only if c	_							eating	(66)
include (57)m in ca 5. Internal gains (se Metabolic gains (Tabl	culation e Table 5 e 5), Wat	of (65)m and 5a	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
include (57)m in ca 5. Internal gains (se  Metabolic gains (Tabl  Jan Feb	culation e Table 5 e 5), Wat Mar 87.45	of (65)m 5 and 5a ts Apr 87.45	only if colors:  May 87.45	Jun 87.45	Jul 87.45	Aug 87.45	Sep 87.45	ater is fr	om com	munity h	eating	
include (57)m in ca  5. Internal gains (se  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45	culation e Table 5 e 5), Wat Mar 87.45	of (65)m 5 and 5a ts Apr 87.45	only if colors:  May 87.45	Jun 87.45	Jul 87.45	Aug 87.45	Sep 87.45	ater is fr	om com	munity h	eating	
include (57)m in ca  5. Internal gains (se  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated)	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap	of (65)m 6 and 5a tts Apr 87.45 ppendix 15.49	only if control is the second of the second	Jun 87.45 ion L9 of	Jul 87.45 r L9a), a	Aug 87.45 Iso see	Sep 87.45 Table 5	Oct 87.45	Nov 87.45	Dec 87.45	eating	(66)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated)  (67)m= 28.32 25.16	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap	of (65)m 6 and 5a tts Apr 87.45 ppendix 15.49	only if control is the second of the second	Jun 87.45 ion L9 of	Jul 87.45 r L9a), a	Aug 87.45 Iso see	Sep 87.45 Table 5	Oct 87.45	Nov 87.45	Dec 87.45	eating	(66)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated) (67)m= 28.32 25.16  Appliances gains (calculated)	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02	of (65)m 5 and 5a ts Apr 87.45 opendix 15.49 Appendix 141.54	May 87.45 L, equati 11.58 dix L, eq	Jun 87.45 ion L9 o 9.77 uation L	Jul 87.45 r L9a), a 10.56 13 or L1 114.03	Aug 87.45 Iso see 13.73 3a), also	Sep 87.45 Table 5 18.43 see Tal 116.44	Oct 87.45  23.4 ble 5 124.92	Nov 87.45	Dec 87.45	eating	(66) (67)
include (57)m in ca  5. Internal gains (se  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated) (67)m= 28.32 25.16  Appliances gains (calculated) (68)m= 152.43 154.01	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02	of (65)m 5 and 5a ts Apr 87.45 opendix 15.49 Appendix 141.54	May 87.45 L, equati 11.58 dix L, eq	Jun 87.45 ion L9 o 9.77 uation L	Jul 87.45 r L9a), a 10.56 13 or L1 114.03	Aug 87.45 Iso see 13.73 3a), also	Sep 87.45 Table 5 18.43 see Tal 116.44	Oct 87.45  23.4 ble 5 124.92	Nov 87.45	Dec 87.45	eating	(66) (67)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated (67)m= 28.32 25.16  Appliances gains (calculated (68)m= 152.43 154.01  Cooking gains (calculated (57)m= 28.32 25.16	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated in 150.02 ated in A 31.75	of (65)m 5 and 5a ts Apr 87.45 ppendix 15.49 Appendix 141.54 ppendix 31.75	May 87.45 L, equati 11.58 dix L, eq 130.83 L, equat	Jun 87.45 ion L9 of 9.77 uation L 120.76	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a)	Aug 87.45 Iso see 13.73 3a), also 112.45	Sep 87.45 Table 5 18.43 See Tal 116.44 ee Table	Oct 87.45  23.4 ble 5 124.92	Nov 87.45 27.31	Dec 87.45	eating	(66) (67) (68)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated (67)m= 28.32 25.16  Appliances gains (calculated (68)m= 152.43 154.01  Cooking gains (calculated (69)m= 31.75 31.75	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75	of (65)m 5 and 5a ts Apr 87.45 ppendix 15.49 Appendix 141.54 ppendix 31.75	May 87.45 L, equati 11.58 dix L, eq 130.83 L, equat	Jun 87.45 ion L9 of 9.77 uation L 120.76	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a)	Aug 87.45 Iso see 13.73 3a), also 112.45	Sep 87.45 Table 5 18.43 See Tal 116.44 ee Table	Oct 87.45  23.4 ble 5 124.92	Nov 87.45 27.31	Dec 87.45	eating	(66) (67) (68)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated (67)m= 28.32 25.16  Appliances gains (calculated (68)m= 152.43 154.01  Cooking gains (calculated (69)m= 31.75 31.75  Pumps and fans gains (70)m= 0 0	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75 c (Table 5	of (65)m 5 and 5a ts Apr 87.45 opendix 15.49 n Append 141.54 oppendix 31.75 5a)	only if control of the control of th	Jun 87.45 ion L9 of 9.77 uation L 120.76 ion L15 31.75	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a) 31.75	Aug 87.45 Iso see 13.73 3a), also 112.45 , also se 31.75	Sep 87.45 Table 5 18.43 see Tal 116.44 ee Table 31.75	Oct 87.45  23.4 ble 5 124.92 5 31.75	Nov 87.45 27.31 135.63	Dec 87.45 29.11 145.7	eating	(66) (67) (68) (69)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated) (67)m= 28.32 25.16  Appliances gains (calculated) (68)m= 152.43 154.01  Cooking gains (calculated) (69)m= 31.75 31.75  Pumps and fans gains	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75 c (Table 5	of (65)m 5 and 5a ts Apr 87.45 opendix 15.49 n Append 141.54 oppendix 31.75 5a)	only if control of the control of th	Jun 87.45 ion L9 of 9.77 uation L 120.76 ion L15 31.75	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a) 31.75	Aug 87.45 Iso see 13.73 3a), also 112.45 , also se 31.75	Sep 87.45 Table 5 18.43 see Tal 116.44 ee Table 31.75	Oct 87.45  23.4 ble 5 124.92 5 31.75	Nov 87.45 27.31 135.63	Dec 87.45 29.11 145.7	eating	(66) (67) (68) (69)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl    Jan   Feb     (66)m=   87.45   87.45     Lighting gains (calculated)   (67)m=   28.32   25.16     Appliances gains (calculated)   (68)m=   152.43   154.01     Cooking gains (calculated)   (69)m=   31.75   31.75     Pumps and fans gains (70)m=   0   0     Losses e.g. evaporatiated   (71)m=   -69.96   -69.96   -69.96	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75 s (Table 5 0 on (nega	of (65)m 5 and 5a ts Apr 87.45 Dependix 15.49 Append 141.54 Dependix 31.75 5a) 0 tive valu	May 87.45 L, equati 11.58 dix L, equati 130.83 L, equati 31.75	Jun 87.45 ion L9 of 9.77 uation L 120.76 ion L15 31.75	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a) 31.75	Aug 87.45 Iso see 13.73 3a), also 112.45 o, also se 31.75	Sep 87.45 Table 5 18.43 o see Tal 116.44 ee Table 31.75	Oct 87.45  23.4 ble 5 124.92 5 31.75	Nov 87.45 27.31 135.63	Dec 87.45  29.11  145.7	eating	(66) (67) (68) (69) (70)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calculated) (67)m= 28.32 25.16  Appliances gains (calculated) (68)m= 152.43 154.01  Cooking gains (calculated) (69)m= 31.75 31.75  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporati	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75 s (Table 5 0 on (nega	of (65)m 5 and 5a ts Apr 87.45 Dependix 15.49 Append 141.54 Dependix 31.75 5a) 0 tive valu	May 87.45 L, equati 11.58 dix L, equati 130.83 L, equati 31.75	Jun 87.45 ion L9 of 9.77 uation L 120.76 ion L15 31.75	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a) 31.75	Aug 87.45 Iso see 13.73 3a), also 112.45 o, also se 31.75	Sep 87.45 Table 5 18.43 o see Tal 116.44 ee Table 31.75	Oct 87.45  23.4 ble 5 124.92 5 31.75	Nov 87.45 27.31 135.63	Dec 87.45  29.11  145.7	eating	(66) (67) (68) (69) (70)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl  Jan Feb  (66)m= 87.45 87.45  Lighting gains (calcula (67)m= 28.32 25.16  Appliances gains (calcula (68)m= 152.43 154.01  Cooking gains (calcula (69)m= 31.75 31.75  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporati (71)m= -69.96 -69.96  Water heating gains (	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75 c (Table 5 0 on (nega -69.96 Table 5) 74.85	of (65)m 5 and 5a ts Apr 87.45 ppendix 15.49 Appendix 31.75 5a) 0 tive valu -69.96	only if construction of the construction of th	Jun 87.45 ion L9 of 9.77 uation L 120.76 ion L15 31.75 0 ole 5) -69.96	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a) 31.75	Aug 87.45 Iso see 13.73 3a), also 112.45 o, also se 31.75	Sep 87.45 Table 5 18.43 0 see Tal 116.44 ee Table 31.75	Oct 87.45  23.4 ble 5 124.92 5 31.75  0  -69.96	Nov 87.45 27.31 135.63 31.75 0	Dec 87.45  29.11  145.7  31.75  0  -69.96	eating	(66) (67) (68) (69) (70)
include (57)m in ca  5. Internal gains (see  Metabolic gains (Tabl    Jan   Feb     (66)m=   87.45   87.45     Lighting gains (calculated)   (67)m=   28.32   25.16     Appliances gains (calculated)   (68)m=   152.43   154.01     Cooking gains (calculated)   (69)m=   31.75   31.75     Pumps and fans gains (70)m=   0   0     Losses e.g. evaporation (71)m=   -69.96   -69.96     Water heating gains (72)m=   80.23   78.48	culation e Table 5 e 5), Wat Mar 87.45 ated in Ap 20.46 culated ir 150.02 ated in A 31.75 c (Table 5 0 on (nega -69.96 Table 5) 74.85	of (65)m 5 and 5a ts Apr 87.45 ppendix 15.49 Appendix 31.75 5a) 0 tive valu -69.96	only if construction of the construction of th	Jun 87.45 ion L9 of 9.77 uation L 120.76 ion L15 31.75 0 ole 5) -69.96	Jul 87.45 r L9a), a 10.56 13 or L1 114.03 or L15a) 31.75	Aug 87.45 Iso see 13.73 3a), also 112.45 o, also se 31.75	Sep 87.45 Table 5 18.43 o see Tal 116.44 ee Table 31.75 0	Oct 87.45  23.4 ble 5 124.92 5 31.75  0  -69.96	Nov 87.45 27.31 135.63 31.75 0	Dec 87.45  29.11  145.7  31.75  0  -69.96	eating	(66) (67) (68) (69) (70)

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

Orienta	ation:	Access Fa Table 6d	actor		Area m²			Flu Tal	x ole 6a		Т	g_ able 6b		Т	FF able 6c			Gains (W)	
North	0.9x	0.77		X	1.9	7	X	1	0.63	X		0.76	x		0.7		=	7.72	(74)
North	0.9x	0.77		x	1.9	7	X	2	0.32	×		0.76	X		0.7		=	14.76	(74)
North	0.9x	0.77		x	1.9	7	X	3	4.53	x		0.76	X		0.7		= [	25.08	(74)
North	0.9x	0.77		x	1.9	7	X	5	5.46	X		0.76	X		0.7		= [	40.28	(74)
North	0.9x	0.77		X	1.9	7	X	7	4.72	X		0.76	X		0.7		=	54.27	(74)
North	0.9x	0.77		x	1.9	7	X	7	9.99	X		0.76	X		0.7		=	58.09	(74)
North	0.9x	0.77		X	1.9	7	X	7	4.68	X		0.76	X		0.7		=	54.24	(74)
North	0.9x	0.77		x	1.9	7	X	5	9.25	X		0.76	X		0.7		=	43.03	(74)
North	0.9x	0.77		x	1.9	7	X	4	1.52	X		0.76	X		0.7		= [	30.15	(74)
North	0.9x	0.77		x	1.9	7	x	2	4.19	x		0.76	X		0.7		= [	17.57	(74)
North	0.9x	0.77		x	1.9	7	x	1	3.12	x		0.76	X		0.7		= [	9.53	(74)
North	0.9x	0.77		x	1.9	7	X	8	3.86	x		0.76	X		0.7		=	6.44	(74)
South	0.9x	0.77		x	1.0	6	X	4	6.75	x		0.76	X		0.7		= [	27.58	(78)
South	0.9x	0.77		x	1.6	3	X	7	6.57	×		0.76	X		0.7		=	45.17	(78)
South	0.9x	0.77		x	1.0	3	X	9	7.53	×		0.76	X		0.7		=	57.53	(78)
South	0.9x	0.77		X	1.6	6	X	1	10.23	X		0.76	X		0.7		=	65.03	(78)
South	0.9x	0.77		x	1.0	5	х	1	14.87	x		0.76	X		0.7			67.76	(78)
South	0.9x	0.77		x	1.6	3	х	1	10.55	×		0.76	X	Ī	0.7		=	65.21	(78)
South	0.9x	0.77		x	1.6	3	x	10	08.01	x		0.76	X	Ē	0.7		=	63.71	(78)
South	0.9x	0.77		x	1.6	3	x	10	04.89	×		0.76	х	Ī	0.7		= [	61.88	(78)
South	0.9x	0.77		x	1.6	5	X	10	01.89	×		0.76	X	Ē	0.7		= [	60.1	(78)
South	0.9x	0.77		x	1.6	6	Х	8	2.59	x		0.76	X	Ē	0.7		= [	48.72	(78)
South	0.9x	0.77		x	1.6	6	x	5	5.42	X		0.76	X		0.7		=	32.69	(78)
South	0.9x	0.77		x	1.6	6	x		10.4	x		0.76	X	Ī	0.7		= [	23.83	(78)
										_			_				-		
Solar g (83)m=	ains ir 35.3	watts, ca	lculat 82.6	$\overline{}$	105.31	122.03	$\neg$	123.3	117.95	<del>–</del>	n = S 4.91	um(74)m 90.25	(82)r 66.2		42.22	30.	27		(83)
		internal a								10.	+.51	90.23	00.2	.0	42.22	50.	21		(00)
(84)m=	345.52		377.1	_	381.48	380.37	<del></del>	65.26	350.13	34	3.59	339.37	333.	96	330.29	332	2.8		(84)
7 Ma				_	booting	20000	n)												
		ernal temp						area f	rom Tak	عاد	) Th	1 (°C)					ı	21	(85)
-		ctor for ga	_	•			_			010	, III	1 ( 0)					l	21	(00)
	Jan	Feb	Ma	$\neg$	Apr	May	Ť	Jun	Jul		ug	Sep	Od	<u>-</u>	Nov		ес		
(86)m=	1	1	1	┪	1	1	+	0.98	0.93		94	0.99	1		1		-		(86)
	intorn	ol tompore		 ::						_		<u> </u>			<u>[</u>				, ,
(87)m=	19.39	al tempera 19.49	19.7	$\overline{}$	20.03	20.35		20.67	20.86	1	.84	20.59	20.1	8	19.77	19.	42		(87)
Temp	eratur	e during h	eating		eriods ir	rest o	of dv	vellina	from Ta	able	9. TI	h2 (°C)			!!				
(88)m=	19.86	19.87	19.87	<del>_</del>	19.92	19.93	_	19.98	19.98	1	.99	19.96	19.9	93	19.91	19.	89		(88)
ا وeiliti ا	ition fa	ctor for ga	ains fo	or r	est of d	velling	h2	m (se	e Tahle	(9a)					,				
(89)m=	1	1 1	1	<u> </u>	1	0.99	$\neg$	0.96	0.85	T .	87	0.98	1		1	1			(89)
` '		1 1						-											•

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 18.38 18.49 18.7 19.07 19.39 19.75 19.91 19.91 19.65 19.23 18.8 18.44	(90)
$fLA = Living area \div (4) =$	0.66 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 19.04 19.15 19.36 19.7 20.02 20.36 20.54 20.52 20.27 19.86 19.44 19.08	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_
(93)m= 19.04 19.15 19.36 19.7 20.02 20.36 20.54 20.52 20.27 19.86 19.44 19.08	(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-cal	culate
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7
Utilisation factor for gains, hm:	_
(94)m= 1 1 1 1 0.99 0.97 0.9 0.92 0.98 1 1 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	_
(95)m= 345.37 366.57 376.76 380.53 377.47 354.11 315.25 315.19 333.63 333.05 330.05 332.69	(95)
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]	7 (07)
(97)m= 1754.01 1681.57 1505.17 1212.46 926.12 613.51 419.07 434.87 668.86 1029.99 1396.61 1713.31	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m = 1048.03 883.68 839.54 598.99 408.19 0 0 0 518.52 767.92 1027.18	7
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	
Space heating requirement in kWh/m²/year	117.15 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0 (301)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =	1 (302)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	1 (302)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;	1 (302)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	1 (302)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers	1 (302) the latter
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  (302) x (303a) =	1 (302) the latter  1 (303a) 1 (304a)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from community system $1 - (301) = $ The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system	1 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community heating system	1 (302)  the latter  1 (303a  1 (304a  1.05 (305)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  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 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)  kWh/year
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  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 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)  kWh/year  6092.05
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  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) x (304a) x (305) x (306) =	1 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)  kWh/year  6092.05  7036.32 (307a
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =	1 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)  kWh/year  6092.05  7036.32 (307a  0 (308)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	1 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)  kWh/year  6092.05  7036.32 (307a  0 (308)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  Water heating	1 (302)  the latter  1 (303a  1 (304a  1.05 (305)  1.1 (306)  kWh/year  6092.05  7036.32 (307a  0 (308)  0 (309)

				_
Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2128.12	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	91.64	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	$=(107) \div (314)$	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	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)			500.21	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
	•	•		
	two fuels repeat (363) to	, ,		(367a)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(307b)+(3)	310b)] x 100 ÷ (367b) x	0 :	3045.42	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(307b)+(3)  Electrical energy for heat distribution	310b)] x 100 ÷ (367b) x	0 : 0.52	3045.42	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  (307b)+(3	310b)] x 100 ÷ (367b) x	0 : 0.52	3045.42	(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)  (307b)+(307	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373	0 0.52	3045.42	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  (307b)+(3	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373	0 : 0.52 : 0	= 3045.42 = 47.56 = 3092.98	(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)  CO2 associated with water from immersion heater or instantance	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373	0 0.52	= 3045.42 = 47.56 = 3092.98 = 0	(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 instantaneously	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373309) x bus heater (312) x 373) + (374) + (375) =	0 0.52	= 3045.42 = 47.56 = 3092.98 = 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 instantaneous total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dwelling	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373309) x bus heater (312) x 373) + (374) + (375) =	0 0.52 0.52 0.52	= 3045.42 = 47.56 = 3092.98 = 0 = 0	(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 instantaneous control co2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dwelling	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373309) x 309) x 373) + (374) + (375) = 373 (331)) x	0 0.52 0.52 0.52	3045.42 = 47.56 = 3092.98 = 0 3092.98 = 0	(367) (372) (373) (374) (375) (376) (378)
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 instantaneous control CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dwelling  CO2 associated with electricity for lighting  (3)	310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(373309) x 309) x 373) + (374) + (375) = 373 (331)) x	0 0.52 0.52 0.52	3045.42 = 47.56 = 3092.98 = 0 3092.98 = 0 = 259.61	(367) (372) (373) (374) (375) (376) (378) (379)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20		roperty	Stroma Softwa Address:	are Ve			Versic	on: 1.0.3.4	
Address :	, London		roperty i	Address	Offit 2					
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	-	Volume(m <sup>3</sup>	*)
Basement				55	(1a) x	2	.17	(2a) =	119.35	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1n	1)	55	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	119.35	(5)
2. Ventilation rate:		_								
		secondar heating	у 	other		total			m³ per hou	r 
Number of chimneys	0 +	0	_ +	0	] = <u>L</u>	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins					2	<b>X</b> '	10 =	20	(7a)
Number of passive vents	3				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	ires				Ē	0	X 4	40 =	0	(7c)
								Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	7c) =		20		÷ (5) =	0.17	(8)
If a pressurisation test has b		ded, proceed	d to (17), o	otherwise o	ontinue fr	rom (9) to (	(16)			7.00
Number of storeys in the Additional infiltration	ne dweiling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel or timber	frame or	0.35 for	r masonr	y constr	ruction	1(0)	.,,	0	(11)
	resent, use the value corre	sponding to	the great	ter wall are	a (after					
deducting areas of openial lf suspended wooden to		aled) or 0	1 (spale	معام (امد	enter ()					(12)
If no draught lobby, en		aled) of o.	i (Scale	ou), else	enter o				0	(13)
Percentage of window		stripped							0	(14)
Window infiltration	· ·			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	20	(17)
If based on air permeabil	•								1.17	(18)
Air permeability value applie Number of sides sheltere		as been don	e or a deg	gree air pe	meability	is being u	sed			(19)
Shelter factor	su .			(20) = 1 -	0.0 <b>75</b> x (1	19)] =			0.85	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.99	(21)
Infiltration rate modified f	or monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2\m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
` '		1						<u> </u>	J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		_		-	
1.27	1.24	1.22	1.09	1.07	0.94	0.94	0.92	0.99	1.07	1.12	1.17		
Calculate effe If mechanic		•	rate for t	пе арріі	cable ca	ise						0	(2:
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(2:
If balanced with									, , ,			0	(2:
a) If balance	ed mech	anical ve	entilation	with he	at recov	erv (MVI	HR) (24a	a)m = (2:	2b)m + (	23b) <b>x</b> [	1 – (23c)		(_
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	иV) (24k	m = (22)	2b)m + (	23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
c) If whole h				•					.5 × (23b	) )	•	•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
d) If natural if (22b)r				•	•				0.5]	<u> </u>		J	
24d)m= 1.27	1.24	1.22	1.09	1.07	0.94	0.94	0.92	0.99	1.07	1.12	1.17	]	(2
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)	•	!	•	•	
25)m= 1.27	1.24	1.22	1.09	1.07	0.94	0.94	0.92	0.99	1.07	1.12	1.17		(2
3. Heat losse	s and he	at loss i	naramet	or.									
LEMENT	Gros		Openin		Net Ar	rea	U-val	ue	AXU		k-value	e	ΑΧk
	area		m		i, A		W/m <sup>2</sup>		(W/I	K)	kJ/m <sup>2</sup> ·		kJ/K
)oo <mark>rs</mark>					1.9	Х	1.4	=	2.66				(2
Vin <mark>dows</mark> Type	1				9.03	x1.	/[1/( 1.6 )+	0.04] =	13.58				(2
Vin <mark>dows Type</mark>	2				1.82	x1	/[1/( 4.8 )+	0.04] =	7.33				(2
Vindows Type	3	'			0.87	x1,	/[1/( 4.8 )+	0.04] =	3.5	7			(2
loor					55	X	0.93	=	51.15	<b>=</b> [			(2
/alls Type1	28.	9	10.8	5	18.05	5 X	2.1	<del>-</del>	37.9	F i		<b>7</b> 7	(2
/alls Type2	7.8	1	2.77		5.04	_	2.1	<u> </u>	10.58	F i		7 F	(2
otal area of e	lements	, m²			91.7								(3
arty wall					27.9	X	0		0				(3
arty wall					1.13	X	0	=	0	≓ i		<b>=</b>   =	(3
for windows and	roof wind	ows, use e	effective wi	ndow U-va				 !/[(1/U-valu		as given in	paragrapl	 h	`
* include the area	as on both	sides of in	nternal wal	ls and par	titions								
abric heat los	ss, W/K :	= S (A x	U)				(26)(30	) + (32) =				126.	71 (3
leat capacity		,						((28).	(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass	•	•		•					tive Value	· ·		450	(3
or design assess an be used inste 	ad of a de	tailed calc	ulation.			•	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	•	,		• .	•	K						14.4	4 (3
details of therma otal fabric he		are not kn	own (36) =	= 0.15 x (3	31)			(33) 1	· (36) =				14 /2
entilation hea		alaulataa	المعمدال							[25)m x (5)		141.	11 (3
antilation por											1		

(00)	10.00	17.00	40	40.00	07.0	07.0	00.00	00.00	40.00	40.07	45.00		(20)
(38)m= 49.84	48.86	47.88	43	42.02	37.2	37.2	36.29	39.09	42.02	43.97	45.93		(38)
Heat transfer (39)m= 190.95	189.97	nt, W/K 188.99	184.11	183.13	178.31	178.31	177.4	(39)m 180.2	= (37) + (3 183.13	38)m 185.08	187.04		
(39)11= 190.95	169.97	100.99	104.11	103.13	170.31	170.31	177.4			Sum(39) <sub>1</sub>		183.88	(39)
Heat loss para	meter (I	HLP), W/	m²K			_	_		= (39)m ÷		12 / 12-	100.00	((3.3)
(40)m= 3.47	3.45	3.44	3.35	3.33	3.24	3.24	3.23	3.28	3.33	3.37	3.4		_
Number of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	3.34	(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	ar:	
Assumed occu	inancv	N									0.4		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (T	ΓFA -13.		84		(42)
Annual averag	je hot wa										'.84		(43)
Reduce the annua	_				_	_	to achieve	a water us	e target o	f			
Jan	Feb	Mar	Apr	Mav	Jun	Jul /	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								Sep	Oct	INOV	Dec		
(44)m= 85.62	82.51	79.39	76.28	73.17	70.05	70.05	73.17	76.28	79.39	82.51	85.62		
									Γotal = Su	m(44) <sub>112</sub> =		934.05	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 126.97	111.05	114.6	99.91	95.86	82.72	76.65	87.96	89.01	103.74	113.24	122.97		<b></b>
If instantaneous w	/ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) <sub>112</sub> =	= [	1224.68	(45)
(46)m= 19.05	16.66	17.19	14.99	14.38	12.41	11.5	13.19	13.35	15.56	16.99	18.45		(46)
Water storage	loss:						l						
Storage volum	` '					•		ame ves	sel		160		(47)
If community hours of therwise if no	_			_			, ,	ars) ante	ar '∩' in <i>(</i>	<b>17</b> )			
Water storage		not wate	i (uno n	iciuues i	iistaiitai	ieous co	THOI DOIL	ers) erite	, O III (	77)			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	=		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-							0	02		(51)
If community h	-			0 2 (	1,11110,00	•97				0.	.02		(01)
Volume factor										1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		03		(54)
Enter (50) or (	` , , `	•	or oook	month			((EG)~ '	FF) (44\-	<b>~</b>	1.	.03		(55)
Water storage					00.00		((56)m = (				00.04		(FC)
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01 d solar sto	30.98 rage. (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 m Appendi	x H	(56)
						1		30.98		1		-	(57)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(31)

Primary circuit loss (annual) from Table 3	0 (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 the	rmostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 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 = $0.85 \times (45)$ n	n + (46)m + (57)m + (59)m + (61)m
(62)m= 182.25 160.98 169.87 153.4 151.14 136.22 131.93 143.24 142.51 159	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar cont	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	,
	0 0 (63)
Output from water heater	
(64)m= 182.25 160.98 169.87 153.4 151.14 136.22 131.93 143.24 142.51 159	.01 166.73 178.24
Output from water h	<del></del>
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 × (45)m + (61)m] + 0.8 x [(46)m]	
	<del></del>
	, ,
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	
	oct Nov Dec
(66)m= 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87	87 91.87 91.87 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 24.29 21.57 17.54 13.28 9.93 8.38 9.06 11.77 15.8 20.	06 23.42 24.96 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	5
(68)m= 160.19 161.85 157.66 148.74 137.49 126.91 119.84 118.18 122.36 131	.28 142.54 153.12 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 32.19 32.19 32.19 32.19 32.19 32.19 32.19 32.19 32.19 32.19 32.19	19 32.19 32.19 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -73.49 -7	.49 -73.49 -73.49 (71)
Water heating gains (Table 5)	
(72)m= 81.76 79.96 76.23 71.15 67.86 63.22 59.27 64.32 66.12 71.	37 77.31 79.97 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m$	
(73)m= 316.79 313.94 301.99 283.74 265.83 249.06 238.73 244.83 254.85 273	
6. Solar gains:	293.02 300.01
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the app	olicable orientation
	FF Gains
Orientation: Access Factor Area Flux g_ Table 6d m² Table 6a Table 6b	Table 6c (W)
North 0.9x 0.77 x 1.82 x 10.63 x 0.85	
1.02 × 10.00 × 0.00	
North 0.9x 0.77 x 0.87 x 10.63 x 0.85	0.7 = 3.81 (74)

	7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)												
(84)m=	484.23	591.39	665	712.24 731.		05.81 681.14	659	.76 640.09	575.05	492.86	452.93		(84)
Total g	ains – ir	nternal and	d solar	(84)m = $(73)$	m + (	83)m , watts							
(83)m=	167.44	277.44	363	428.51 465.		56.75 442.42	414	<u> </u>	301.77	199.04	144.32	]	(83)
Solar	aine in v	watte calc	المهدان	for each mor	nth		(83)m	ı = Sum(74)m .	(82\m				
South	0.9x	0.77	X	9.03	X	40.4	X	0.76	х	0.7	=	134.49	(78)
South	0.9x	0.77	X	9.03	X	55.42	X	0.76	x [	0.7	=	184.49	(78)
South	0.9x	0.77	X	9.03	X	82.59	X	0.76	x [	0.7	=	274.94	(78)
South	0.9x	0.77	x	9.03	X	101.89	x	0.76	x [	0.7	=	339.19	(78)
South	0.9x	0.77	x	9.03	X	104.89	x	0.76	x [	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.03	X	108.01	X	0.76	×	0.7	=	359.59	(78)
South	0.9x	0.77	×	9.03	X	110.55	] x	0.76	x [	0.7	= =	368.03	(78)
South	0.9x	0.77	= ^	9.03	] ^ ] x	114.87	]	0.76	^ L x [	0.7	_ =	382.42	(78)
South	0.9x 0.9x	0.77	^   x	9.03	」 ^ □ x	110.23	」 ^ ] x	0.76	^ [ 	0.7	╡ -	366.99	(78)
South	0.9x	0.77		9.03	X x	76.57 97.53	」× ]x	0.76	x [	0.7	=	2 <mark>54.91</mark> 324.7	(78)
South	0.9x 0.9x	0.77	X	9.03	X X	46.75	」× ]x	0.76	× [	0.7	=	155.64	(78)
South	0.9x	0.77	→ ×	0.87	] ×	8.86	] X ] v	0.85	× [	0.7	_ =	3.18	(74)
North	0.9x	0.77	■ ×	1.82	X	8.86	] X	0.85	× [	0.7	_ =	6.65	= $(74)$ $(74)$
North North	0.9x	0.77	X X	0.87	] x	13.12	]	0.85	x [	0.7	=	4.71	(74)
North	0.9x	0.77	H X	1.82	X	13.12	] x	0.85	x [	0.7	=	9.84	= $(74)$
North	0.9x	0.77	×	0.87	X	24.19	X	0.85	X	0.7		8.68	(74)
North	0.9x	0.77	×	1.82	X	24.19	X	0.85	x	0.7	=	18.15	(74)
North	0.9x	0.77	X	0.87	X	41.52	X	0.85	x [	0.7	=	14.89	(74)
North	0.9x	0.77	X	1.82	X	41.52	X	0.85	x	0.7	=	31.16	(74)
North	0.9x	0.77	X	0.87	X	59.25	X	0.85	x [	0.7	=	21.25	(74)
North	0.9x	0.77	X	1.82	X	59.25	X	0.85	x	0.7	=	44.46	(74)
North	0.9x	0.77	X	0.87	X	74.68	X	0.85	x [	0.7	=	26.79	(74)
North	0.9x	0.77	x	1.82	j x	74.68	j×	0.85	x [	0.7		56.04	(74)
North	0.9x	0.77	x	0.87	X	79.99	X	0.85	×	0.7	=	28.69	(74)
North	0.9x	0.77	x	1.82	d x	79.99	X	0.85	x [	0.7	=	60.02	(74)
North	0.9x	0.77	x	0.87	] x	74.72	X	0.85	x [	0.7	= =	26.8	(74)
North	0.9x	0.77	x	1.82	X	74.72	X	0.85	x [	0.7		56.07	(74)
North	0.9x	0.77	x	0.87	X	55.46	X	0.85	x [	0.7	╡ =	19.9	(74)
North	0.9x	0.77	x	1.82	X	55.46	X	0.85	_ x	0.7		41.62	(74)
North	0.9x	0.77	×	0.87	] x	34.53	] x	0.85	x [	0.7	<del>-</del>	12.39	(74)
North	0.9x	0.77	×	1.82	]	34.53	]	0.85	^ L x [	0.7	╡ -	25.91	(74)
North	0.9x		=		╡		╡		╡┆		=		╡` ′
North	0.9x	0.77	X X	0.87	」 × □ x	20.32	」 x ] x	0.85 0.85	x [ x [	0.7	= =	7.29	$=$ $\frac{(74)}{(74)}$

(86)m= 1 1 0.99 0.99 0.97 0.92	0.83	0.86	0.95	0.99	1	1		(86)
Mean internal temperature in living area T1 (follow ste	eps 3 to 7	in Table	e 9c)					
(87)m= 18.75 18.95 19.27 19.72 20.16 20.58	20.82	20.79	20.46	19.88	19.25	18.75		(87)
Temperature during heating periods in rest of dwelling	from Ta	ble 9, Ti	h2 (°C)					
(88)m= 19.26 19.27 19.28 19.33 19.34 19.38	19.38	19.39	19.36	19.34	19.32	19.3		(88)
Utilisation factor for gains for rest of dwelling, h2,m (so	ee Table	9a)					•	
(89)m= 1 1 0.99 0.98 0.95 0.85	0.64	0.69	0.9	0.98	1	1		(89)
Mean internal temperature in the rest of dwelling T2 (1	follow ste	ps 3 to 7	7 in Tabl	e 9c)		!	ı	
(90)m= 17.29 17.49 17.82 18.3 18.74 19.16	19.33	19.32	19.05	18.46	17.83	17.32		(90)
			f	LA = Livin	g area ÷ (4	4) =	0.55	(91)
Mean internal temperature (for the whole dwelling) = f	ΊΔ <b>ν</b> Τ1 .	<b>⊥</b> (1 _ fl	Δ) <b>v</b> T2					
(92)m= 18.09 18.29 18.61 19.08 19.52 19.94	20.15	20.13	19.83	19.24	18.61	18.1		(92)
Apply adjustment to the mean internal temperature from	m Table							
(93)m= 18.09 18.29 18.61 19.08 19.52 19.94	20.15	20.13	19.83	19.24	18.61	18.1		(93)
8. Space heating requirement								
Set Ti to the mean internal temperature obtained at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisation factor for gains using Table 9a	1					_		
Jan Feb Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:  (94)m= 1 0.99 0.99 0.98 0.95 0.88	0.75	0.78	0.92	0.98	1	1		(94)
Useful gains, hmGm , W = (94)m x (84)m	0.70	0.70	0.02	0.00				()
(95)m= 482.98 588.26 658.13 696.95 695.46 621.84	511.73	516.37	589.56	564.37	490.53	452.03		(95)
Monthly average external temperature from Table 8						<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 for mean internal temperature, Lm , W	=[(39)m >	⟨ [(93)m	– (96)m	]			•	
(97)m= 2633.88 2543.64 2289.38 1874.09 1432.54 952.89	632.32	661.17				2600.63		(97)
Space heating requirement for each month, kWh/mon	1					1	ı	
(98)m= 1600.27 1314.02 1213.65 847.54 548.38 0	0	0	0	757.24	1181.1	1598.55		(oo)
		Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	9060.75	(98)
Space heating requirement in kWh/m²/year							164.74	(99)
9b. Energy requirements – Community heating scheme	Э							
This part is used for space heating, space cooling or w		• .	-		unity sch	neme.	2	(301)
Fraction of space heat from secondary/supplementary	• ,	rable r	1) U II N	one			0	
Fraction of space heat from community system 1 – (30	1) =						1	(302)
The community scheme may obtain heat from several sources. The				up to four o	other heat	sources; to	he latter	
includes boilers, heat pumps, geothermal and waste heat from powe Fraction of heat from Community boilers	r stations. S	see <i>Арре</i> і	iaix C.				1	(303a)
Fraction of total space heat from Community boilers				(2)	02) x (303	(a) -		(304a)
•					02) X (303	a) =	1	=
Factor for control and charging method (Table 4c(3)) for	or commu	inity hea	iting syst	tem			1.05	(305)
Distribution loss factor (Table 12c) for community heati	ng syster	m					1.1	(306)
Space heating							kWh/ye	ar
Annual space heating requirement							9060.75	

Space heat from Community boilers	(98) x (304a)	x (305) x (306) =	10465.17	(307a)
Efficiency of secondary/supplementary heating system	n in % (from Table 4a or Appe	endix E)	0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) >	( 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1875.52	]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a)	x (305) x (306) =	2166.23	(310a)
Electricity used for heat distribution	0.01 × [(307a)(3	07e) + (310a)(310e)] =	126.31	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = $(107) \div (31)$	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 41 mechanical ventilation - balanced, extract or positive in			0	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			428.94	(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 (r	kWh/year	kg CO2/kWh	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and water heating (r	kWh/year not CHP)	kg CO2/kWh to (366) for the second fuel	kg CO <mark>2/yea</mark> r	(367a) (367)
CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)	kWh/year not CHP) s CHP using two fuels repeat (363)	kg CO2/kWh to (366) for the second fuel	65 4197.51	` 
CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)  CO2 associated with heat source 1	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x	kg CO2/kWh to (366) for the second fuel 0 = 0.52 =	65 4197.51	(367)
CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x	kg CO2/kWh to (366) for the second fuel 0 = 0.52 =	65 4197.51 65.56 4263.07	(367)
CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(369) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.72) = 0 = 0.52	65 4197.51 65.56 4263.07	(367) (372) (373)
CO2 from other sources of space and water heating (refficiency 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)	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(369) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.52 = 0.52 = 0.52	65 4197.51 65.56 4263.07	(367) (372) (373) (374)
CO2 from other sources of space and water heating (refficiency 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 in	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(3  (309) x  nstantaneous heater (312) x  (373) + (374) + (375) =	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.52 = 0.52 = 0.52	65 4197.51 65.56 4263.07 0 4263.07	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (refficiency 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 intotal CO2 associated with space and water heating	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(3  (309) x  nstantaneous heater (312) x  (373) + (374) + (375) =	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.72) = 0 = 0.22 = 0.22	65 4197.51 65.56 4263.07 0 4263.07	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (refficiency 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 in the community systems  Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans with	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(3  (309) x  nstantaneous heater (312) x  (373) + (374) + (375) =  hin dwelling (331)) x  (332))) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.22 = 0.52 = 0.52	65 4197.51 65.56 4263.07 0 4263.07	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (refficiency 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 in the control of	kWh/year  not CHP) s CHP using two fuels repeat (363)  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(3  (309) x  nstantaneous heater (312) x  (373) + (374) + (375) =  hin dwelling (331)) x  (332))) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.22 = 0.52 = 0.52	65 4197.51 65.56 4263.07 0 4263.07 0 222.62	(367) (372) (373) (374) (375) (376) (378) (379)

		User Do	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	;	Stroma Softwa	re Ve			Versic	on: 1.0.3.4	
		Property A	Address:	Unit 3					
Address: 1. Overall dwelling dimer	, london								
1. Overall dwelling diffler	1510115.	Area	n(m²)		Av He	ight(m)		Volume(m³	`
Basement			<u> </u>	(1a) x		.17	(2a) =	110.67	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e)+(1	n)	51	(4)			_		
Dwelling volume		· L			)+(3c)+(3c	d)+(3e)+	(3n) =	110.67	(5)
2. Ventilation rate:									
<u> </u>	main seconda heating heating	ry (	other		total			m³ per hou	r
Number of chimneys		<b>-</b> + -	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	<b></b>	0	i - F	0	x	20 =	0	(6b)
Number of intermittent fan	is			<b>'</b>	2	x -	10 =	20	(7a)
Number of passive vents				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fire	es			Ī	0	X 4	40 =	0	(7c)
				_			Δir ch	nanges per ho	ur
Infiltration due to chimney	s, flues and fans = (6a)+(6b)+(	7a)±(7h)±(7	70) -	_					_
	en carried out or is intended, proces			ontinue fr	20 rom (9) to (		÷ (5) =	0.18	(8)
Number of storeys in the						-/		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o			•	uction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding t	o the greate	er wall area	a (after					
, ,	oor, enter 0.2 (unsealed) or 0	).1 (seale	d), 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	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(	(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
•	q50, expressed in cubic metro	•	•	•	etre of e	envelope	area	20	(17)
•	ty value, then $(18) = [(17) \div 20] + (18) = [(17) \div 20]$							1.18	(18)
	if a pressurisation test has been do	ne or a deg	ıree air per	meability	is being u	sed			7(40)
Number of sides sheltered Shelter factor	1	(	(20) = 1 - [	0.075 x (1	19)] =			0.78	(19) (20)
Infiltration rate incorporation	ng shelter factor		(21) = (18)		/ <del>-</del>			0.70	(21)
Infiltration rate modified fo			, , , ,	, ,				0.92	(21)
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7	'					•	•	
<del> </del>	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (00 c) (22	1 1	1 1				1	•	ı	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25 1	)m ÷ 4 .23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
(22a)m= 1.27 1.25 1	.20 1.1 1.00 0.95	0.95	0.92	ı	1.08	1.12	1.10	J	

1.17	1.14	1.12	1.01	0.98	0.87	0.87	0.85	(22a)m <sub>0.92</sub>	0.98	1.03	1.08	1	
alculate effe		l					0.00	0.32	0.90	1.00	1.00	J	
If mechanica	al ventila	ition:										0	(2
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(2
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	)m = (22	2b)m + (	23b)		_	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•								
if (22b)n	า < 0.5 x	(23b), t	hen (24)	c) = (23b)	); other\	vise (24	c) = (22k	o) m + 0	.5 × (23b	<u>)</u>		1	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural									0.51				
if (22b)n 4d)m= 1.17	1 = 1, 111	1.12	1.01	0.98	0.88	0.88	0.5 + [(2	0.92	0.5]	1.03	1.08	1	(2
- /		<u> </u>							0.90	1.03	1.00		(2
Effective air 5)m= 1.17	change 1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08	1	(2
5)111= 1.17	1.14	1.12	1.01	0.30	0.88	0.00	0.86	0.92	0.98	1.03	1.08		(2
. Heat losse	s and he	eat loss	oaramete	er:									
LEMENT	Gros		Openin	-	Net Ar		U-valı W/m2		A X U (W/I	k)	k-value		A X k kJ/K
oors	area	(111-)	- 11		A ,r				`	N)	kJ/m²-l	N.	
	. 1				1.9	X	1.4	0.04]	2.66	H			(2
indows Type					9.03		/[1/( 1.6 )+		13.58	H			(2
indows Type	2				2.89	x1.	/[1/( 4.8 )+	0.04] =	11.64	닡 ,			(2
oor					51	X	0.99	=	50.49	<u> </u>		<b>ᆜ</b>	(2
alls Type1	16.1	4	9.03		7.11	X	2.1	=	14.93				(2
alls Type2	16.	1	4.79		11.31	X	2.1	=	23.75				(2
tal area of e	lements	, m²			83.24	1							(3
arty wall					33.3	X	0	=	0				(3
or windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	
include the area				is and par	titions		(26)(30)	1 + (32) -					- (
bric heat lose eat capacity		•	U)				(20)(00)		(30) + (32	2) + (225)	(220) -	117.0	====
ermal mass		,	2 – Cm ·	TEA) ir	k I/m2k/			., ,	tive Value	, , ,	(326) =	0	(3
r design assess	•	•		,			acisaly the			· ·	ahla 1f	450	(3
n be used inste				CONSTRUCT	ion are no	i kilowii pi	colsoly the	maioative	, values of	TIVII III I	abic 11		
nermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						12.8	3 (3
letails of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
tal fabric he	at loss							(33) +	(36) =			129.8	35 (3
entilation hea	at loss ca	alculated	monthly				1	(38)m	= 0.33 × (	(25)m x (5	)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Į	
3)m= 42.61	41.77	40.94	36.76	35.93	32.06	32.06	31.34	33.55	35.93	37.6	39.27	]	(3
eat transfer o	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
	171.62	170.79	166.61	165.78	161.91	161.91	161.19	163.4	165.78	167.44	169.12	]	
9)m= 172.46	171.02	170.70	100.01	100.70	101.01		101110						

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 3.38	3.37	3.35	3.27	3.25	3.17	3.17	3.16	3.2	3.25	3.28	3.32		
		l .				ļ	ļ		L Average =	Sum(40) <sub>1</sub> .	12 /12=	3.26	(40)
Number of day	ys in mo	nth (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 hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
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 ( <sup>-</sup>	TFA -13.		72		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	` ,		se target o		.04		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		
						•				m(44) <sub>112</sub> =		900.48	(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	100.01	109.17	118.55		_
<i>II</i> :				that was to					Total = Su	m(45) <sub>112</sub> =	[	1180.67	(45)
If instantaneous w	_			-		_	boxes (46)						
(46)m= 18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
Water storage Storage volum		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-								20		(E1)
If community h	•			C Z (KVV	ii/iiti e/ue	.y <i>)</i>				0.	02		(51)
Volume factor	•									1.	03		(52)
Temperature f	actor fro	m Table	2b							-	.6		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or		_	•								03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												хН	, ,
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	,	,			59)m = (	(58) ÷ 36	65 × (41)	m					•
(modified by				,	•	` '	, ,		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 o	oloulotod	for ooob	month	(61)m -	(60) ·	265 ~ (41	\m							
(61)m= 0	0 0	0	0	0	(00) -	- 303 x (41	)III   0		0	0	T 0	0	1	(61)
			<u> </u>										(50)== : (61)==	(01)
(62)m= 177.6	<del></del>	165.75	149.81	147.69	133.		140.	_	139.31	45)III +	<del>`                                    </del>	173.82	· (59)m + (61)m ]	(62)
` ′			<u> </u>				<u> </u>						]	(02)
Solar DHW inputation										CONTINU	illon to wate	er neaung)		
(63)m= 0	0	0	0	0	аррі 0	0	0		0	0	0	0	1	(63)
Output from	ļ												I	(00)
(64)m= 177.6		165.75	149.81	147.69	133.	24 129.18	140.	08	139.31	155.28	162.66	173.82	1	
(01)111= 177.0	100.00	100.70	1 10.01	111.00	100	120.10	L				er (annual)		1831.51	(64)
Heat gains fi	om water	heating	k\Mh/m	onth () 2	o1 ` 7	85 <b>v</b> (45)m								J` ′
(65)m= 59.31		55.34	50.03	49.34	44.5	<del></del>	46.8		46.54	51.86	54.31	58.03	]	(65)
, ,			l			er is in the	<u> </u>						] posting	()
5. Internal	•				ymrac		uweii	iiig	OI HOL W	alei is	iioiii coiii	indinty i	leating	
	•			).										
Metabolic ga	T	Mar	Apr	May	Ju	n Jul	Aı	ıa	Sep	Oct	Nov	Dec	1	
(66)m= $85.98$		85.98	85.98	85.98	85.9		85.9	Ť	85.98	85.98	85.98	85.98		(66)
Lighting gain	_	ted in Ar	nendix	Leguat			_	$\rightarrow$						
(67)m= $22.71$	<u> </u>	16.4	12.42	9.28	7.8		11.0	_	14.77	18.76	21.89	23.34	1	(67)
Appliances of	-	ulated ir	Append	dix L ea	uatio	1 13 or l 1		$\vdash$			_		1	
(68)m= 149.8	<u> </u>	147.47	139.13	128.6	118		110.		114.45	122.8	133.32	143.22	]	(68)
Cooking gair	_			L equat		_	) also	0. SE	ee Table	5			1	
(69)m= 31.6	31.6	31.6	31.6	31.6	31.0		31.	_	31.6	31.6	31.6	31.6	]	(69)
Pumps and f	ans gains	(Table f	5a)				<u> </u>							
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(70)
Losses e.g.	evaporatio	n (nega	ı tive valu	es) (Tab	le 5)	<b>!</b>	!				<u>.</u> l		1	
(71)m= -68.78		-68.78	-68.78	-68.78	-68.	78 -68.78	-68.	78	-68.78	-68.78	-68.78	-68.78	]	(71)
Water heatin	g gains (T	rable 5)	ļ								ļ		ı	
(72)m= 79.72	<del>~~</del>	74.39	69.49	66.32	61.8	4 58.04	62.9	91	64.64	69.71	75.43	77.99	]	(72)
Total intern	al gains =	<u> </u>				<b>I</b> (66)m + (67)m	า + (68	3)m +	+ (69)m + (	(70)m + (		)m	ı	
(73)m= 301.0	<del></del>	287.05	269.83	252.99	237.	17 227.39	233.	.25	242.66	260.05	279.44	293.35	]	(73)
6. Solar gai	ns:													
Solar gains are		using sola	r flux from	Table 6a	and as	sociated equa	ations t	to co	nvert to th	e applica	ıble orienta	tion.		
Orientation:			Area			Flux			g_		FF		Gains	
	Table 6d		m²			Table 6a		Т	able 6b	_	Γable 6c		(W)	
North 0.9	0.77	X	2.8	39	<b>x</b>	10.63	X		0.85	x [	0.7	=	12.67	(74)
North 0.9	0.77	х	2.8	39	x	20.32	x		0.85	x	0.7	=	24.22	(74)
North 0.9	0.77	х	2.8	39	x	34.53	X		0.85	x	0.7	=	41.15	(74)
North 0.9	0.77	X	2.8	39	x	55.46	x		0.85	x [	0.7	=	66.09	(74)
North 0.9	0.77	X	2.8	39	x	74.72	x		0.85	x [	0.7	=	89.03	(74)

North	_		7							_				_
North	0.9x	0.77	X	2.8	9	X	79.99	X	0.85	X	0.7	=	95.31	(74)
North	0.9x	0.77	X	2.8	9	X	74.68	X	0.85	X	0.7	=	88.99	(74)
North	0.9x	0.77	X	2.8	9	X	59.25	X	0.85	X	0.7	=	70.6	(74)
North	0.9x	0.77	X	2.8	9	X	41.52	X	0.85	X	0.7	=	49.47	(74)
North	0.9x	0.77	X	2.8	9	X	24.19	X	0.85	X	0.7	=	28.83	(74)
North	0.9x	0.77	X	2.8	9	X	13.12	X	0.85	X	0.7	=	15.63	(74)
North	0.9x	0.77	X	2.8	9	x	8.86	x	0.85	X	0.7	=	10.56	(74)
South	0.9x	0.77	x	9.0	3	X	46.75	x	0.76	X	0.7	=	155.64	(78)
South	0.9x	0.77	x	9.0	3	X	76.57	x	0.76	x	0.7	=	254.91	(78)
South	0.9x	0.77	x	9.0	3	X	97.53	x	0.76	X	0.7	=	324.7	(78)
South	0.9x	0.77	x	9.0	3	X	110.23	x	0.76	X	0.7	=	366.99	(78)
South	0.9x	0.77	x	9.0	3	X	114.87	x	0.76	x	0.7	=	382.42	(78)
South	0.9x	0.77	x	9.0	3	X	110.55	x	0.76	x	0.7	=	368.03	(78)
South	0.9x	0.77	х	9.0	3	x	108.01	x	0.76	x	0.7	=	359.59	(78)
South	0.9x	0.77	x	9.0	3	x	104.89	x	0.76	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.0	3	X	101.89	×	0.76	×	0.7	=	339.19	(78)
South	0.9x	0.77	x	9.0	3	X	82.59	x	0.76	×	0.7	=	274.94	(78)
South	0.9x	0.77	X	9.03	3	X	55.42	X	0.76	Х	0.7	=	184.49	(78)
South	0.9x	0.77	j×	9.0	3	Х	40.4	x	0.76	x	0.7	_	134.49	(78)
														_
Solar g	ains in v	vatts, <mark>calcu</mark> l	ated	for each	n month	1		(83)m	= Sum(74)m .	(82)m				
(83)m=	168.32	279.12 365	5.85	433.08	471.46	46	63.34 448.58	419	.81 388.67	303.76	200.12	145.05		(83)
Total g	ains – in	ternal and s	solar	(84)m =	: (73)m	3) +	83)m , watts							
(84)m=	469.37	577.45 65	2.9	702.91	724.45	70	00.52 675.97	653	.06 631.33	563.82	479.56	438.4		(84)
7. Mea	an interr	nal temperat	ture (	heating	seasor	n)								
Tempe	erature o	during heati	ng p	eriods in	the livi	ing	area from Ta	able 9,	Th1 (°C)				21	(85)
Utilisa	ition fact	or for gains	for li	ving are	a, h1,m	า (ร	ee Table 9a)	)						_
[	Jan	Feb M	1ar	Apr	May		Jun Jul							
(86)m=	1	4			,		Juli Juli	A	ug Sep	Oct	Nov	Dec		
		1 0.	99	0.98	0.96	+	0.91 0.8	0.8		Oct 0.99	Nov 1	Dec 1		(86)
Mean	internal	!			0.96	(	0.91 0.8	0.8	3 0.94		+			(86)
Mean (87)m=	internal	temperatur			0.96	ollo		0.8	3 0.94 able 9c)		1			(86) (87)
(87)m=	18.82	temperatur	e in I	iving are	0.96 ea T1 (f	ollo 2	0.91 0.8 w steps 3 to 0.63 20.84	0.8 7 in T	a3 0.94 Table 9c) 82 20.51	0.99	1	1		` ,
(87)m= Tempe	18.82 erature	temperatur 19.02 19 during heati	e in l	iving are 19.79 eriods in	0.96 ea T1 (for 20.23	ollo 2 dw	0.91 0.8 w steps 3 to 0.63 20.84 relling from 1	0.8 7 in T 20.8	0.94  able 9c) 20.51  7, Th2 (°C)	0.99 19.93	19.31	1 18.82		` ,
(87)m= Tempo (88)m=	18.82 erature (	temperatur 19.02 19 during heati 19.32 19	e in I .34 ng po	iving are 19.79 eriods in	0.96 ea T1 (for 20.23 a rest of 19.37	ollo 2 dw	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41	0.8 7 in T 20.8 Table 9	0.94  able 9c) 20.51  7, Th2 (°C)	0.99	19.31	1		(87)
(87)m= [ Tempe (88)m= [ Utilisa	18.82 erature ( 19.31 ation fact	temperatur 19.02 19 during heati 19.32 19 or for gains	e in l .34 ng po .33	iving are 19.79 eriods in 19.37 est of dv	0.96 ea T1 (f 20.23 express of 19.37 welling,	ollo 2 dw 1 h2,	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Table)	0.8 7 in T 20.8  Table 9 19.6  19.6	able 9c) 20.51 3, Th2 (°C) 42 19.4	0.99 19.93 19.37	19.31	1 18.82 19.34		(87)
(87)m= [ Tempe (88)m= [ Utilisa (89)m= [	erature of 19.31 ation fact	temperatur 19.02 19 during heati 19.32 19 or for gains 1 0.9	e in I .34 ng po .33 for r	iving are 19.79 eriods in 19.37 est of dv 0.98	0.96 ea T1 (for 20.23 no rest of 19.37 welling, 0.94	ollo 2 dw 1 h2,	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Table 0.82 0.61	0.8 7 in T 20.8 Table 9 19.6 9 0.6	7 able 9c) 82 20.51 9), Th2 (°C) 42 19.4	0.99 19.93 19.37	19.31	1 18.82		(87)
(87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean	erature (19.31 lation fact 1 linternal	temperatur 19.02 19 during heati 19.32 19 or for gains 1 0. temperatur	e in I .34  ng pe .33  for r 99	eriods in 19.37 est of dv 0.98 he rest of	0.96 ea T1 (for 20.23 express of 19.37 expression welling, 0.94 of dwell	ollo 2 dw 1 h2,	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Tabl 0.82 0.61  T2 (follow s	0.8 7 in T 20.6 Table 9 19.6 e 9a) 0.6 teps 3	able 9c) 20.51  7, Th2 (°C) 21 22 20.51  23 20.51  24 21 24 21 25 26 26 27 27 28 28 29 20.51  20.51	0.99 19.93 19.37 0.98 e 9c)	19.31	1 18.82 19.34		(87) (88) (89)
(87)m= [ Tempe (88)m= [ Utilisa (89)m= [	erature of 19.31 ation fact	temperatur 19.02 19 during heati 19.32 19 or for gains 1 0. temperatur	e in I .34 ng po .33 for r	iving are 19.79 eriods in 19.37 est of dv 0.98	0.96 ea T1 (for 20.23 no rest of 19.37 welling, 0.94	ollo 2 dw 1 h2,	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Table 0.82 0.61	0.8 7 in T 20.8 Table 9 19.6 9 0.6	7 able 9c) 82 20.51 9, Th2 (°C) 42 19.4 16 0.89 16 7 in Tabl 37 19.12	0.99 19.93 19.37 0.98 e 9c) 18.55	19.31 19.36 1 17.92	1 18.82 19.34 1		(87) (88) (89) (90)
(87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean	erature (19.31 lation fact 1 linternal	temperatur 19.02 19 during heati 19.32 19 or for gains 1 0. temperatur	e in I .34  ng pe .33  for r 99	eriods in 19.37 est of dv 0.98 he rest of	0.96 ea T1 (for 20.23 express of 19.37 expression welling, 0.94 of dwell	ollo 2 dw 1 h2,	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Tabl 0.82 0.61  T2 (follow s	0.8 7 in T 20.6 Table 9 19.6 e 9a) 0.6 teps 3	7 able 9c) 82 20.51 9, Th2 (°C) 42 19.4 16 0.89 16 7 in Tabl 37 19.12	0.99 19.93 19.37 0.98 e 9c) 18.55	19.31	1 18.82 19.34 1	0.55	(87) (88) (89)
(87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean (90)m= [	erature (19.31 stion fact 1 internal 17.39	temperatur 19.02 19 during heati 19.32 19 or for gains 1 0. temperatur 17.6 17	e in I .34 ng po .33 for r 99	eriods in 19.37 est of dv 0.98 he rest of	0.96 ea T1 (for 20.23) n rest of 19.37 welling, 0.94 of dwell 18.83	ollo 2 dw 1 h2, cut ling 1	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Tabl 0.82 0.61  T2 (follow s	0.8 7 in T 20.4 19.4 e 9a) 0.6 teps 3	7 able 9c) 82 20.51 9, Th2 (°C) 42 19.4 16 0.89 16 7 in Tabl 37 19.12	0.99 19.93 19.37 0.98 e 9c) 18.55	19.31 19.36 1 17.92	1 18.82 19.34 1	0.55	(87) (88) (89) (90)
(87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean (90)m= [  Mean (92)m= [	erature of 19.31 ation fact of 1 internal 17.39 internal 18.19	temperatur 19.02 19 during heati 19.32 19 or for gains 1 0. temperatur 17.6 17 temperatur 18.39 18	e in l	est of dv 0.98 he rest of 18.4	0.96 ea T1 (for 20.23 no rest of 19.37 welling, 0.94 of dwell 18.83 ole dwell 19.61	ollo 2 dw 1 h2, cut ling 1	0.91 0.8  w steps 3 to 0.63 20.84  relling from 7 9.41 19.41  m (see Tabl 0.82 0.61  T2 (follow s 9.23 19.37	0.8 7 in T 20.4 19.4 e 9a) 0.6 teps 3 19.4 1 + (1-20.4	7 able 9c) 82 20.51 9, Th2 (°C) 42 19.4 6 0.89 to 7 in Tabl 37 19.12 f	0.99  19.93  19.37  0.98  e 9c)  18.55  LA = Liv	19.31 19.36 19.36 17.92 ring area ÷ (-	1 18.82 19.34 1	0.55	(87) (88) (89) (90)

(93)m= 18.19	18.39	18.71	19.17	19.61	20.01	20.19	20.17	19.89	19.32	18.7	18.19		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9	o, 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 fac	L	L		May	00.1		7.09	Сор					
(94)m= 1	0.99	0.99	0.97	0.94	0.86	0.72	0.76	0.91	0.98	0.99	1		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m	Į.	Į.			Į.	Į.			
(95)m= 468.03	573.98	645.06	685.03	682.48	603.48	487.47	493.33	573.38	551.64	476.99	437.44		(95)
Monthly aver	age exte	rnal 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	1					<del>-``</del>	<del>- `                                   </del>	<u>`</u>	<del></del>	<u> </u>			(0-1)
` '	2314.88		1711.55	1310.84	875.22	581.23	607.94	946.16	1445.15	l .	2366.26		(97)
Space heatin	<del>i i</del>		r each n 739.1	10nth, K\ 467.5	/vn/mon	$\ln = 0.02$	24 x [(97]	)m – (95 0	)m] x (4)	1)m 1054.51	1435.04		
(98)m= 1433.55	1169.89	1071.95	739.1	467.3	U	U				<u> </u>	└──┤	0026.24	(98)
				.,			Tota	l per year	(KWII/yeai	) = Sum(9	<b>O)</b> 15,912 =	8036.31	╡``
Space heatin	ig require	ement in	kWh/m²	/year							L	157.57	(99)
9b. Energy red				Ĭ									
This part is us Fraction of spa					_			-		unity sch	neme.	0	(301)
							(Table I	1, 0 11 11	Offic		I		
Fraction of spa											[	1	(302)
The c <mark>ommu</mark> nity so includes boilers, h									up to four	other heat	sources; th	ne latter	
Fraction of hea					iom power	oldirono.	occ 7 ippor					1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for conf						r commi	unity hea	ating sys		<b>,</b> `	′ L	1.05	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.1	(306)
Space heating		`	,		,	0 ,					L	kWh/yea	r
Annual space	_	requirem	nent									8036.31	<u>.</u>
Space heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	- [	9281.94	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/sur	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =	ĺ	0	(309)
Water heating	g												
Annual water	heating ı	requirem	ent									1831.51	
If DHW from c Water heat fro								(64) x (30	03a) x (30	5) x (306) :	= [	2115.39	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	113.97	(313)
											L		_
Cooling Syster	m Energ	y Efficie	ncy Ratio	<b>)</b>								0	(314)
Cooling System Space cooling	_	-	•		n, if not e	enter 0)		= (107) ÷	· (314) =		]	0	(314)
	(if there	is a fixe	d cooling	g system		,		= (107) ÷	(314) =		[		=
Space cooling	(if there oumps a	is a fixe	d cooling	g system	Γable 4f)	:	outside	= (107) ÷	· (314) =		] ] ]		=

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)				401.03	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		nissions   CO2/year	
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  If there is CHP	IP) using two fuels repeat (363) to	(366) for the second	d fuel	0.5	(367a)
	using two racio repeat (600) to		luci	65	](367a)
CO2 associated with heat source 1 [(30	7b)+(310b)] x 100 ÷ (367b) x	0	=	3787.42	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	59.15	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	3846.57	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			3846.57	(376)
CO2 associated with electricity for pumps and fans within du	velling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	208.13	(379)
Total CO2, kg/year sum of (376)(382) =				4054.71	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				79.5	(384)
El rating (section 14)				45.56	(385)

			User D	etails: _						
Assessor Name: Software Name:	Stroma FSAP			Strom Softwa Address	are Vei			Versio	n: 1.0.3.4	
Address :	, london	r	roperty.	Address	Offit 4					
1. Overall dwelling dime	nsions:									
_			Area	a(m²)		Av. He	ight(m)	<b>.</b>	Volume(m <sup>3</sup>	<u>^</u>
Basement				51	(1a) x	2	.18	(2a) =	111.18	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	+(1e)+(1r	ר)	51	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	111.18	(5)
2. Ventilation rate:				-41		4-4-1				-
	main heating	secondar heating	ту 	other		total		i	m³ per hou	r 
Number of chimneys	0	0	_	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	] + [	0	=	0	x 2	20 =	0	(6b)
Number of intermittent far	ns					2	X '	10 =	20	(7a)
Number of passive vents						0	X ·	10 =	0	(7b)
Number of flueless gas fir	res				Ī	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimney						20		÷ (5) =	0.18	(8)
If a pressurisation test has be Number of storeys in th		ended, procee	d to (17), (	otherwise (	continue fr	om (9) to (	(16)		0	(9)
Additional infiltration	ic dwelling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or time	per frame or	0.35 fo	r masonı	y constr	uction	,	•	0	(11)
if both types of wall are pr		orresponding to	the great	ter wall are	a (after			'		
deducting areas of opening If suspended wooden floor	• ,. ,	sealed) or 0	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, ent	,	•	(000	, c.cc					0	(13)
Percentage of windows	and doors draugh	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	20	(17)
If based on air permeabili  Air permeability value applies	•					is heina u	sad .		1.18	(18)
Number of sides sheltere		it rias been dei	ic or a act	gree an pe	meability	is being a	Scu		2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporati	ing shelter factor			(21) = (18	x (20) =				1	(21)
Infiltration rate modified for	or monthly wind sp	eed				1	1	1	1	
Jan Feb	Mar Apr M	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe									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		
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

1.28	ation rate	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		
alculate effe	ctive air	change	rate for t	he appli	cable ca	se	ļ .	<u> </u>					
If mechanica												0	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0	(2
If balanced with	ı heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(2
a) If balance					·	<del>- ` ` </del>	<del>- ^ `</del>	ŕ	<del>,                                    </del>	<del> </del>	<del>1 ` '</del>	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance						<u> </u>	<del>- ^ ` ` </del>	<del>í `</del>	<del> </del>	<del>-                                    </del>		I	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00l-				
	n < 0.5 ×	(23b), t	<u> </u>	<u> </u>	ŕ	wise (24)	<del>É `</del>	o) m + 0.	· ` ·	í –			(2
			0	0		<u> </u>	0	<u> </u>	0	0	0		(2
d) If natural if (22b)n	ventilation								0.51				
1d)m= 1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(2
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)		<u> </u>	ļ		
5)m= 1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(2
								ı					
. Heat losse												_	
LEMENT	Gros area		Openin	-	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		A X k kJ/K
oors	G.: <b>5</b>	,,,	, i		1.9	x	1.4	= 1	2.66	-,	,,,,,		(2
in <mark>dows</mark> Type	<u>.</u> 1				9.03	=	/[1/( 1.6 )+	\ !	13.58	Ħ			(2
indows Type					0.39	<del>-</del>	/[1/( 4.8 )+		1.57	Ħ			(2
oor										╡,			`
					51	x	0.97	=	49.47	<del> </del>		╡	(2
alls Type1	39.2		0.39	=	38.81	=	2.1	=	81.5	닠 ¦		╡	(2
alls Type2	10.9		10.93	3	0.06	×	2.1	=	0.13				(2
otal area of e	lements	, <b>m</b> ²			101.1	9							(;
arty wall					16.1	X	0	=	0				(3
or windows and include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	n paragraph	3.2	
bric heat los							(26)(30)	) + (32) =				148.91	(:
eat capacity		•	-,					((28).	(30) + (32	2) + (32a)	(32e) =	0	(;
nermal mass	`	,	= Cm ÷	- TFA) ir	n kJ/m²K			,	itive Value	, , ,	` '	450	(3
r design assess	•	•		,			ecisely the	e indicative	e values of	TMP in T	able 1f	100	
n be used inste							•						
nermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix I	<						15.2	(3
letails of therma		are not kn	own (36) =	= 0.15 x (3	11)			(0.0)	(0.0)		ı		
otal fabric he									(36) =	, ,_		164.11	(3
entilation hea					Ι.	l			= 0.33 × (		1	l	
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	45.00	45.00	40.70	00.50		l ^-	1 04.4		1 00		4000		10
Jan	45.99	45.08	40.48	39.56	35	35	34.13	36.8	39.56	41.4	43.24		(3
Jan		<u> </u>	40.48	39.56	35	35	34.13	<u> </u>	39.56	<u> </u>	43.24		(3

Heat Ic	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	4.14	4.12	4.1	4.01	3.99	3.9	3.9	3.89	3.94	3.99	4.03	4.07		
							l .		,	Average =	Sum(40) <sub>1</sub>	12 /12=	4.01	(40)
Numbe	er of day		nth (Tab	le 1a)			i	i			<del></del>			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ar:	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		72		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed t	(25 x N) to achieve		se target o		5.04		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		
- Charant	antont of	hat water	used sel	aulated m	anthly 1	100 v Vd r		Tm / 3600			m(44) <sub>112</sub> =		900.48	(44)
										,				
(45)m=	122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	100.01	109.17	118.55	4400.07	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		lotal = Su	m(45) <sub>112</sub> =		1180.67	(45)
(46)m=	18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
	storage				4000	11100								, ,
Storag	e volum	e (litres)	includir	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		160		(47)
	-	_			elling, e			, ,						
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage anufact		eclared l	nss facto	or is kno	wn (k\//ł	n/day).					0		(48)
,			m Table		) 13 KHO	WII (ICVVI	ı, day).					0		(49)
•			storage		ar			(48) x (49)	· –			10		(50)
			_	-	oss facto	or is not		(40) X (40)	_		'	10		(30)
Hot wa	iter stora	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ay)				0.	.02		(51)
	•	•	ee secti	on 4.3										
		from Tal	bie 2a m Table	2h							<b>—</b>	.03		(52)
•								(47) v (E4)	. v. (EQ) v. (I	E0)		.6		(53)
• • • • • • • • • • • • • • • • • • • •		711 water [54) in (5	storage	, KVVII/ye	ai			(47) x (51)	) X (32) X (	33) =		.03		(54) (55)
		. , .	culated f	or each	month			((56)m = (	55) × (41)ı	m	1.	.03		(00)
1	32.01	28.92	32.01			30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
(56)m=				30.98	32.01 m = (56)m							m Appendi	кH	(30)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
` '						50.30	JZ.01	02.01	50.30	JZ.U1	<u> </u>	<u> </u>		, ,
	•	•	nual) fro			50\ <del>~</del>	(EQ) + 20	SE > (44)	m			0		(58)
	•				,	•	` '	65 × (41) ng and a		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)
(55)					_56			L0.20				5.20		( )

Combi loss	calculated	for oach	month	(61)m -	(60) · ·	265 × (41	)m						
(61)m= 0	0 0	0	0	01)111 =	00) +	0 7 (41	0	T 0	0	T 0	0	1	(61)
												] · (59)m + (61)m	(0.)
(62)m= 177.6	<del>-i</del>	165.75	149.81	147.69	133.24		140.08		155.28	162.66	173.82	(39)III + (01)IIII ]	(62)
Solar DHW inp							ļ					]	(02)
(add addition									ii continbu	tion to wat	ci ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter	<u> </u>	<u> </u>			<u> </u>	<u>I</u>	<u>!</u>	1	Į	J	
(64)m= 177.6		165.75	149.81	147.69	133.24	129.18	140.08	3 139.31	155.28	162.66	173.82	]	
			<u> </u>	<u> </u>	<u> </u>	1	Ot	Itput from w	ater heate	er (annual)	112	1831.51	(64)
Heat gains f	rom water	heating	, kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (61)	m] + 0.8 x	x [(46)m	+ (57)m	ı + (59)m	]	-
(65)m= 59.3		55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03	]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	vlinder	is in the	dwellin	g or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	•		` ′		•							<u> </u>	
Metabolic ga				,									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 85.98	8 85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98		(66)
Lighting gair	ns (calcula	ted in A	pendix	L, equ <mark>at</mark>	ion L9	or L9a),	ılso see	Table 5					
(67)m= 23.08	8 20.5	16.67	12.62	9.44	<b>7</b> .97	8.61	11.19	15.02	19.07	22.26	23.72		(67)
Appliances (	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation	L13 or L1	3a), al	so see Ta	ble 5				
(68)m= 149.8	33 151.39	147.47	139.13	128.6	118.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L1	5 or L15a	), also	see Table	5		•	•	
(69)m= 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps and	fans gains	(Table	 5a)				•					•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•	•	-		•		•	
(71)m= -68.7	8 -68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	]	(71)
Water heatir	ng gains (1	Table 5)				-						•	
(72)m= 79.72	2 77.99	74.39	69.49	66.32	61.84	58.04	62.91	64.64	69.71	75.43	77.99	]	(72)
Total intern	al gains =				(6	6)m + (67)n	n + (68)n	n + (69)m +	(70)m + (7	71)m + (72)	)m	•	
(73)m= 301.4	3 298.67	287.32	270.04	253.14	237.3	227.53	233.43	3 242.91	260.36	279.8	293.73	]	(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to th	ne applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		g_ Table 6b	т	FF able 6c		Gains	
						able ba	. –	Table 60	_ '	able oc		(W)	,
North 0.9		X	0.3	39	x	10.63	X	0.85	x	0.7	=	1.71	(74)
North 0.9		X	0.3	39	x	20.32	X	0.85	x	0.7	=	3.27	(74)
North 0.9	× 0.77	X	0.3	39	x	34.53	X	0.85	x	0.7	=	5.55	(74)
North 0.9		X	0.3	39	x	55.46	X	0.85	x	0.7	=	8.92	(74)
North 0.9	X 0.77	x	0.3	. I	X	74.72	X	0.85	X	0.7	=	12.02	(74)

North										_				_
	0.9x 0.77	X	0.3	9	X	79.9	99	X	0.85	X	0.7	=	12.86	(74)
North	0.9x 0.77	×	0.3	9	X	74.6	68	X	0.85	X	0.7	=	12.01	(74)
North	0.9x 0.77	×	0.3	9	X	59.2	25	X	0.85	X	0.7	=	9.53	(74)
North	0.9x 0.77	×	0.3	9	X	41.5	52	X	0.85	X	0.7	=	6.68	(74)
North	0.9x 0.77	×	0.3	9	X	24.1	19	X	0.85	X	0.7	=	3.89	(74)
North	0.9x 0.77	×	0.3	9	X	13.1	12	X	0.85	X	0.7	=	2.11	(74)
North	0.9x 0.77	×	0.3	9	x	8.8	36	X	0.85	X	0.7	=	1.43	(74)
South	0.9x 0.77	×	9.0	13	x	46.7	75	x	0.76	x	0.7	=	155.64	(78)
South	0.9x 0.77	×	9.0	13	x	76.5	57	x	0.76	x	0.7	=	254.91	(78)
South	0.9x 0.77	×	9.0	13	x	97.5	53	x	0.76	x	0.7	=	324.7	(78)
South	0.9x 0.77	×	9.0	13	x	110.	.23	x	0.76	x	0.7	=	366.99	(78)
South	0.9x 0.77	×	9.0	13	x	114.	.87	X	0.76	x	0.7	=	382.42	(78)
South	0.9x 0.77	, x	9.0	13	x	110.	.55	x	0.76	x	0.7	=	368.03	(78)
South	0.9x 0.77	×	9.0	13	x	108.	.01	x	0.76	x	0.7		359.59	(78)
South	0.9x 0.77	, x	9.0	3	x	104.	.89	x	0.76	x	0.7		349.21	(78)
South	0.9x 0.77	×	9.0	13	x	101.	.89	х	0.76	×	0.7	=	339.19	(78)
South	0.9x 0.77	, x	9.0	3	х	82.5	59	x	0.76	x	0.7	=	274.94	(78)
South	0.9x 0.77	×	9.0	13	x i	55.4	42	Х	0.76	Х	0.7	=	184.49	(78)
South	0.9x 0.77	×	9.0	3	х	40.	.4	х	0.76	x	0.7		134.49	(78)
Solar ga	ins in watts, c	alculated	for each	n month				(83)m	= Sum(74)m .	( <mark>8</mark> 2)m				
(83)m=	1 <b>5</b> 7.35 258.1 <mark>7</mark>	330.26	375.91	394.44	38	30.89	371.6	358.	74 345.87	278.8	3 186.6	135.92		(83)
Total ga	ins – internal	and solar	(84)m =	= (73)m	3) +	33)m , v	watts							
(84)m= 4	458.78 556.84			047.50						_	_	-		
	456.76   556.64	617.58	645.94	647.58	6	18.2 5	599.13	592.	17 588.78	539.1	9 466.4	429.65		(84)
7. Mea	n internal tem				_	18.2 5	599.13	592.	17 588.78	539.1	9 466.4	429.65		(84)
		perature	(heating	season	)					539.1	9 466.4	429.65	21	(84)
Tempe	n internal tem	perature heating p	(heating eriods in	season	ng a	area fro	om Tab			539.1	9 466.4	429.65	21	
Tempe	n internal tem	perature heating p	(heating eriods in	season	ng a	area fro	om Tab		Th1 (°C)	539.11 Oct		429.65 Dec	21	
Tempe	n internal tem rature during ion factor for g	perature heating p gains for I	(heating eriods in iving are	season the livi	ng a	area fro ee Table Jun	om Tab	ole 9,	Th1 (°C)				21	
Tempe Utilisati	n internal tem rature during ion factor for g Jan Feb	perature heating p gains for I Mar 0.99	(heating eriods ir iving are Apr 0.99	season the living ea, h1,m May	ng a	area fro ee Tablo Jun	om Tab e 9a) Jul 0.88	ole 9,	Th1 (°C)  ug Sep 9 0.96	Oct	Nov	Dec	21	(85)
Tempe Utilisati (86)m=	n internal tem rature during ion factor for g Jan Feb 1 1	perature heating p gains for I Mar 0.99	(heating eriods ir iving are Apr 0.99	season the living ea, h1,m May	ng a (se	area fro ee Table Jun ).94	om Tab e 9a) Jul 0.88	ole 9,	Th1 (°C)  ug Sep 9 0.96  able 9c)	Oct	Nov 1	Dec	21	(85)
Tempe Utilisati (86)m=  Mean ii (87)m=	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6	perature heating p gains for I Mar 0.99 rature in 18.95	(heating eriods in iving are 0.99 living are 19.43	season the livings, h1,m May 0.98 ea T1 (for	ng a (se	area fro ee Table Jun 0.94 w steps	om Tab e 9a) Jul 0.88	0.8 ' in T	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29	Oct 0.99	Nov 1	Dec 1	21	(85)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe	perature heating p gains for I Mar 0.99 rature in 18.95	(heating eriods in iving are 0.99 living are 19.43	season the livings, h1,m May 0.98 ea T1 (for	ng a (see	area fro ee Table Jun 0.94 w steps 20.4	om Tab e 9a) Jul 0.88	0.8 ' in T	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29  9, Th2 (°C)	Oct 0.99	Nov 1	Dec 1	21	(85)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94	perature heating p gains for I Mar 0.99 rature in 18.95 heating p	(heating eriods in iving are 0.99 living are 19.43 eriods in 18.99	season the livings, h1,m May 0.98 ea T1 (for 19.92 or rest of	))	area from the second se	om Table 9a)  Jul  0.88  s 3 to 7  20.7  rom Ta  19.05	0.8 7 in T 20.6 ble 9	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29  9, Th2 (°C)	Oct 0.99	Nov 1 18.96	Dec 1	21	(86)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=  Utilisati	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95	criods in iving are 0.99 living are 19.43 eriods in 18.99	season the living the	ng a (se color) (se co	area from the second se	om Table 9a)  Jul  0.88  3 to 7  20.7  rom Ta  19.05	Au 0.8 7 in T 20.6 ble 9 19.0	Th1 (°C)  ug Sep 9 0.96  able 9c)  67 20.29  1, Th2 (°C)  16 19.03	Oct 0.99 19.64	18.96	Dec 1 18.4 18.97	21	(85) (86) (87) (88)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=  Utilisati (89)m=	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g 1 0.99	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95 gains for I 0.99	criods in iving are 0.99 living are 19.43 eriods in 18.99 rest of dv 0.98	season the livings, h1,m May 0.98 ea T1 (for 19.92 or rest of 19 welling, 0.96	)) ng a (see ) c c c c c c c c c c c c c c c c c c c	area from the second se	om Table 9a)  Jul  0.88  3 to 7  20.7  rom Ta  19.05  Table  0.68	Au 0.8 7 in T 20.6 19.0 9a) 0.7	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29  0, Th2 (°C) 106 19.03	Oct 0.99 19.64 19	Nov 1 18.96	Dec 1	21	(86)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=  Utilisati (89)m=  Mean ii	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g 1 0.99 nternal tempe	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95 gains for I 0.99	(heating eriods in 19.43) eriods in 18.99 rest of do 0.98	season the living the	) ng a (se ) c   c   c   c   c   c   c   c   c   c	area from the second se	om Table 9a)  Jul  0.88  s 3 to 7  20.7  rom Ta  19.05  Table  0.68	Au 0.8 7 in T 20.6 19.0 9a) 0.7 ps 3	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29  9, Th2 (°C) 19.03  1 0.91  to 7 in Table	Oct 0.99 19.64 19 0.98 e 9c)	1 Nov 1 1 18.96 18.99 0.99	Dec 1 18.4 18.97	21	(85) (86) (87) (88) (89)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=  Utilisati (89)m=  Mean ii	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g 1 0.99	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95 gains for I 0.99	criods in iving are 0.99 living are 19.43 eriods in 18.99 rest of dv 0.98	season the livings, h1,m May 0.98 ea T1 (for 19.92 or rest of 19 welling, 0.96	) ng a (se ) c   c   c   c   c   c   c   c   c   c	area from the second se	om Table 9a)  Jul  0.88  3 to 7  20.7  rom Ta  19.05  Table  0.68	Au 0.8 7 in T 20.6 19.0 9a) 0.7	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29 0, Th2 (°C) 19.03  1 0.91  to 7 in Table 07 18.64	Oct 0.99 19.64 19 0.98 e 9c) 17.99	Nov 1 18.96 18.99 0.99	Dec 1 18.4 18.97		(85) (86) (87) (88) (89)
Tempe Utilisati  (86)m=  Mean ii  (87)m=  Tempe  (88)m=  Utilisati  (89)m=  Mean ii	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g 1 0.99 nternal tempe	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95 gains for I 0.99	(heating eriods in 19.43) eriods in 18.99 rest of do 0.98	season the living the	) ng a (se ) c   c   c   c   c   c   c   c   c   c	area from the second se	om Table 9a)  Jul  0.88  s 3 to 7  20.7  rom Ta  19.05  Table  0.68	Au 0.8 7 in T 20.6 19.0 9a) 0.7 ps 3	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29 0, Th2 (°C) 19.03  1 0.91  to 7 in Table 07 18.64	Oct 0.99 19.64 19 0.98 e 9c) 17.99	1 Nov 1 1 18.96 18.99 0.99	Dec 1 18.4 18.97	21	(85) (86) (87) (88) (89)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=  Utilisati (89)m=  Mean ii (90)m=	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g 1 0.99 nternal tempe 16.71 16.91	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95 gains for I 0.99 rature in 17.26	criods in iving are 19.43 eriods in 18.99 erest of do 17.77	season the living ea, h1,m 0.98 ea T1 (for 19.92 or rest of 19 welling, 0.96 of dwelling,	) ng a (se of collow the collow t	area from the second se	om Table 9a)  Jul  0.88  3 to 7  20.7  Table  0.68  ow ste  18.98	Au 0.8  7 in T 20.6  19.0  9a) 0.7  ps 3	Th1 (°C)  ug Sep 9 0.96  able 9c) 67 20.29  0, Th2 (°C) 106 19.03  1 0.91  to 7 in Table 17 18.64	Oct 0.99 19.64 19 0.98 e 9c) 17.99	Nov 1 18.96 18.99 0.99	Dec 1 18.4 18.97		(85) (86) (87) (88) (89)
Tempe Utilisati (86)m=  Mean ii (87)m=  Tempe (88)m=  Utilisati (89)m=  Mean ii (90)m=  Mean ii (90)m=	n internal tem rature during ion factor for g Jan Feb 1 1 nternal tempe 18.41 18.6 rature during 18.93 18.94 ion factor for g 1 0.99 nternal tempe 16.71 16.91	perature heating p gains for I Mar 0.99 rature in 18.95 heating p 18.95 gains for I 0.99 rature in 17.26	criods in iving are Apr 0.99 living are 19.43 eriods in 18.99 erest of do 0.98 the rest of 17.77 results the whole 18.55	season the living the	) ng a (se of the second secon	area from the second se	om Table 9a)  Jul  0.88  3 to 7  20.7  Table  0.68  ow ste  18.98	Au 0.8  7 in T 20.6  19.0  9a)  0.7  ps 3  18.9  + (1-1)	Th1 (°C)  Ig Sep 9 0.96  able 9c) 67 20.29  0, Th2 (°C) 106 19.03  1 0.91  to 7 in Table 17 18.64  f  - fLA) × T2 19.42	Oct 0.99 19.64 19 0.98 e 9c) 17.99 LA = Liv	Nov 1 18.96 18.99 0.99 17.3 ving area ÷ (	Dec 1 18.4 18.97		(85) (86) (87) (88) (89)

	T		l		T	T	l		T		1		(00)
(93)m= 17.51	17.71	18.06	18.55	19.04	19.53	19.79	19.77	19.42	18.77	18.08	17.52		(93)
8. Space hea				ro obtoir	and at at	on 11 of	Table Ok	o co tha	t Ti m_/	76)m an	d ro colo	ulato	
the utilisation					icu ai sii	ър птог	i abie 3i	), 50 ii ia	ı. 11,111—(	<i>i</i> ojili ali	u ie-caic	uiate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, hm	1:										
(94)m= 1	0.99	0.99	0.98	0.96	0.9	0.78	0.8	0.92	0.98	0.99	1		(94)
Useful gains,	1	· ·	4)m x (84	4)m	T	ı	1		ı				
(95)m= 457.11	553.06	610.21	631.85	618.93	555.19	467.2	475.12	543.64	527.84	463.46	428.4		(95)
Monthly aver	<del></del>	T T	·		r						I 1		(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	e for mea		1975.04	1495.61	Lm , VV =	=[(39)m 635.17	x [(93)m-	` ,	1664.17	2256.73	2761.2		(97)
(97)m= 2787.46 Space heatin	l	l			<u> </u>	l		1068.9	<u> </u>		2/01.2		(97)
(98)m= 1733.78	<del></del>		967.1	652.25	0	0.02	0	0 0	845.43	1291.15	1735.6		
(30)111= 1733.70	1407.04	1044.01	307.1	002.20				,	<u> </u>	r) = Sum(9	<u> </u>	10006.86	(98)
O b			1-10/1- /	2/			Tota	i poi year	(KVVII/yCai	) = Odiff(3	O)15,912 —		= ' '
Space heating	ig require	ement in	kvvh/m²	/year							l	196.21	(99)
9b. Energy red			The state of the s	Ĭ									
This part is us Fraction of spa										unity sch	neme.	0	(301)
							(Table I	1) 0 11 11	OHE		l	0	=
Fraction of spa	ace heat	trom co	mmunity	system	1 - (30)	1) =					[	1	(302)
The community s									up to four	other heat	sources; th	he latter	
includes boilers, l Fraction of he					rom power	stations.	See Apper	idix C.				1	(303a)
					oiloro				(2	02) v (202	[		╡`
Fraction of tot										02) x (303	a) = [	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1.05	(305)
Distribution los	ss factor	(Table 1	12c) for d	commun	ity heatii	ng syste	m					1.1	(306)
Space heatin	g											kWh/yea	r
Annual space	heating	requiren	nent									10006.86	
Space heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [	11557.93	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	.ppendix	E)		0	(308
Space heating	•		•		-	,			) ) ) ) x 100 -	,	l [	0	(309)
Space fleating	require	ineni no	111 360011	uary/su	ppiemen	lary sys	l <b>C</b> III	(50) X (50	31) X 100 ·	- (300) =			(303)
Water heating	-										ı		
Annual water	_	•										1831.51	
If DHW from o		•						(64) v (3(	13a) v (30	5) x (306) :	_ [	2115.39	(310a)
		•									l r		=
Electricity use							0.01	× [(307a).	(307e) +	· (310a)(	310e)] =	136.73	(313)
Cooling Syste	m Energ	y Efficie	ncy Ration	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans	within dv	velling (	Γable 4f)	:							
mechanical ve							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)			407.66	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission facto kg CO2/kWh	r 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 to	two fuels repeat (363) to	(366) for the second for	uel 65	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0	= 4543.75	(367)
Electrical energy for heat distribution [(3	313) x	0.52	= 70.96	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372	2)	= 4614.71	(373)
CO2 associated with space heating (secondary) (3	809) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (3	373) + (374) + (375) =		4614.71	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	332))) x	0.52	= 211.57	(379)
Total CO2, kg/year sum of (376)(382) =			4826.29	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			94.63	(384)
El rating (section 14)			38.37	(385)

				User D	etails:						
Assessor Name: Software Name:	Strom	na FSAP 201	2		Strom Softwa				Versio	on: 1.0.3.4	
			Р	roperty .	Address	Unit 5					
Address :	, londo	on									
1. Overall dwelling dime	ensions:			Δ	- (m- 2)		Av. Ha	: au la 4 / 124 \		Value a/m²	
Basement					a(m²) 128	(1a) x		ight(m) .08	(2a) =	<b>Volume(m</b> <sup>2</sup> 522.24	(3a)
Total floor area TFA = (1	a)+(1b)+	-(1c)+(1d)+(1e	e)+(1r	n)	128	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	522.24	(5)
2. Ventilation rate:											
Number of chimneys	ma hea		econdai neating	ry   +	other 0	] = [	total 0	X 4	40 =	m³ per hou	ı <b>r</b>   (6a)
Number of open flues		0 +	0	┪╻┝	0	」 ] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	L_ ans				0	J L			10 =		(7a)
						Ļ	3			30	╡`´
Number of passive vents						L	0		10 =	0	(7b)
Number of flueless gas f	ires						0	X 4	40 =	0	(7c)
									Air ch	nanges per ho	NI P
	مريد ال	and fame (6	a) . (6b) . (7	70) ( (7b) ( (	70) -	_		_			_
Infiltration due to chimne						continue fr	30 om (9) to (		÷ (5) =	0.06	(8)
Number of storeys in t			λα, μ. σσσσ				0,11 (0) 10 (	. 3)		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (						•	uction			0	(11)
if both types of wall are p deducting areas of open			ponding to	the great	er wall are	a (after					
If suspended wooden	• / .		led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er		•	,	,	,.					0	(13)
Percentage of window	s and do	ors draught s	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	(13) +	+ (15) =		0	(16)
Air permeability value				•		•	etre of e	nvelope	area	20	(17)
If based on air permeabi	•						:- h - :	1		1.06	(18)
Air permeability value application Number of sides sheltered		surisation test na	s been aor	ne or a deg	gree air pe	теарицу	is being us	sea		2	(19)
Shelter factor	Ju				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelt	ter factor			(21) = (18	x (20) =				0.9	(21)
Infiltration rate modified	for month	nly wind speed	ł								_
Jan Feb	Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from	n Table 7									
(22)m= 5.1 5		4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	.0)	•								-	
Wind Factor (22a)m = (2	<del>-</del> -	, ,								1	
(22a)m= 1.27   1.25	1.23	1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

l 1.15 l					<del>i ´</del>	<del>r` ´</del>	(22a)m				1	
Calculate effec	1.12 1.1 tive air chan	1	0.97 he appli	0.85 cable ca	0.85 se	0.83	0.9	0.97	1.01	1.06	]	
If mechanica		<b>9</b>										0
If exhaust air he	at pump using A	Appendix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)				0 (
If balanced with	heat recovery:	efficiency in %	allowing f	for in-use f	factor (fron	n Table 4h	) =					0
a) If balance	d mechanica	l ventilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(
b) If balance	d mechanica	l ventilation	without	heat red	covery (I	ИV) (24b	m = (22)	2b)m + (2	23b)		7	
24b)m= 0	0 0		0	0	0	0	0	0	0	0	]	(
c) If whole he if (22b)m	ouse extract $0 < 0.5 \times (23 \text{ kg})$		•	•				.5 × (23b	)			
24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(
d) If natural v	ventilation or n = 1, then (2		•	•				0.5]		•	•	
24d)m= 1.15	1.12 1.1	0.99	0.97	0.86	0.86	0.85	0.9	0.97	1.01	1.06	]	(
Effective air	change rate	- enter (24a	n) or (24k	b) or (24	c) or (24	d) in bo	x (25)			-	-	
25)m= 1.15	1.12 1.1	0.99	0.97	0.86	0.86	0.85	0.9	0.97	1.01	1.06		(
3. Heat losses	and heat lo	ss paramet	er:									_
LEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value		A X k kJ/K
oors Type 1				2.8	х	1.4	=	3.92				
oors Type 2												
r				1.5	X	1.4	<del>-</del>	2.1				(
vindows Type	1			1.5	x x x1	1.4 /[1/( 4.8 )+		2.1 69.87				(
					<b>-</b>		0.04] =					
/indows Type	2			17.35	x1	/[1/( 4.8 )+	0.04] =	69.87				(
Vin <mark>dows Type</mark> Vindows Type Vindows Type Ioor	2			17.35	x1 x1	/[1/( 4.8 )+ /[1/( 1.6 )+	0.04] =	69.87				
/indows Type /indows Type loor	2	18.8	5	17.35 2.48 1.5	x1 x1 x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+	0.04] =	69.87 3.73 6.04			] ] [	(
/indows Type /indows Type loor /alls Type1	2 3	18.8	_	17.35 2.48 1.5	x1 x1 x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+ 	0.04] = 0.04] = 0.04] = = = =	69.87 3.73 6.04 101.12				(
/indows Type /indows Type loor /alls Type1 /alls Type2	2 3 74.26		3	17.35 2.48 1.5 128 55.4	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+ 0.79	0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	69.87 3.73 6.04 101.12 116.36				
/indows Type /indows Type loor /alls Type1 /alls Type2 /alls Type3	2 3 74.26 46.4	5.28	3	17.38 2.48 1.5 128 55.4 41.12	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+ 0.79 2.1	0.04] = 0.04] = 0.04] = = = = = = = =	69.87 3.73 6.04 101.12 116.36 11.51				
/indows Type /indows Type loor /alls Type1 /alls Type2 /alls Type3 /alls Type4	2 3 74.26 46.4 71.16	5.28	3	17.35 2.48 1.5 128 55.4 <sup>2</sup> 41.12 69.66	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+ 0.79 2.1 0.28	0.04] = 0.04] = 0.04] = = = = = = = = = =	69.87 3.73 6.04 101.12 116.36 11.51 146.29				
/indows Type /indows Type loor /alls Type1 /alls Type2 /alls Type3 /alls Type4 oof	2 3 74.26 46.4 71.16 5.34	5.28 1.5	3	17.35 2.48 1.5 128 55.4 41.12 69.66 5.34	x1 x1 x x1 x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+	0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	69.87 3.73 6.04 101.12 116.36 11.51 146.29				
/indows Type /indows Type	2 3 74.26 46.4 71.16 5.34	5.28 1.5	3	17.35 2.48 1.5 128 55.4 41.12 69.66 5.34	x1 x1 x x1 x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+	0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	69.87 3.73 6.04 101.12 116.36 11.51 146.29				
/indows Type /indows Type loor /alls Type1 /alls Type2 /alls Type3 /alls Type4 oof otal area of elearty wall	2 3 74.26 46.4 71.16 5.34 17 dements, m <sup>2</sup>	5.28 1.5 0 0 se effective w	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	17.35 2.48 1.5 128 55.4 41.12 69.66 5.34 17 342.1 22.1 alue calcul	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+ /[1/( 4.8 )+ 0.79 2.1 0.28 2.1 0.3	0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 1.7	] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [	paragrapi	] [ ] [ ] [ ] [	
/indows Type /indows Type /indows Type /alls Type1 /alls Type3 /alls Type4 oof otal area of elearty wall for windows and include the area	2 3 74.26 46.4 71.16 5.34 17 lements, m² roof windows, us on both sides	5.28 1.5 0 0 see effective w	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	17.35 2.48 1.5 128 55.4 41.12 69.66 5.34 17 342.1 22.1 alue calcul	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+ /[1/( 4.8 )+ 0.79 2.1 0.28 2.1 0.3	0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 1.7	] [	paragrapi		
/indows Type /indows Type loor /alls Type1 /alls Type2 /alls Type3 /alls Type4 oof otal area of el	2 3 74.26 46.4 71.16 5.34 17 lements, m² roof windows, us s on both sides s, W/K = S (A)	5.28 1.5 0 0 see effective w of internal was	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	17.35 2.48 1.5 128 55.4 41.12 69.66 5.34 17 342.1 22.1 alue calcul	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+	0.04] = 0.04]	69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 1.7			46	
/indows Type /indows Type /indows Type /alls Type1 /alls Type3 /alls Type4 oof otal area of ele arty wall for windows and include the area abric heat los	2 3 74.26 46.4 71.16 5.34 17 dements, m² roof windows, us on both sides s, W/K = S (A x k) Cm = S(A x k)	5.26 1.5 0 0 see effective w of internal was A x U)	indow U-ve	17.35 2.48 1.5 128 55.4 41.12 69.66 5.34 17 342.1 22.1 alue calculatitions	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/( 4.8 )+ /[1/( 1.6 )+ /[1/( 4.8 )+	0.04] = 0.04]	69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 1.7 0 ue)+0.04] a	2) + (32a).		46	4.24

if details of therma	0 0	are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)				<b>7</b>
Total fabric he				_				• •	(36) =	(E)		516.24	(37)
Ventilation hea			·	<u> </u>		<del></del>		· · ·	<u> </u>	25)m x (5)		1	
Jan 407.5	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m= 197.5	193.63	189.76	170.4	166.62	149	149	145.73	155.79	166.62	174.27	182.01		(30)
Heat transfer of		nt, W/K				1	1	<del>-                                    </del>	= (37) + (3	38)m	1	ī	
(39)m= 713.74	709.87	705.99	686.64	682.86	665.24	665.24	661.97	672.02	682.86	690.5	698.25		_
Heat loss para	motor (L	אי עם ור	/m2l/						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	686.26	(39)
Heat loss para (40)m= 5.58	5.55	5.52	5.36	5.33	5.2	5.2	5.17	5.25	5.33	5.39	5.46	]	
(40)m= 5.58	5.55	5.52	5.36	5.55	5.2	5.2	5.17					F 26	(40)
Number of day	s in mor	nth (Tab	le 1a)	_	-	-	-		Average =	Sum(40)₁	12 / 1 Z=	5.36	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ener	rgy requi	irement:								kWh/ye	ear:	
Assumed east	inanay l	NI.										1	(40)
Assumed occu if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)1 + 0.0	0013 x (	ΓFA -13.		.89		(42)
if TFA £ 13.9			L. 5.4	( ) )	(		,_,	(					
Annual averag											2.83		(43)
Redu <mark>ce the</mark> annua	\				_	-	to achieve	a water us	se target o	f			
		_							0.1			1	
Jan Hot water usage ii	Feb	Mar day for or	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
												1	
(44)m= 113.11	109	104.88	100.77	96.66	92.55	92.55	96.66	100.77	104.88	109	113.11		7
Energy content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,i	m x nm x E	OTm / 3600			m(44) <sub>112</sub> : ables 1b, 1		1233.94	(44)
(45)m= 167.74	146.71	151.39	131.98	126.64	109.28	101.27	116.2	117.59	137.04	149.59	162.45		
									Γotal = Su	m(45) <sub>112</sub> =	=	1617.89	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 25.16	22.01	22.71	19.8	19	16.39	15.19	17.43	17.64	20.56	22.44	24.37		(46)
Water storage			-					-				1	
Storage volum	` ,		•			_		ame ves	sel		160		(47)
If community h	•			•			` '		(01.1				
Otherwise if no		hot wate	er (this in	ıcludes ı	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	47)			
Water storage a) If manufact		aclared l	nee farti	nr is kna	wn (k\/\/	n/day)·					0	]	(48)
•				JI 13 KI10	WII (IXVVI	i/day).					0	] ]	, ,
Temperature for							(40) (40)				0		(49)
Energy lost fro b) If manufact		•	-		or is not		(48) x (49)	) =		1	10		(50)
Hot water stora			-							0	.02		(51)
If community h	-			,		-,					<del>-</del>	Į	(= -)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	(54) in (5	55)								1.	.03		(55)
												•	

Water storage loss calcul	lated for each	month			((56)m = (	55) × (41)r	m				
(56)m= 32.01 28.92 3	32.01 30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dedicated so	olar storage, (57)	m = (56)m x	· [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01 28.92 3	32.01 30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit loss (annu	ual) from Table	e 3							0		(58)
Primary circuit loss calcul	•		59)m = (	(58) ÷ 36	55 × (41)	m				l	
(modified by factor fron		,	,	. ,	, ,		r thermo	stat)			
(59)m= 23.26 21.01 2	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	r each month	(61)m = (6	60) ÷ 36	65 × (41)	)m					•	
(61)m= 0 0	0 0	0	0	0	0	0	0	0	0		(61)
Total heat required for wa	ater heating ca	alculated	for each	n month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 223.02 196.63 2	06.67 185.48	181.92	162.78	156.54	171.48	171.09	192.32	203.09	217.72		(62)
Solar DHW input calculated usi	ing Appendix G o	Appendix I	H (negativ	ve quantity	/) (enter '0	if no sola	r contribut	on to wate	er heating)	•	
(add additional lines if FG	GHRS 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	ſ	-							-	•	
(64)m= 223.02 196.63 2	06.67 185.48	181.92	162.78	156.54	171.48	171.09	192.32	203.09	217.72		
					Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2268.73	(64)
Heat gains from water he	eating, kWh/m	onth 0.25	[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	
(65)m= 74.38 65.59 6	8.95 61.89	60.72	54.35	52.28	57.25	F7.44	64.18	67.75	72.62		(65)
(00)	01.09	00.72	54.55	52.20	57.25	57.11	04.10	67.75	12.62		(00)
include (57)m in calcula			_						<u> </u>	eating	(55)
	ation of (65)m	only if cy	_						<u> </u>	eating	(66)
include (57)m in calcula  5. Internal gains (see Ta	ation of (65)m able 5 and 5a	only if cy	_						<u> </u>	eating	(66)
include (57)m in calcula 5. Internal gains (see Tournal gains (Table 5)	ation of (65)m able 5 and 5a	only if cy	_						<u> </u>	eating	(33)
include (57)m in calcula  5. Internal gains (see Table 5)  Metabolic gains (Table 5)  Jan Feb	ation of (65)m able 5 and 5a ), Watts	only if cy	vlinder is	s in the d	dwelling	or hot w	ater is fr	om com	munity h	eating	(66)
include (57)m in calcula  5. Internal gains (see Table 5)  Metabolic gains (Table 5)  Jan Feb	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48	only if cy : May 144.48	Jun 144.48	Jul 144.48	Aug 144.48	Sep	oct	om com	munity h	eating	
include (57)m in calculated  5. Internal gains (see Towns of the second	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48	only if cy : May 144.48	Jun 144.48	Jul 144.48	Aug 144.48	Sep	oct	om com	munity h	eating	
include (57)m in calculated  5. Internal gains (see Towns of the see Towns	ation of (65)m  able 5 and 5a  ), Watts  Mar Apr  44.48 144.48  d in Appendix 32.88 24.89	only if cy : May 144.48 L, equation 18.61	Jun 144.48 on L9 on 15.71	Jul 144.48 r L9a), a 16.97	Aug 144.48 Iso see	Sep 144.48 Table 5 29.61	Oct 144.48	Nov	Dec	eating	(66)
include (57)m in calculated  5. Internal gains (see Table 5)  Metabolic gains (Table 5)  Jan Feb  (66)m= 144.48 144.48 1  Lighting gains (calculated 67)m= 45.52 40.43 3  Appliances gains (calculated forms)	ation of (65)m  able 5 and 5a  ), Watts  Mar Apr  44.48 144.48  d in Appendix 32.88 24.89	only if cy : May 144.48 L, equation 18.61	Jun 144.48 on L9 on 15.71	Jul 144.48 r L9a), a 16.97	Aug 144.48 Iso see	Sep 144.48 Table 5 29.61	Oct 144.48	Nov	Dec	eating	(66)
include (57)m in calculated  5. Internal gains (see Table 5)  Metabolic gains (Table 5)  Jan Feb  (66)m= 144.48 144.48 15  Lighting gains (calculated (67)m= 45.52 40.43 3  Appliances gains (calculated forms)	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 90.64 274.2	May 144.48 L, equation 18.61 dix L, equal 253.45	Jun 144.48 on L9 or 15.71 ration L	Jul 144.48 r L9a), a 16.97 13 or L1: 220.91	Aug 144.48 Iso see 22.06 3a), also 217.85	Sep 144.48 Table 5 29.61 see Tal 225.57	Oct 144.48 37.6 ble 5 242.01	Nov 144.48 43.88	Dec 144.48	eating	(66) (67)
include (57)m in calculated  5. Internal gains (see Table 5)  Jan Feb  (66)m= 144.48 144.48 1.  Lighting gains (calculated 67)m= 45.52 40.43 3.  Appliances gains (calculated 68)m= 295.29 298.36 2.  Cooking gains (calculated	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 90.64 274.2	May 144.48 L, equation 18.61 dix L, equal 253.45	Jun 144.48 on L9 or 15.71 ration L	Jul 144.48 r L9a), a 16.97 13 or L1: 220.91	Aug 144.48 Iso see 22.06 3a), also 217.85	Sep 144.48 Table 5 29.61 see Tal 225.57	Oct 144.48 37.6 ble 5 242.01	Nov 144.48 43.88	Dec 144.48	eating	(66) (67)
include (57)m in calculated (57)m in calculated (57)m in calculated (58)m= 144.48 144.48 152 152 152 152 152 152 152 153 153 153 153 153 153 153 153 153 153	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendi 90.64 274.2 d in Appendix 37.45 37.45	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation	Jun 144.48 on L9 on 15.71 uation L 233.94 on L15	Jul 144.48 r L9a), a 16.97 13 or L1: 220.91 or L15a)	Aug 144.48 Iso see 22.06 3a), also 217.85	Sep 144.48 Table 5 29.61 see Tal 225.57	Oct 144.48  37.6 ble 5 242.01	Nov 144.48 43.88	Dec 144.48 46.78	eating	(66) (67) (68)
include (57)m in calculated  5. Internal gains (see Table 5)  Jan Feb  (66)m= 144.48 144.48 1  Lighting gains (calculated 67)m= 45.52 40.43 3  Appliances gains (calculated 68)m= 295.29 298.36 2  Cooking gains (calculated	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendi 90.64 274.2 d in Appendix 37.45 37.45	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation	Jun 144.48 on L9 on 15.71 uation L 233.94 on L15	Jul 144.48 r L9a), a 16.97 13 or L1: 220.91 or L15a)	Aug 144.48 Iso see 22.06 3a), also 217.85	Sep 144.48 Table 5 29.61 see Tal 225.57	Oct 144.48  37.6 ble 5 242.01	Nov 144.48 43.88	Dec 144.48 46.78	eating	(66) (67) (68)
include (57)m in calculated  5. Internal gains (see Towns of the following see Towns of the following	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 90.64 274.2 d in Appendix 37.45 37.45 Table 5a) 0 0	May 144.48 L, equation 18.61 dix L, equation 253.45 L, equation 37.45	Jun 144.48 on L9 on 15.71 lation L 233.94 on L15 37.45	Jul 144.48 r L9a), a 16.97 13 or L1: 220.91 or L15a) 37.45	Aug 144.48 Iso see 22.06 3a), also 217.85 , also se 37.45	Sep 144.48 Table 5 29.61 see Tal 225.57 ee Table 37.45	Oct 144.48  37.6 ble 5 242.01 5 37.45	Nov 144.48 43.88 262.76	Dec 144.48 46.78 282.26 37.45	eating	(66) (67) (68) (69)
include (57)m in calculated  5. Internal gains (see Table 5)  Jan Feb  (66)m= 144.48 144.48 1.  Lighting gains (calculated (67)m= 45.52 40.43 3.  Appliances gains (calculated (68)m= 295.29 298.36 2.  Cooking gains (calculated (69)m= 37.45 37.45 3.  Pumps and fans gains (Table 5)  Jan Feb  (66)m= 144.48 1.  Lighting gains (calculated (67)m= 295.29 298.36 2.  Cooking gains (calculated (69)m= 37.45 37.45 3.	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 90.64 274.2 d in Appendix 37.45 37.45 able 5a) 0 0 (negative value	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation 37.45  0 es) (Table	Jun 144.48 on L9 on 15.71 lation L 233.94 on L15 37.45	Jul 144.48 r L9a), a 16.97 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 22.06 3a), also 217.85 , also se 37.45	Sep 144.48 Table 5 29.61 0 see Tal 225.57 ee Table 37.45	Oct 144.48  37.6 ble 5 242.01 5 37.45	Nov 144.48 43.88 262.76	Dec 144.48 46.78 282.26 0	eating	(66) (67) (68) (69)
include (57)m in calculated (58)m= 295.29 298.36 2 Cooking gains (calculated (69)m= 37.45 37.45 3 Pumps and fans gains (T0)m= 0 0 Losses e.g. evaporation (55.2	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 37.45 37.45 able 5a) 0 0 (negative value) 15.58 -115.58	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation 37.45  0 es) (Table	Jun 144.48 on L9 or 15.71 ration L <sup>2</sup> 233.94 on L15 37.45	Jul 144.48 r L9a), a 16.97 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 22.06 3a), also 217.85 , also se 37.45	Sep 144.48 Table 5 29.61 0 see Tal 225.57 ee Table 37.45	Oct 144.48 37.6 ole 5 242.01 5 37.45	Nov 144.48 43.88 262.76	Dec 144.48 46.78 282.26 0	eating	(66) (67) (68) (69) (70)
include (57)m in calculated (57)m in calculated (57)m in calculated (66)m= 144.48 144.48 1.  Lighting gains (calculated (67)m= 45.52 40.43 3.  Appliances gains (calculated (68)m= 295.29 298.36 2.  Cooking gains (calculated (69)m= 37.45 37.45 3.  Pumps and fans gains (Topims of the cooking gains of the cooking gains (Topims of the cooking gains of the cooking gain	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 37.45 37.45 able 5a) 0 0 (negative value) 15.58 -115.58	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation 37.45  0 es) (Table	Jun 144.48 on L9 or 15.71 ration L <sup>2</sup> 233.94 on L15 37.45	Jul 144.48 r L9a), a 16.97 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 22.06 3a), also 217.85 , also se 37.45	Sep 144.48 Table 5 29.61 0 see Tal 225.57 ee Table 37.45	Oct 144.48 37.6 ole 5 242.01 5 37.45	Nov 144.48 43.88 262.76	Dec 144.48 46.78 282.26 0	eating	(66) (67) (68) (69) (70)
include (57)m in calculated (57)m in calculated (57)m in calculated (58)m= 144.48 144.48 1.  Lighting gains (calculated (67)m= 45.52 40.43 3.  Appliances gains (calculated (68)m= 295.29 298.36 2.  Cooking gains (calculated (69)m= 37.45 37.45 3.  Pumps and fans gains (Topical (70)m= 0 0.  Losses e.g. evaporation (71)m= -115.58 -115.58 -1.  Water heating gains (Tab	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 37.45 37.45 able 5a) 0 0 (negative valu 15.58 -115.58 ble 5)	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation 37.45  0 es) (Table -115.58	Jun 144.48 on L9 or 15.71 ration L <sup>2</sup> 233.94 on L15 37.45 0 e 5) -115.58	Jul 144.48 r L9a), a 16.97 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 22.06 3a), also 217.85 , also se 37.45	Sep 144.48 Table 5 29.61 225.57 ee Table 37.45	Oct 144.48 37.6 ole 5 242.01 5 37.45 0 -115.58	Nov 144.48 43.88 262.76 37.45 0 -115.58	Dec 144.48 46.78 282.26 0 -115.58	eating	(66) (67) (68) (69) (70)
include (57)m in calculated (56)m= 144.48 144.48 1.  Lighting gains (calculated (67)m= 45.52 40.43 3.  Appliances gains (calculated (68)m= 295.29 298.36 2.  Cooking gains (calculated (69)m= 37.45 37.45 3.  Pumps and fans gains (T(70)m= 0 0 0.  Losses e.g. evaporation (71)m= -115.58 -115.58 -1.  Water heating gains (Table (72)m= 99.98 97.6 9.  Total internal gains =	ation of (65)m able 5 and 5a ), Watts Mar Apr 44.48 144.48 d in Appendix 32.88 24.89 ated in Appendix 37.45 37.45 able 5a) 0 0 (negative valu 15.58 -115.58 ble 5)	May 144.48 L, equation 18.61 dix L, equ 253.45 L, equation 37.45  0 es) (Table -115.58	Jun 144.48 on L9 or 15.71 ration L <sup>2</sup> 233.94 on L15 37.45 0 e 5) -115.58	Jul 144.48 r L9a), a 16.97 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 22.06 3a), also 217.85 , also se 37.45	Sep 144.48 Table 5 29.61 225.57 ee Table 37.45 0	Oct 144.48 37.6 ole 5 242.01 5 37.45 0 -115.58	Nov 144.48 43.88 262.76 37.45 0 -115.58	Dec 144.48 46.78 282.26 0 -115.58	eating	(66) (67) (68) (69) (70)

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

Orientat	tion:	Access Factor Table 6d	or	Area m²		Flu Tal	x ole 6a		g_ Table 6b	,	FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.48	,	1	0.63	x	0.76	х	0.7	=	9.72	(74)
North	0.9x	0.77	x	2.48	<u> </u>	2	0.32	x	0.76	X	0.7	=	18.58	(74)
North	0.9x	0.77	X	2.48	<u> </u>	3	4.53	x	0.76	x	0.7	=	31.57	(74)
North	0.9x	0.77	x	2.48	<u> </u>	: 5	5.46	x	0.76	x	0.7	=	50.71	(74)
North	0.9x	0.77	x	2.48	,	7	4.72	x	0.76	x	0.7	=	68.31	(74)
North	0.9x	0.77	X	2.48	<u> </u>	7	9.99	x	0.76	x	0.7	=	73.13	(74)
North	0.9x	0.77	X	2.48	,	7	'4.68	x	0.76	x	0.7	=	68.28	(74)
North	0.9x	0.77	X	2.48	<u> </u>	5	9.25	x	0.76	x	0.7	=	54.17	(74)
North	0.9x	0.77	X	2.48	,	2	1.52	x	0.76	x	0.7	=	37.96	(74)
North	0.9x	0.77	X	2.48	,	2	4.19	x	0.76	x	0.7	=	22.12	(74)
North	0.9x	0.77	X	2.48	,	1	3.12	x	0.76	x	0.7	=	11.99	(74)
North	0.9x	0.77	X	2.48	,		3.86	x	0.76	X	0.7	=	8.1	(74)
South	0.9x	0.77	X	17.35	,		6.75	x	0.85	X	0.7	=	334.46	(78)
South	0.9x	0.77	X	17.35	<u> </u>	7	6.57	x	0.85	x	0.7	=	547.77	(78)
South	0.9x	0.77	X	17.35	<u> </u>	: 5	7.53	x	0.85	x	0.7		697.76	(78)
South	0.9x	0.77	×	17.35		1	10.23	Х	0.85	X	0.7		788.62	(78)
South	0.9x	0.77	x	17.35	= ,	1	14.87	х	0.85	x	0.7	7	821.79	(78)
South	0.9x	0.77	x	17.35	<u> </u>	1	10.55	x \	0.85	x	0.7	_ =	790.86	(78)
South	0.9x	0.77	X	17.35	<b>7</b> ,	1	08.01	x	0.85	х	0.7	=	772.72	(78)
South	0.9x	0.77	x	17.35	<b>,</b>	1	04.89	х	0.85	x	0.7	<del>-</del>	750.42	(78)
South	0.9x	0.77	x	17.35	= ,	1	01.89	х	0.85	x	0.7	<del>=</del>	728.89	(78)
South	0.9x	0.77	x	17.35	٠,		2.59	x	0.85	x	0.7	=	590.82	(78)
South	0.9x	0.77	x	17.35			55.42	x	0.85	×	0.7	=	396.45	(78)
South	0.9x	0.77	x	17.35	= ,	:	40.4	x	0.85	x	0.7	=	289.01	(78)
West	0.9x	0.77	x	1.5	,	1	9.64	x	0.85	x	0.7	=	12.15	(80)
West	0.9x	0.77	X	1.5	,	: 3	8.42	x	0.85	x	0.7	=	23.76	(80)
West	0.9x	0.77	x	1.5	<u> </u>		3.27	x	0.85	x	0.7	=	39.13	(80)
West	0.9x	0.77	x	1.5	,		2.28	x	0.85	x	0.7	=	57.08	(80)
West	0.9x	0.77	X	1.5	<u> </u>	1	13.09	x	0.85	x	0.7	=	69.95	(80)
West	0.9x	0.77	x	1.5	<b>=</b> ,	1	15.77	x	0.85	x	0.7	_ =	71.6	(80)
West	0.9x	0.77	x	1.5	,	1	10.22	x	0.85	x	0.7	=	68.17	(80)
West	0.9x	0.77	X	1.5	<u> </u>		4.68	x	0.85	x	0.7	=	58.56	(80)
West	0.9x	0.77	x	1.5	<b>=</b> ,	: 7	'3.59	x	0.85	x	0.7	_ =	45.52	(80)
West	0.9x	0.77	x	1.5	= ,		5.59	x	0.85	x	0.7	<del>=</del>	28.2	(80)
West	0.9x	0.77	x	1.5	= ,	2	4.49	x	0.85	x	0.7	=	15.15	(80)
West	0.9x	0.77	x	1.5	= ,	1	6.15	х	0.85	x	0.7	=	9.99	(80)
			_		_			•						
Solar ga	ains ir	n watts, calcul	ated	for each mo	nth			(83)m	= Sum(74)m	(82)m			_	
` ′	356.33		3.46	896.41 960		935.6	909.17	863	.14 812.37	641.1	3 423.6	307.1	]	(83)
<u>_</u>		internal and		<del>`                                    </del>		` '				,			7	
(84)m=	863.47	1092.84 125	0.99	1347.8 1380	0.06	1327.07	1283.67	1246	5.35 1213.21	1073.3	890.68	800.1	J	(84)

7. Me	an inter	nal temr	perature	(heating	season	)								
				`			from Tah	ole 9, Th	1 (°C)				21	(85)
-		_		living are		_		JIO 0, 111	. ( 0)					
Otilise	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
(86)m=	1	1	1	0.99	0.98	0.97	0.93	0.94	0.98	0.99	1	1	l	(86)
			<u> </u>							0.55	'	'		(00)
			T T		<u> </u>		<del>-</del>	in Table				1	l	(a=)
(87)m=	17.67	17.88	18.28	18.87	19.47	20.08	20.46	20.42	19.94	19.15	18.34	17.68		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, Ti	h2 (°C)					
=m(88)	18.21	18.23	18.24	18.32	18.33	18.4	18.4	18.41	18.37	18.33	18.3	18.27	l	(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.99	0.97	0.9	0.7	0.75	0.93	0.99	1	1	1	(89)
Mean	interna	l tampar	atura in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to 7	7 in Tahl	 a 0c)				
(90)m=	15.48	15.7	16.11	16.75	17.35	17.99	18.31	18.29	17.84	17.04	16.21	15.53	1	(90)
(00)	.00							10.20		LA = Livin			0.36	(91)
											`	<i>'</i>		
			· `	1				+ (1 – fL				1	l	(00)
(92)m=	16.27	16.49	16.9	17.51	18.12	18.74	19.09	19.06	18.6	17.8	16.98	16.31		(92)
	_							4e, whe						(00)
(93)m=	16.27	16.49	16.9	17.51	18.12	18.74	19.09	19.06	18.6	17.8	16.98	16.31		(93)
			uirement			1 1 1		<del>-</del>		. —	-0)		1.	
				mperatui using Ta		ed at ste	ep 11 of	l able 9	o, so tha	t II,m=(	/6)m an	d re-calc	ulate	
tric at	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		ividy	Juli	July	, rug	ССР	001	1407	_ D00		
(94)m=	1	0.99	0.99	0.98	0.96	0.92	0.81	0.83	0.94	0.98	1	1		(94)
	L dains		<u> </u>	4)m x (84										
(95)m=	860.91	1086.77	<del>- `</del>	1323.83		1216.5	1035.48	1038.91	1142	1056.28	886.33	798.23	l	(95)
	nlv avera	age exte		perature		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	l	(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	1				
(97)m=	8546.27	8226.8	7339.05	5913.9	4382.29			1759.51	3021.12		6823.99	8453.98	l	(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>2</sup>	1)m			
(98)m=	5717.9	4798.1	4538.62		2270.7	0	0	0	0	2872.72		5695.88	1	
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	33473.89	(98)
Space	e heatin	a require	ement in	kWh/m²	?/vear								261.51	(99)
•		• ,											201.01	
	· ·			mmunity	Ŭ									
				• .		-		ting prov (Table 1	-		unity scr	neme. 	0	(301)
	•			-		•		(Table T	., •	0110				亅`
ractio	n ot spa	ace neat	from co	mmunity	system	1 – (301	1) =						1	(302)
	-									up to four o	other heat	sources; ti	ne latter	
			-	nai and wa ity boiler		rom power	stations.	See Appei	idix C.				1	(303a)
	5. 1100	0.111	. J	,	-								!	

Fraction of total space heat from Community boilers		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commu	unity heating system		1.05	(305)
Distribution loss factor (Table 12c) for community heating system			1.1	(306)
Space heating			kWh/year	_
Annual space heating requirement			33473.89	]
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	38662.34	(307a)
Efficiency of secondary/supplementary heating system in % (from	om Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary syst	tem (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2268.73	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2620.38	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	412.83	(313)
Cooling System Energy Efficiency Ratio			0	(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	0b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			803.82	(332)
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 (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to	(366) for the second fue	65	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0 =	13718.57	(367)
Electrical energy for heat distribution	[(313) x	0.52	214.26	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2) =	13932.82	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane			= 0	7(275)
	eous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	eous heater (312) x (373) + (374) + (375) =	0.22	13932.82	(375) (376)
Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelli	(373) + (374) + (375) =	0.22	13932.82	<b>」</b> ` `
CO2 associated with electricity for pumps and fans within dwelli	(373) + (374) + (375) =	0.22	13932.82	(376)
CO2 associated with electricity for pumps and fans within dwelli	(373) + (374) + (375) = ing (331)) x	0.52	13932.82	(376)
CO2 associated with electricity for pumps and fans within dwelling	(373) + (374) + (375) = ing (331)) x	0.52	13932.82	(376) (378) (379)
CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Total CO2, kg/year sum of (376)(382) =	(373) + (374) + (375) = ing (331)) x	0.52	13932.82 0 417.18 14350.01	(376) (378) (379) (383)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	re Ve			Versio	on: 1.0.3.4	
		roperty i	Address:	Unit 7					
Address: 1. Overall dwelling dime	, london								
1. Overall awelling all ne	noiono.	Area	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Basement			<u>`</u>	(1a) x		.05	(2a) =	250.1	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	82	(4)			J		
Dwelling volume				(3a)+(3b	)+(3c)+(3d	d)+(3e)+	(3n) =	250.1	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+ [	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0		0	x	20 =	0	(6b)
Number of intermittent far	ns			Ī	2	x -	10 =	20	(7a)
Number of passive vents				Ī	0	x ·	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X 4	40 =	0	(7c)
				_			Air ch	nanges per ho	our
Infiltration due to chimne	vs, flues and fans = (6a)+(6b)+(	7a)+(7b)+(	7c) =	Г	20		÷ (5) =	0.08	(8)
	een carried out or is intended, procee			ontinue fr			- (3) =	0.06	(0)
Number of storeys in th	ne dw <mark>elling</mark> (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame of			•	uction			0	(11)
deducting areas of openin	esent, use the value corresponding to gs); if equal user 0.35	o tne great	er waii are	а (аптег					
If suspended wooden f	loor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
<u> </u>	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	, ,	-			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	envelope	area	20	(17)
·	ty value, then $(18) = [(17) \div 20] + (18)$ is if a pressurisation test has been do				io hoina u	and		1.08	(18)
Number of sides sheltere		ie or a deg	gree air per	пеаышу	is being us	seu		2	(19)
Shelter factor	-		(20) = 1 -	0.075 x (	19)] =			0.85	(20)
Infiltration rate incorporati	ing shelter factor		(21) = (18)	x (20) =				0.92	(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								
(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	2)m ÷ 1							-	
	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	]	
	1 1 3.00	L		•		L <u>-</u>	L	J	

4.47	`	<u>_</u>	shelter ar	nd wind s	<del>i ´</del>	<del>`</del>	<del>` ´</del>	1 0 00	4.00	4.00	1	
1.17   Calculate effective				1	0.87 ise	0.85	0.92	0.99	1.03	1.08	J	
If mechanical		-	,,								0	(2
If exhaust air heat	pump using	Appendix N,	(23b) = (23b)	a) × Fmv (e	equation (l	N5)) , othe	rwise (23b	o) = (23a)			0	(2
If balanced with he	eat recovery	efficiency in	% allowing	for in-use f	factor (fron	n Table 4h	) =				0	(2
a) If balanced	mechanic	al ventilatio	n with he	at recov	ery (MV	HR) (24a	a)m = (2)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0	0	0 0	0	0	0	0	0	0	0	0		(2
b) If balanced	mechanic	al ventilatio	n without	heat red	covery (I	MV) (24b	m = (22)	2b)m + (2	23b)			
24b)m= 0	0	0 0	0	0	0	0	0	0	0	0		(2
c) If whole hou if (22b)m <		t ventilation (24), then	•	•				.5 × (23b	o)		_	
24c)m= 0	0	0 0	0	0	0	0	0	0	0	0		(2
d) If natural ve if (22b)m =		r whole hou 24d)m = (22	•	•				0.5]			_	
24d)m= 1.17	1.15 1.	12 1.01	0.99	0.88	0.88	0.86	0.92	0.99	1.03	1.08		(2
Effective air ch	nange rate	- enter (24	a) or (24	b) or (24	c) or (24	d) in bo	x (25)				,	
25)m= 1.17	1.15 1.	1.01	0.99	0.88	0.88	0.86	0.92	0.99	1.03	1.08		(2
3. Heat losses a	and heat lo	oss parame	ter:								_	
LEMENT	Gross area (m²	Openi )	ngs m²	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
oo <mark>rs Ty</mark> pe 1				1.8	х	3	=	5.4				(2
oo <mark>rs Ty</mark> pe 2				1.6	x	1.4		2.24				(2
Vindows Type 1				5.56	x1	/[1/( 4.8 )+	0.04] =	22.39				(2
Vindows Type 2				4	x1	/[1/( 4.8 )+	0.04] =	16.11				(2
Vindows Type 3				1.21	x1	/[1/( 4.8 )+	0.04] =	4.87				(2
loor				82	x	1.25		102.5	<u> </u>			(2
Valls Type1	79.85	12.	57	67.28	3 x	2.1	<del>-</del>	141.29	T i		$\exists \                                   $	(2
Valls Type2	20.23	1.	6	18.63	3 X	2.1	=	39.12				(2
loof	19.77			19.77	7 X	2.3	<del>-</del>	45.47	T i		7 F	(3
otal area of ele	ments, m²			201.8	35							(;
arty wall				16.8	X	0	=	0				(3
arty wall				5.8	x	0	<b>=</b>	0	F i		7 7	(3
for windows and ro include the areas					lated using	g formula 1	  /[(1/U-valu	ue)+0.04] a	as given in	paragraph	1 3.2	`
abric heat loss,	W/K = S	(A x U)				(26)(30	) + (32) =				379.39	9 (3
	m = S(A x)	k )					((28).	(30) + (32	2) + (32a).	(32e) =	0	(3
leat capacity Cr					•		Indica	ative Value	· High		450	
leat capacity Cr hermal mass pa	arameter (	TMP = Cm	÷ TFA) i	n KJ/m²K	١.		maice	ative value	. r iigii		450	(;
	ents where t	he details of th	,			recisely the			•	able 1f	450	(

Ventilation heat loss calculated monthly  Vanilation heat loss calculated monthly  Vanilation heat loss calculated monthly  Jun Jul Aug Sep Oct Nov Dec  (38)m = (38)	Total fabric he	at loss							(33) +	(36) =		Γ	397.79	(37)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec			alculated	d monthly	V						(25)m x (5)	L	397.79	(37)
(38)   96.6   94.7   92.81   83.34   81.43   72.85   71.02   76.94   81.45   85.23   89.02   (38)		1		· ·	<del></del>	Jun	Jul	Aua	` ′		1			
(39)				<del></del>				Ť				<del> </del>		(38)
(39)	Heat transfer	coefficie	nt, W/K	ļ.	l		Į.		(39)m	= (37) + (	38)m			
Heat loss parameter (HLP), W/m²K  (40)m = 0.03			<u> </u>	481.13	479.24	470.44	470.44	468.81			·	486.81		
Harmonian   Harm			=>				ı			_		12 /12=	480.87	(39)
Average = Sum(40)x/12=   5.86   (40)		<del> </del>	<del>-                                    </del>	r —	5.04	F 7.4		T = 70	·		r –			
Number of days in month (Table 1a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(40)m= 6.03	6.01	5.98	5.87	5.84	5.74	5.74	5.72				L .	5.96	(40)
4. Water heating energy requirement:  **Reduce the 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 or not more that 125 tiles here per base on per day of lawater usa, hot and cold!  **Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 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 or not more that 125 tiles here per base on per day rall water usa, 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 = fector from Table 1c x 43:  **(44)m= 102.93 99.18 95.44 91.7 87.95 84.21 84.21 87.95 91.7 95.44 99.18 102.93  **Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/min (see Tables to, fc, rd)  **(46)m= 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  **It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  **Water storage loss:**  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  **Diff monumal storage loss factor from Table 2 (kWh/litre/day) 0.02 (61)  **Total = Sum(45)	Number of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 / 12=	5.00	(40)
### A. 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 in litres per day. Vd., average = (25 x N) + 36  ### Reduce the 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 dwalling is designed to achieve a water use target or not more that 125 litres per person per day of water usage. In litres per day. Jun	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 or not more that 125 litres per person per day (all water usa, 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 = 102.93 99.18 95.44 91.7 87.95 84.21 84.21 87.95 91.7 95.44 99.18 102.93  Total = Sum(44)e 1122.82 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWn/month (see Tables 1b, 1c, 1d)  (45)m = 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  Total = Sum(45)e 117.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17  (46)m = 22.9 20.02 20.66 18.01 17.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17  (47) Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (47)  Water storage loss:  3) If manufacturer's declared loss factor is known (kWh/day): 0 (48)  Temperature factor from Table 2b 0 (49)  Diff manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)  Energy lost from water storage, kWh/year (48) x (49) = 0.6 (63)  Energy lost from water storage section 4.3  Volume factor from Table 2b 0.6 (63)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.06	(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 E 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 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 x (43)  (44)m = 102.93 99.18 95.44 91,7 87.95 84.21 84.21 87.95 91,7 95.44 99.18 102.93  Total = Sum(44), v = 1122.82 (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 = 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  Total = Sum(45), v = 1472.19 (45)  if instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m = 22.9 20.02 20.66 18.01 17.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)  for community heating see section 4.3  Volume factor from Table 2b 0.6 (63)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)														
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 divelling is designed to achieve a water use target or not more that 125 litres per person per day (all water usage hot water usage to litres per person per day (all water usage hot water usage in litres per person per day (all water usage hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)  (44)m = 102.93	4. Water hea	ting ene	rgy requi	irement:								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 divelling is designed to achieve a water use target or not more that 125 litres per per day fall water usage hot water usage by 5% if the divelling is designed to achieve a water use target or not more that 125 litres per per day fall 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 = 102.93	A													
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				:[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)1 + 0.0	0013 x (	ΓFA -13.		5		(42)
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 fall water use. Not and cold)    Jan					(	( )		/_/]	(		,			
Note										no torget o		3.57		(43)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m = 102.93 99.18 95.44 91.7 87.95 84.21 84.21 87.95 91.7 95.44 99.18 102.93  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 = 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  If instantaneous water healing at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m = 22.9 20.02 20.66 18.01 17.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17  (46) Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  If community heating see section 4.3  Volume factor from Table 2a 1.03 (52)  Temperature factor from Table 2b (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)						_	-	io acriieve	a water us	se largel o	·/			
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m = 102.93 99.18 95.44 91.7 87.95 84.21 84.21 87.95 91.7 95.44 99.18 102.93  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 = 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  If instantaneous water healing at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m = 22.9 20.02 20.66 18.01 17.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17  (46) Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  If community heating see section 4.3  Volume factor from Table 2a 1.03 (52)  Temperature factor from Table 2b (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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= 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 22.9 20.02 20.66 18.01 17.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)  If community heating see section 4.3  Volume factor from Table 2a 1.03 (52)  Temperature factor from Table 2b (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)				<u> </u>					Сор	00.	1101	300		
Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 k Wh/month (see Tables 1b, 1c, 1d)  (45)m= 152.63 133.5 137.76 120.1 115.24 99.44 92.15 105.74 107 124.7 136.12 147.82  Total = Sum(45) 1.12 = 1472.19 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 22.9 20.02 20.66 18.01 17.29 14.92 13.82 15.86 16.05 18.71 20.42 22.17 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)  If community heating see section 4.3  Volume factor from Table 2b 0.66 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)	(44)m= 102.93	99.18	95.44	91.7	87.95	84.21	84.21	87.95	91.7	95.44	99.18	102.93		
(45)me       152.63       133.5       137.76       120.1       115.24       99.44       92.15       105.74       107       124.7       136.12       147.82         Total = Sum(45) 12       Total = Sum(45) 12       1472.19       (45)         If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)       106       1472.19       (46)         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       160       (47)         If instantaneous 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)         Total = Sum(45) 12       0       (48)         Water storage loss:       0       (47)         A loss in the storage loss factor is known (kWh/day):       0       (48)         Calcated cylinder loss factor is not known:       0       (48)         Hot manufacturer's declared cylinder loss factor is not known:       0       0       0       0         Hot										Total = Su	m(44) <sub>112</sub> =	=	1122.82	(44)
Total = Sum(45) <sub>112</sub> = 1472.19   (45)	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	bles 1b, 1	c, 1d)		
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)         (46)m=       22.9       20.02       20.66       18.01       17.29       14.92       13.82       15.86       16.05       18.71       20.42       22.17       (46)         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       160       (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) =       110       (50)         b) If manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2 (kWh/litre/day)       0.02       (51)         If community heating see section 4.3         Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       1.03       (54)	(45)m= 152.63	133.5	137.76	120.1	115.24	99.44	92.15	105.74	107	124.7	136.12	147.82		_
(46)m=       22.9       20.02       20.66       18.01       17.29       14.92       13.82       15.86       16.05       18.71       20.42       22.17       (46)         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       160       (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) × (49) =       110       (50)         b) If manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2 (kWh/litre/day)       0.02       (51)         If community heating see section 4.3         Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       1.03       (54)	If instantaneous v	vater heati	na at point	of use (no	o hot water	· storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	- [	1472.19	(45)
Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel  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):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) x (49) =  110  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) x (51) x (52) x (53) =  1.03  (54)										18 71	20.42	22 17		(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)  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) × (49) =  110  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)		1	20.00	10.01	17.23	14.92	13.02	13.00	10.03	10.71	20.42	22.17		(10)
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  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)	Storage volum	ne (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(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) × (49) =  110 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03 (54)	If community h	neating a	ınd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) x (51) x (52) x (53) =  (48) x (49) =  0  (49)  (49)  (50)  (51)  (51)  (52)  (52)  (53)  Energy lost from water storage, kWh/year  (47) x (51) x (52) x (53) =  1.03  (54)			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b $0$ (49)  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) $0.02$ (51)  If community heating see section 4.3  Volume factor from Table 2a $1.03$ (52)  Temperature factor from Table 2b $0.6$ (53)  Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$ (54)	_		odorod I	oon foot	or io kno		2/dox4):							(40)
Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3  Volume factor from Table 2a 1.03 (52) Temperature factor from Table 2b 0.6 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03	,				JI IS KIIO	WII (KVVI	i/uay).							
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) x (51) x (52) x (53) =  1.03  (54)	•				201			(40) × (40)						
Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) x (51) x (52) x (53) =  1.03  (51)  (52)  (53)	•		_	-		or is not		(40) X (49)	) =		1	10		(50)
Volume factor from Table 2a	•			-							0.	02		(51)
Temperature factor from Table 2b		-		on 4.3										
Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 1.03 $ (54)				01							1.	.03		
	•										0	.6		(53)
Totar (FO) or (FA) in (FF)			_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	-			
Enter (50) or (54) in (55) 1.03 (55)	⊏⊓(e) (50) 0f	(54) III (t	JJ)								1.	.03		(55)

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(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= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(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 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= 207.91 183.42 193.03 173.59 170.51 152.93 147.42 161.02 160.5 179.98 189.61 203.1	(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	(63)
Output from water heater	
(64)m= 207.91 183.42 193.03 173.59 170.51 152.93 147.42 161.02 160.5 179.98 189.61 203.1	
Output from water heater (annual) <sub>112</sub> 2123.03	(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= 69.36 61.2 64.41 57.94 56.93 51.07 49.25 53.77 53.59 60.07 63.27 67.76	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
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):	
5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	(66)
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)
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= 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99	(66) (67)
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	` '
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	` '
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	(67)
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= 124.99 124.9	(67)
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= 124.99 124.9	(67) (68)
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= 124.99 124.9	(67) (68)
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	(67) (68) (69)
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= 124.99 124.9	(67) (68) (69)
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= 124.99 124.9	(67) (68) (69) (70)
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= 124.99 124.9	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70)
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= 124.99 124.9	(67) (68) (69) (70)

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

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flu Tal	x ole 6a		g_ Table 6b		FF Table 6c		Gains (W		
North	0.9x	0.77	x	4	×	1	0.63	x	0.85	x	0.7	=	17	.54	(74)
North	0.9x	0.77	x	4	X	2	0.32	x	0.85	x	0.7	_ =	33	.52	(74)
North	0.9x	0.77	x	4	X	3	4.53	x	0.85	x	0.7	=	56	.95	(74)
North	0.9x	0.77	x	4	X	5	5.46	x	0.85	x	0.7	=	91	.48	(74)
North	0.9x	0.77	x	4	X	7	4.72	x	0.85	x	0.7	=	123	3.23	(74)
North	0.9x	0.77	x	4	X	7	9.99	x	0.85	x	0.7	=	13 <sup>-</sup>	1.92	(74)
North	0.9x	0.77	x	4	X	7	4.68	x	0.85	x	0.7	=	123	3.17	(74)
North	0.9x	0.77	X	4	X	5	9.25	x	0.85	x	0.7	=	97	.72	(74)
North	0.9x	0.77	x	4	X		1.52	x	0.85	x	0.7	=	68	.47	(74)
North	0.9x	0.77	X	4	X	2	4.19	x	0.85	x	0.7	=	39	9.9	(74)
North	0.9x	0.77	x	4	X	1	3.12	X	0.85	X	0.7	=	21	.64	(74)
North	0.9x	0.77	x	4	X		8.86	x	0.85	x	0.7		14	.62	(74)
East	0.9x	1	X	5.56	X	1	9.64	x	0.85	x	0.7	=	45	.03	(76)
East	0.9x	1	x	5.56	X	3	8.42	X	0.85	X	0.7	=	88	.08	(76)
East	0.9x	1	x	5.56	X	6	3.27	x	0.85	x	0.7	=	14	5.06	(76)
East	0.9x	1	X	5.56	×	9	2.28	X	0.85	X	0.7	=	21	1.56	(76)
East	0.9x	1	x	5.56	x	1	13.09	x	0.85	x	0.7	_	259	9.27	(76)
East	0.9x	1	x	5.56	x	1	15.77	] x	0.85	x	0.7	=	26	5.41	(76)
East	0.9x	1	x	5.56	X	1	10.22	]/x	0.85	x	0.7	=	252	2.68	(76)
East	0.9x	1	x	5.56	X	9	4.68	X	0.85	x	0.7		217	7.05	(76)
East	0.9x	1	x	5.56	X	7	3.59	x	0.85	х	0.7	=	168	3.71	(76)
East	0.9x	1	x	5.56	x	4	5.59	X	0.85	x	0.7	=	104	4.52	(76)
East	0.9x	1	x	5.56	X	2	4.49	x	0.85	x	0.7	=	56	.14	(76)
East	0.9x	1	x	5.56	X	1	6.15	x	0.85	x	0.7	=	37	.03	(76)
West	0.9x	0.77	X	1.21	X	1	9.64	X	0.85	x	0.7	=	9	.8	(80)
West	0.9x	0.77	x	1.21	X	3	8.42	X	0.85	x	0.7	=	19	.17	(80)
West	0.9x	0.77	X	1.21	X	6	3.27	X	0.85	X	0.7	=	31	.57	(80)
West	0.9x	0.77	X	1.21	X	9	2.28	X	0.85	x	0.7	=	46	.04	(80)
West	0.9x	0.77	x	1.21	X	1	13.09	x	0.85	x	0.7	=	56	.42	(80)
West	0.9x	0.77	X	1.21	X	1	15.77	X	0.85	X	0.7	=	57	.76	(80)
West	0.9x	0.77	X	1.21	X	1	10.22	X	0.85	X	0.7	=	54	.99	(80)
West	0.9x	0.77	x	1.21	X	9	4.68	X	0.85	x	0.7	=	47	.24	(80)
West	0.9x	0.77	x	1.21	X	7	'3.59	x	0.85	x	0.7	=	36	.72	(80)
West	0.9x	0.77	x	1.21	X		5.59	x	0.85	x	0.7	=	22	.75	(80)
West	0.9x	0.77	x	1.21	X	2	4.49	x	0.85	x	0.7	=	12	.22	(80)
West	0.9x	0.77	x	1.21	X	1	6.15	x	0.85	x	0.7	=	8.	06	(80)
T		n watts, calcula	$\overline{}$				·	<del></del>	ı = Sum(74)m		1	T	7		(00)
(83)m=	72.36			349.08   438.		455.1	430.84	362	.01 273.9	167.16	90	59.71			(83)
Ţ		internal and s		<del>` '                                   </del>		` '		677	12 602.00	524 24	474.05	464.04	7		(84)
(84)m=	485.59	9 550.13 626	.05	717.3 782.	52 <u> </u>	776.05	738.19	677	.12 602.98	521.31	471.95	461.91	J		(04)

7. Me	an inter	nal temp	perature	(heating	season	)								
						•	from Tab	ole 9, Th	1 (°C)				21	(85)
-		_		living are		_		,	( - /					` ′
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.99	0.97	0.95	0.96	0.99	1	1	1		(86)
Mean	interna	l temner	ature in	living ar	 aa T1 (fo	llow sta	ns 3 to 7	r in Table					ı	
(87)m=	17.47	17.64	18.04	18.65	19.3	19.95	20.36	20.3	19.76	18.94	18.14	17.47		(87)
			l				Τ-	l					I	, ,
(88)m=	erature 18	auring r	18.01	18.07	18.08	aweiling 18.13	18.13	able 9, TI	18.11	18.08	18.05	18.03		(88)
			l .			Į		<u> </u>	10.11	10.00	10.00	10.00		(00)
1	tion fac			rest of d		<u>`</u>						I .		(00)
(89)m=	1	1	1	0.99	0.97	0.91	0.7	0.77	0.96	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)			•	
(90)m=	15.14	15.31	15.72	16.37	17.02	17.69	18.04	18.01	17.5	16.67	15.84	15.16		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.53	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	16.38	16.55	16.95	17.58	18.23	18.89	19.27	19.23	18.7	17.88	17.06	16.39		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	16.38	16.55	16.95	17.58	18.23	18.89	19.27	19.23	18.7	17.88	17.06	16.39		(93)
8. Spa	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut				using Ta								I _		
1.1411	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g			0.07	0.04	0.07		0.07	0.00				(04)
(94)m=	1	1	0.99	0.99	0.97	0.94	0.87	0.9	0.97	0.99	1	1		(94)
ı	484.46	548.29	0.00 + 0.00	4)m x (84 708.92	762.04	728.53	640.12	606.56	583.86	516.89	470.39	460.99		(95)
(95)m=							040.12	606.56	303.00	516.69	470.39	460.99		(90)
(96)m=	4.3	4.9	6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			<u> </u>					x [(93)m·			7.1	4.2		(00)
(97)m=		5738.37	5128.98		3131.71	2019.47			2180.79	Ī —	4811.71	5934.28		(97)
		l						24 x [(97)				00020		( )
(98)m=		3487.73	3352.41	2496.85	1763.04	0	0	0	0	<del>- `</del>	3125.75	4072.12		
` ′			ļ	ļ				LTota	l per year	l (kWh/year	) = Sum(9	8) <sub>15.912</sub> =	24591.08	(98)
Space	hoatin	a roquir	amont in	kWh/m²	!/voar					` ,	, (	,		(99)
·		•											299.89	
				mmunity										
						-		ting prov (Table 1 <i>°</i>	-		unity sch	neme.	0	(301)
	•			•	• •	•		(Table T	1) 0 11 11	OHE				=
	•			mmunity	•	,	,						1	(302)
								allows for		up to four (	other heat	sources; t	he latter	
			_	narana wa ity boiler		rom power	งเสม <b>ป</b> กร.	See Apper	iuix U.				1	(303a)
2.20				,									·	`

Fraction of total space heat from Community boilers	S	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)		m [	1.05	(305)
Distribution loss factor (Table 12c) for community he			1.1	<u> </u>  (306)
Space heating		L	kWh/year	<b>_</b>
Annual space heating requirement			24591.08	
Space heat from Community boilers	(98) x (304a	a) x (305) x (306) =	28402.69	(307a)
Efficiency of secondary/supplementary heating syst	em in % (from Table 4a or App	pendix E)	0	(308
Space heating requirement from secondary/suppler	mentary system (98) x (301)	x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		[	2123.03	_ ]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a	a) x (305) x (306) =	2452.1	(310a)
Electricity used for heat distribution	0.01 × [(307a)(	307e) + (310a)(310e)] =	308.55	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if r	not enter 0) = $(107) \div (3)$	14) =	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) + (3	330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)		Ī	634.57	(332)
12b. CO2 Emissions - Community heating scheme				
	Energy kWh/year	Emission factor I kg CO2/kWh I	Emissions kg CO2/year	
CO2 from other sources of space and water heating	•		.g ===,=	
Efficiency of heat source 1 (%)	ere is CHP using two fuels repeat (363)	) to (366) for the second fuel	65	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b)	x 0 =	10253.29	(367)
Electrical energy for heat distribution	[(313) x	0.52	160.14	(372)
Total CO2 associated with community systems	(363)(366) + (368)(	(372) =	10413.42	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312)	x 0.22 =	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		10413.42	(376)
CO2 associated with electricity for pumps and fans	within dwelling (004)	0.52 =	0	_
CO2 associated with electricity for pumps and fails	within dwelling (331)) x			(378)
CO2 associated with electricity for lighting	(332))) x	0.52 =	329.34	(378)
, , ,	(332))) x	0.52 =		
CO2 associated with electricity for lighting	(332))) x	0.52 =	329.34	(379)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20			Strom Softwa Address	are Vei			Versio	n: 1.0.3.4	
Address :	, london	r	торену .	Address	Offit 6					
1. Overall dwelling dimens	ions:									
_			Area	a(m²)		Av. He	ight(m)	,	Volume(m <sup>3</sup>	_
Basement				70	(1a) x	3	3.5	(2a) =	245	(3a)
Total floor area TFA = (1a)+	+(1b)+(1c)+(1d)+(1	1e)+(1r	n)	70	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	245	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	r
Number of chimneys	0 +	0	+ [	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = [	0	x 2	20 =	0	(6b)
Number of intermittent fans						2	x -	10 =	20	(7a)
Number of passive vents					Ė	0	x -	10 =	0	(7b)
Number of flueless gas fires	6				F	0	X 4	40 =	0	(7c)
					L			Air ch	nanges per ho	
Infiltration due to chimneys,						20		÷ (5) =	0.08	(8)
If a pressurisation test has been Number of storeys in the		ded, procee	d to (17), (	otherwise (	continue fr	om (9) to (	(16)		0	(9)
Additional infiltration	dwelling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timbe	r frame or	0.35 fo	r masonı	y constr	uction	,	•	0	(11)
if both types of wall are prese		esponding to	the great	ter wall are	a (after			'		
deducting areas of openings  If suspended wooden floo	•	aled) or 0	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, enter	,	•	(000	, c.cc					0	(13)
Percentage of windows a	nd doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, q5	•			•	•	etre of e	envelope	area	20	(17)
If based on air permeability  Air permeability value applies if	·					is boing u	sod		1.08	(18)
Number of sides sheltered	a pressurisation test n	ias been doi	ie or a det	gree all pe	meability	is being u	seu		1	(19)
Shelter factor				(20) = 1 -	(0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporating	g shelter factor			(21) = (18	x (20) =				1	(21)
Infiltration rate modified for	monthly wind spec	ed					-		-	
Jan Feb M	ar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spee	d from Table 7								1	
(22)m= 5.1 5 4.9	9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)r	n ÷ 4									
(22a)m= 1.27 1.25 1.2		0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rate (a	allowir	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
1.28	1.25 1	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		
Calculate effect		-	ate for t	he appli	cable ca	se						•	
If mechanica			ndiv N. (2	2h) _ (22a	) Em. (a	auation (N	IE\\ otho	nuico (22h	) - (225)			0	(23a)
If exhaust air he									) = (23a)			0	(23b)
If balanced with									21.) (		4 (00.)	0	(23c)
a) If balance	<del> </del>					<u> </u>	<u> </u>	ŕ	<del> </del>	<del></del>	<del>```</del>	÷ 100] I	(24a)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance								<del>í `</del>	<del>r ´       `</del>	<del>-                                    </del>	Ι ,	I	(24b)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240)
c) If whole h	ouse extrac n < 0.5 × (2			•	•				5 v (23k	<b>.</b> )			
(24c)m = 0	0.5 x (2.	0	0	0	0	0	0 = (221)	0	0	0	0	1	(24c)
( - /													(= :0)
d) If natural if (22b)n	n = 1, then (			•	•				0.5]				
(24d)m= 1.28	1.25 1	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(24d)
Effective air	change rate	e - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-		
(25)m= 1.28	1.25 1	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(25)
3. Heat losse	s and heat	lose n	aramete	or.									_
ELEMENT	Gross		Openin		Net Ar	ea	U-valu	IE.	AXU		k-value	j.	AXk
	are <mark>a (m²</mark>		m		A ,r		W/m2		(W/	K)	kJ/m <sup>2</sup> ·l		kJ/K
Doors					1.9	x	3	=	5.7				(26)
Windows Type	e 1				8.7	x1/	/[1/( 4.8 )+	0.04] =	35.03	Ħ			(27)
Windows Type	2				6.5	X1/	/[1/( 4.8 )+	0.04] =	26.17	Ħ			(27)
Windows Type	3				2.2	x1/	/[1/( 4.8 )+	0.04] =	8.86	5			(27)
Floor					70	X	1.25	─	87.5				(28)
Walls	116.5	7	19.3		97.2	x	2.1	<b>=</b>	204.12			<b>i</b> i	(29)
Roof	26.7	╡	0		26.7	X	2.3	_	61.41	=		╡┝	(30)
Total area of e		 2			213.2	=	2.0		01111				(31)
Party wall	,				24.2	=	0		0				(32)
Party wall						=		_		<b>러</b> 片		╡ 누	
* for windows and	roof windows	usa at	factive wi	ndow H-vs	8.6	x ated using	formula 1	=   	0		naragrank		(32)
** include the area						aleu usirig	TOTTIUIA 1	/[( 1/ <b>O</b> -vaic	1 <del>0)+0.04</del> ] 6	as giveri iii	paragrapi	1 3.2	
Fabric heat los	ss, W/K = S	(A x l	J)				(26)(30)	) + (32) =				428.8	(33)
Heat capacity	Cm = S(A x	(k)						((28).	(30) + (3	2) + (32a).	(32e) =	0	(34)
Thermal mass	parameter	(TMP	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For design assess can be used inste				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L x Y	/) calc	ulated ι	using Ap	pendix ł	<						84.8	(36)
if details of therma		not kno	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			513.6	
Ventilation hea		ılated	monthly	/						(25)m x (5)	)	313.0	(01)
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	100   1	iviai	, \pi	iviay	L	Jui	, lug	L	1 001	1,404	1 200		

(38)m   103.14   103.11   90.09   83.88   85.56   76.95   76.95   76.95   76.95   80.88   86.96   91   95.05   (88)								î			
Signate   Sign	` '	3.98 86.96	76.95	76.95	75.05	80.89	86.96	91	95.05		(38)
Heat loss parameter (HLP), W/m²K						· · ·		<del>_</del>			
Heat loss parameter (HLP), W/m²K	(39)m= 616.73 614.71 612.69 602	2.58   600.56	590.54	590.54	588.65				<u> </u>		7(20)
Average   Sum(40)	Heat loss parameter (HLP), W/m²l	<					_		12 /12=	602.11	(39)
Number of days in month (Table 1a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(40)m= 8.81 8.78 8.75 8.	.61 8.58	8.44	8.44	8.41						_
4. Water heating energy requirement:  **Note of the standard 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)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per day for each month Vd, m = acron from Table To, (43)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per person per day (all water use, hot and cold)  **Hot water usage in litres per day for each month Vd, m = acron from Table To, (43)  **Hot water usage in litres per day for each month Vd, m = acron from Table To, (43)  **Hot water usage in litres per day for each month Vd, m = acron from Table To, (43)  **Hot water usage in litres per day for each month Vd, m = acron from Table To, (43)  **Hot water storage loss:**  **It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  **Hot water storage loss:**  **It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  **Water storage loss:**  **It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  **Water storage loss acclared loss factor is known (kWh/day):**  **It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  **Water storage loss:**  **It instantaneous water heati	Number of days in month (Table 1	a)				/	Average =	Sum(40) <sub>1</sub>	12 /12=	8.6	(40)
### A. 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 pto 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 cot)  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)	Jan Feb Mar <i>F</i>	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 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 128 litres per person per day (all water use, not 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 tox (43)  (44)m 96.3 92.8 89.3 85.79 82.29 78.79 78.79 78.79 82.29 85.79 88.3 92.8 96.3  Total = Sum(44) = 105.55 [44]  Energy content of hot water used - calculated monthly = 4,190 x Vd.m x mm x DTm / 3600 kWh/month (see Tables to, fc, fd)  (45)m 142.81 124.3 128.89 112.37 107.82 83.04 86.22 98.93 100.12 116.67 127.36 138.3  Total = Sum(45) = 1 105.55 [44]  Energy content of litres point of use (no hot water storage), enter 0 in boxes (46) to (61)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  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:  3) If manufacturer's declared cylinder loss factor is known (kWh/day):  0 (48)  Temperature factor from Table 2b  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (52)  Temperature factor from Table 2a (52)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (55)  Water storage loss calculated for each month (66) monthly (66) me (55) x (41)m	(41)m= 31 28 31 3	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 littres 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 or not more that 128 litres per person per day (all water use, not 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 1cx (43)  (44)m 96.3 92.8 89.3 85.79 82.29 78.79 78.79 78.79 82.29 85.79 88.3 92.8 96.3  Total = Sum(44) = 1050.55 [44)  Energy content of hot water used - calculated monthly = 4,190 x Vd.m x mm x DTm / 3800 kWh/month (see Tables 16, 1c, 1d)  45)m 142.81 12.81 12.88 112.37 107.82 83.04 86.22 98.93 100.12 116.67 127.36 138.3  Total = Sum(45) = 137.43 [45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  Water Storage olume (litres) including any solar or WWHRS storage within same vessel 160 (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: 3 (48) (48) (49) = 110 (50)  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a (1.03 (52) (53) (53) (55)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (52)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (55)  Water storage loss calculated for each month (65) month (65) = 1.03 (55)		•									
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 1cx (43)  (44)m= 96.3 92.8 89.3 85.79 82.29 78.79 78.79 82.29 95.79 89.3 92.8 96.3  Energy content of hot water used - calculated monthly = 4,190 x Vd.m x pm x DTm 3600 kW/month (see Tables 1b, 1c, 1d)  (45)m= 142.81 124.9 128.89 112.37 107.82 93.04 86.22 98.93 100.12 116.67 127.36 138.3  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  If community heating see section 4.3  Volume factor from Table 2a 1.03 (52)  Energy lost from water storage, kWh/year (48) x (50) = 1.03 (52)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (52)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)	4. Water heating energy requirem	nent:							kWh/ye	ar:	
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 1cx (43)  (44)m= 96.3 92.8 89.3 86.79 82.29 78.79 78.79 82.29 96.79 89.3 92.8 96.3  Energy content of hot water usage - calculated monthly = 4,190 x Vd.m x pm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 142.81 124.9 128.89 112.37 107.82 93.04 86.22 98.93 100.12 116.67 127.36 138.3  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 21.42 18.74 19.33 16.86 16.17 13.96 12.93 14.84 15.02 17.5 19.1 20.75  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)  frommunity heating see section 4.3  Volume factor from Table 2b 0.6 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (52)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	Assumed occupancy. N							2	25		(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 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	if TFA > 13.9, N = 1 + 1.76 x [1 -	- exp(-0.00034	19 x (TF	FA -13.9)	)2)] + 0.0	0013 x (	ΓFA -13.		2.5		( := /
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Annual average hot water usage in								.55		(43)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	· · · · · · · · · · · · · · · · · · ·		•	•	o achieve	a water us	e target o	f	_		
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m = 96.3 92.8 89.3 85.79 82.29 78.79 78.79 82.29 85.79 83.3 92.8 96.3  Total = Sum(44)m = 1050.55 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd,m x hm x DTm / 3600 kWh/month (see Tables tb, 1c, 1d)  (46)m = 142.81 123.9 128.89 112.37 107.82 93.04 86.22 98.93 100.12 116.67 127.36 138.3  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m = 21.42 18.74 19.33 16.86 16.17 13.96 12.93 14.84 15.02 17.5 19.1 20.75 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 160 (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)  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)  If community heating see section 4.3  Volume factor from Table 2a 1.03 (52)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (55)  Water storage loss calculated for each month (56)m = (55) x (41)m				<i></i>	Aug	Con	Oct	Nov	Doo		
(44)m   96.3   92.8   89.3   85.79   82.29   78.79   78.79   82.29   85.79   89.3   92.8   96.3						Sep	Oct	INOV	Dec		
Total   Sum(44)   1.7 =   1050.55   (44)						85.79	89.3	92.8	96.3		
(45)m	(11)11.2 00.0 02.0 00.0	02.20	70.70	10.70	OZ.ZO					1050.55	(44)
Total = Sum(45)   =   1377.43   (45)	Energy content of hot water used - calculat	ted monthly = $4.19$	90 x Vd,n	n x nm x D	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
## instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  ## (46)m= 21.42   18.74   19.33   16.86   16.17   13.96   12.93   14.84   15.02   17.5   19.1   20.75  ## Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel   160   (47)  ## 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):	(45)m= 142.81 124.9 128.89 11	2.37 107.82	93.04	86.22	98.93	100.12	116.67	127.36	138.3		
(46)me       21.42       18.74       19.33       16.86       16.17       13.96       12.93       14.84       15.02       17.5       19.1       20.75         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       160       (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 loss factor from Table 2 (kWh/litre/day)       0.02       (51)         If community heating see section 4.3         Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       1.03       (54)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       1.03       (54)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =	If instantaneous water heating at point of u	uso (no hot water s	etorago)	ontor 0 in	hovos (16		Γotal = Su	m(45) <sub>112</sub> =	-	1377.43	(45)
Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel  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):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)  Enter (50) or (54) in (55)  Water storage loss calculated for each month		<del>.</del>			` '		47.5	10.1	00.75		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel  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):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) × (49) =  110  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) × (41)m	( -/	5.86   16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.75		(46)
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  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  C(47) × (51) × (52) × (53) =  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56) m = (55) × (41) m	· ·	ny solar or W\	WHRS	storage	within sa	ame ves	sel		160		(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  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  (48) × (49) =  0  0  (48)  0  (48) × (49) =  110  0  0.02  (51)  1.03  (52)  1.03  (54)  Enter (50) or (54) in (55)	If community heating and no tank i	in dwelling, en	ter 110	litres in	(47)						
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) × (41)m)	•	his includes in	stantan	eous co	mbi boil	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b $0$ $(49)$ Energy lost from water storage, kWh/year $(48) \times (49) = 110$ $(50)$ b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) $0.02$ $(51)$ If community heating see section 4.3  Volume factor from Table 2a $0.6$	•	factor is know	ın (k\A/k	\/day/\:							(40)
Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) $0.02$ (51) If community heating see section 4.3 (52) Temperature factor from Table 2b $0.6$ (53) Energy lost from water storage, kWh/year $0.02$ (54) in (55) $0.06$ (55) Water storage loss calculated for each month $0.06$ (56) $0.06$ (57) $0.06$ (58) $0.06$ (59) $0.06$ (59) $0.06$ (50) $0.06$ (50) $0.06$ (51)	,	iacioi is kilow	VII (KVVI	i/uay).							, ,
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) × (41)m)  (51)  (52)  (53)  (54)  (55)	•	Wh/vear			(48) x (49)	. =					
If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month $((52)$ $(47) \times (51) \times (52) \times (53) = (54)$ $(53)$ $(54)$ $(55)$ $(55)$ $((56)m = (55) \times (41)m$		•	r is not		(10) // (10)				10		(30)
Volume factor from Table 2a1.03(52)Temperature factor from Table 2b0.6(53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 1.03(54)Enter (50) or (54) in (55)1.03(55)Water storage loss calculated for each month $((56)m = (55) \times (41)m$	_	•	/litre/da	y)				0.	02		(51)
Temperature factor from Table 2b		4.3									(50)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$ (54) Enter (50) or (54) in (55) 1.03 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$								-			
Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) $\times$ (41)m	·	Mhlyear			(47) v (51)	v (52) v (l	23) -				. ,
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	-	vii/y <del>c</del> ai			(47) X (31)	/ X (32) X (	55) =				
	, , , , , ,	each month			((56)m = (	55) × (41)r	n		00		()
			30.98	32.01	32.01	30.98	32.01	30.98	32.01		(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	` '									хH	. ,
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (57)	(57)m= 32.01 28.92 32.01 30	0.98 32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	0	(58)
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 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)
Combi loss calculated for each month (61)m = (60) $\div$ 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 × (45)m +	(46)m + (57)m +	(59)m + (61)m
(62)m= 198.09 174.83 184.17 165.86 163.1 146.53 141.49 154.21 153.61 171.95	180.85 193.58	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu'	tion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	3,	
(63)m= 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater	<u> </u>	
(64)m= 198.09 174.83 184.17 165.86 163.1 146.53 141.49 154.21 153.61 171.95	180.85 193.58	1
Output from water heate	ļļ	2028.27 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m		, · · ·
(65)m= 66.09 58.34 61.47 55.37 54.46 48.95 47.28 51.51 51.3 57.4	60.36 64.6	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is f	rom community n	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= 112.31 112.31 112.31 112.31 112.31 112.31 112.31 112.31 112.31 112.31	112.31 112.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 29.9 26.56 21.6 16.35 12.22 10.32 11.15 14.49 19.45 24.7	28.83 30.73	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 197.3 199.34 194.19 183.2 169.34 156.31 147.6 145.55 150.71 161.7	175.56 188.59	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	-	
(69)m= 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23	34.23 34.23	(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 values) (Table 5)		
(71)m= -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84	-89.84 -89.84	(71)
Water heating gains (Table 5)		
(72)m= 88.84 86.81 82.61 76.91 73.2 67.98 63.54 69.23 71.25 77.16	83.83 86.82	(72)
	<u> </u>	()
	<del>, , , ,</del> , ,	(73)
(73)m= 372.73 369.41 355.09 333.15 311.45 291.3 278.99 285.97 298.11 320.24	344.91 362.84	(13)
<ol><li>Solar gains:</li><li>Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applical</li></ol>	ble orientation	
	FF	Gains
<del>0=</del>	able 6c	(W)
0.00	0.7 =	38.15 (74)
North 0.9x 0.77 x 8.7 x 20.32 x 0.85 x	0.7	72.9 (74)

-		_	_	r li	ving area, h1,	m (:			ı	ug Sep		Oct	Nov	Dec		
					heating seaso eriods in the li		area 1	rom Tab	ole 9.	Th1 (°C)					21	(85)
(84)m=	505.92	614.74	737.02	_	879.44 986.79		988.8	940.26	847	7.4 736.69	9 6	04.12	507.87	474.57		(84)
_				_	(84)m = (73)n	_	` '								- -	
(83)m=	133.2	245.33	381.93	$\overline{}$	546.29 675.3	_	697.5	661.27	561		_	83.88	162.96	111.73		(83)
Solar o	ains in v	watts. ca	lculate	ed	for each mon	th			(83)m	ı = Sum(74)m	n(8	32)m				
West	0.9x	0.77		X	6.5	X	1	6.15	X	0.85		X	0.7	=	43.29	(80)
West	0.9x	0.77	=	X	6.5	X	_	4.49	X	0.85	_	x	0.7	=	65.64	(80)
West	0.9x	0.77		X	6.5	X	4	5.59	x	0.85		x	0.7	=	122.19	==
West	0.9x	0.77		X	6.5	X	7	3.59	X	0.85		x	0.7	=	197.23	(80)
West	0.9x	0.77		X	6.5	x	9	4.68	x	0.85		x	0.7	=	253.75	(80)
West	0.9x	0.77		x	6.5	×	1	10.22	x	0.85		x	0.7	=	295.4	(80)
West	0.9x	0.77		x	6.5	x	1	15.77	x	0.85		x	0.7	=	310.29	(80)
West	0.9x	0.77		x	6.5	x	1	13.09	x	0.85		x	0.7	=	303.11	(80)
West	0.9x	0.77	$\dashv$	x	6.5	X		2.28	x	0.85	一	x [	0.7	=	247.33	(80)
West	0.9x	0.77	$\dashv$	x	6.5	×		3.27	X	0.85		x	0.7		169.58	(80)
West	0.9x	0.77		x	6.5	X		8.42	X	0.85	一	×	0.7	=	102.97	(80)
West	0.9x	0.77	#	x	6.5	X	-	9.64	X	0.85	=	× [	0.7	= =	52.64	(80)
South	0.9x	0.77		X	2.2	X		10.4	X	0.85	一	× [	0.7	=	36.65	(78)
South	0.9x	0.77		x	2.2	] ^ ] <sub>X</sub>	<del> </del>	5.42	^     x	0.85	$\dashv$	x [	0.7		50.27	(78)
South	0.9x	0.77	$\blacksquare$	x	2.2	, ,	-	2.59	^     x	0.85	$\dashv$	x F	0.7	╣ -	74.92	(78)
South	0.9x	0.77		x	2.2	]	<b>\</b>	04.89	x	0.85	$\dashv$	x F	0.7	= [	95.15	(78)
South	0.9x	0.77	=	x x	2.2	X		08.01	X	0.85	$\dashv$	x	0.7		97.98	(78)
South	0.9x 0.9x	0.77	<del></del>	X	2.2	X		10.55	X I v	0.85	$\dashv$	× L	0.7	╡ -	100.28	(78)
South	0.9x	0.77	_	X	2.2	l X		14.87	X	0.85	$\dashv$	× L	0.7	┥ -	104.2	(78)
South	0.9x	0.77	=	X	2.2	X L		10.23	X I	0.85	괵	х <u>Г</u>	0.7	╣ -	100	(78)
South South	0.9x	0.77	=	X	2.2	X		7.53	X	0.85		х Г	0.7	_  =	88.48	(78)
South	0.9x	0.77	_	X	2.2	X		6.57	X	0.85		X	0.7	=	69.46	(78)
South	0.9x	0.77	_	X	2.2	X	4	6.75	X	0.85		x	0.7	=	42.41	(78)
North	0.9x	0.77		X	8.7	x		3.86	X	0.85		x	0.7	=	31.8	(74)
North	0.9x	0.77		X	8.7	X	1	3.12	X	0.85		x	0.7	=	47.06	(74)
North	0.9x	0.77		X	8.7	X	2	4.19	X	0.85		x	0.7	=	86.78	(74)
North	0.9x	0.77		X	8.7	×	4	1.52	x	0.85		x	0.7	=	148.93	(74)
North	0.9x	0.77		X	8.7	X	5	9.25	X	0.85		x	0.7	=	212.54	(74)
North	0.9x	0.77		X	8.7	x	7	4.68	x	0.85		x	0.7	=	267.89	(74)
North	0.9x	0.77		X	8.7	x	7	9.99	x	0.85		x	0.7	=	286.93	(74)
North	0.9x	0.77		x	8.7	x	7	4.72	x	0.85		x	0.7	=	268.03	(74)
North	0.9x	0.77		X	8.7	x	5	5.46	x	0.85		x	0.7	_ =	198.97	(74)
North	0.9x	0.77		X	8.7	x	3	4.53	x	0.85		x	0.7	=	123.87	(74)

(86)m=	1	1	0.99	0.99	0.97	0.95	0.91	0.93	0.97	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	16.67	16.89	17.38	18.12	18.92	19.71	20.21	20.13	19.47	18.47	17.47	16.66		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
(88)m=	18	18	18	18	18	18	18	18	18	18	18	18		(88)
Utilisa	ition fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.99	0.98	0.95	0.86	0.62	0.7	0.93	0.98	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	14.49	14.7	15.2	15.93	16.72	17.48	17.89	17.84	17.26	16.27	15.28	14.47		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.81	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	16.25	16.47	16.96	17.7	18.5	19.28	19.77	19.69	19.05	18.05	17.05	16.24		(92)
		r					m Table			·	47.05	40.04		(93)
(93)m=	16.25	16.47	16.96 uirement	17.7	18.5	19.28	19.77	19.69	19.05	18.05	17.05	16.24		(93)
•		· ·			re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti.m=(	76)m an	d re-calc	culate	
			or gains			ou ur ou	ορ σ.		, ooa	( ) ( )	, o, i i a i	a ro care	diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.05	0.04	0.05		0.05	0.00	0.00			(04)
(94)m=	0.99	0.99	0.99 , W = (94	0.98	0.95	0.91	0.85	0.88	0.95	0.98	0.99	1		(94)
(95)m=	503.35	609.98	727.44	857.98	940.63	902.61	803.57	747.04	700.58	594	504.26	472.49		(95)
` ′			rnal tem		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)
1						Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	1			
		L	6410.78				1870.17		2942.15		6015.4	7326.33		(97)
		g require 4368.95			2339.63	Wh/mont	th = 0.02	24 x [(97)	)m – (95 0	)m] x (4 <sup>-</sup> 2884.9	ŕ	5099.26		
(90)111=	5109.16	4300.93	4220.4	3201.23	2339.03	0	0		l per year	l			31199.58	(98)
Space	, hoatin	a roquir	ement in	k\Mh/m²	2/voor			Tota	i per year	(KVVII/yeai	) = Sum(9	O)15,912 —	445.71	(99)
•		•				م داد د داد د							445.71	(55)
			nts – Cor		Ĭ		ater heat	ing prov	ided by	a comm	unity sch	nama		
							heating (				urnity 301		0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The com	munity so	cheme ma	y obtain he	eat from se	everal soul	ces. The p	orocedure :	allows for	CHP and ι	up to four (	other heat	sources; tl	he latter	
			-			rom powei	r stations.	See Appei	ndix C.			ı		<b>—</b> ,,
Fractio	n of hea	at from C	Commun	ity boiler	S							ļ	1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1.05	(305)
Distribu	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				ĺ	1.1	(306)
Space	heating	g										'	kWh/yea	ar
Annual	space	heating	requiren	nent									31199.58	

Space heat from Community boilers	(98) x (304a)	x (305) x (306) =	36035.51	(307a)
Efficiency of secondary/supplementary heating system in	% (from Table 4a or Appe	endix E)	0	(308
Space heating requirement from secondary/supplementa	ry system (98) x (301) x	( 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2028.27	]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a)	x (305) x (306) =	2342.65	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	07e) + (310a)(310e)] =	383.78	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not en	ter 0) = (107) ÷ (31	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	ıt 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) + (33	30b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			528.07	(332)
12b. CO2 Emissions – Community heating scheme	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not	kWh/year	kg CO2/kWh	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)  If there is C	kWh/year	kg CO2/kWh to (366) for the second fuel	kg CO <mark>2/yea</mark> r	(367a) (367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)  If there is C	kWh/year CHP) HP using two fuels repeat (363)	kg CO2/kWh to (366) for the second fuel	65 12753.36	` 
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)  CO2 associated with heat source 1	kWh/year  CHP)  HP using two fuels repeat (363)  ((307b)+(310b)] x 100 ÷ (367b) x	kg CO2/kWh to (366) for the second fuel  0 =  0.52 =	65 12753.36 199.18	(367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	kWh/year  CHP)  HP using two fuels repeat (363)  ((307b)+(310b)] x 100 ÷ (367b) x  [(313) x	kg CO2/kWh to (366) for the second fuel  0 =  0.52 =	65 12753.36 199.18 12952.54	(367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	kWh/year CHP) HP using two fuels repeat (363) (307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(369) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.72) = 0 = 0.52	65 12753.36 199.18 12952.54	(367) (372) (373)
CO2 from other sources of space and water heating (not 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)	kWh/year CHP) HP using two fuels repeat (363) (307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(369) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.72) = 0 = 0.52	65 12753.36 199.18 12952.54	(367) (372) (373) (374)
CO2 from other sources of space and water heating (not 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 inst	kWh/year  CHP)  HP using two fuels repeat (363) to (307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(369) x  (309) x  antaneous heater (312) x  (373) + (374) + (375) =	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.72) = 0 = 0.52	65 12753.36 199.18 12952.54 0 12952.54	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not 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 instantal CO2 associated with space and water heating	kWh/year  CHP)  HP using two fuels repeat (363) to (307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(369) x  (309) x  antaneous heater (312) x  (373) + (374) + (375) =	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.72) = 0 = 0.22	65 12753.36 199.18 12952.54 0 12952.54 0	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not 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 inst  Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within	kWh/year  CHP)  HP using two fuels repeat (363) to (307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(369) x  antaneous heater (312) x  (373) + (374) + (375) =  dwelling (331)) x  (332))) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.22 = 0.52 = 0.52	65 12753.36 199.18 12952.54 0 12952.54	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not 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 instance and water heating  CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting	kWh/year  CHP)  HP using two fuels repeat (363) to (307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(369) x  antaneous heater (312) x  (373) + (374) + (375) =  dwelling (331)) x  (332))) x	kg CO2/kWh  to (366) for the second fuel  0 = 0.52 = 0.22 = 0.52 = 0.52	65 12753.36 199.18 12952.54 0 12952.54 0 274.07	(367) (372) (373) (374) (375) (376) (378) (379)

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP			Strom Softwa	are Ve			Versio	n: 1.0.3.4	
Address :	, london	r	торену	Address	Onit 9					
1. Overall dwelling dime	nsions:									
Decement				a(m²)	44.)		ight(m)	٦,, ١	Volume(m <sup>3</sup>	<u>^</u>
Basement				124	(1a) x	2	.37	(2a) =	293.88	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	+(1e)+(1r	ገ) [	124	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	293.88	(5)
2. Ventilation rate:	main	aaaan da	* *	other		40401			m3 nor hou	
	main heating	secondar heating	-	other	, –	total			m³ per hou	_
Number of chimneys	0 +	0	_  +	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	=	0	x :	20 =	0	(6b)
Number of intermittent far	ns					2	Χ.	10 =	20	(7a)
Number of passive vents						0	<b>X</b> '	10 =	0	(7b)
Number of flueless gas fin	res				Γ	0	X 4	40 =	0	(7c)
								Air ch	ange <mark>s per</mark> ho	our
Infilt <mark>ration</mark> due to chimney	s, flues and fans	= (6a)+(6b)+(7	7a)+(7b)+(	(7c) =	Г	20		÷ (5) =	0.07	(8)
If a pressurisation test has be		tended, procee	ed to (17),	otherwise (	continue fr	om (9) to (	(16)			
Number of storeys in the Additional infiltration	ie dweiling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	.25 for steel or timl	per frame or	0.35 fo	r masoni	y constr	ruction	1(0)	.,,	0	(11)
if both types of wall are pr		orresponding to	the great	ter wall are	a (after			!		
deducting areas of opening If suspended wooden f	• ,. ,	sealed) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, ent	,	,	. 1 (00010	<i>3</i> 4), 0.00	ontor o				0	(13)
Percentage of windows	s and doors draugh	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value,	•		•		•	etre of e	envelope	area	20	(17)
If based on air permeabili  Air permeability value applies	•					is heina u	sed		1.07	(18)
Number of sides sheltere		i nao boon aoi	10 01 a ao	groo an po	mousinty	io boiling a	000		1	(19)
Shelter factor				(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.92	(20)
Infiltration rate incorporat	•			(21) = (18	) x (20) =				0.99	(21)
Infiltration rate modified for	<del> </del>			1					1	
L 1		lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		0 1 00		1 0 -	4	1 4 6	1 4 5	1 -	I	
(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	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

	1.23	1.21	1.09	1.06	0.94	0.94	0.91	0.99	1.06	1.11	1.16		
Calculate effec		-	rate for t	he appli	cable ca	se	ı			l			<u> </u>
If mechanica If exhaust air he			andiv N. (2	2h) _ (22a	) Em. /	auation (N	JE)) otho	muino (22h	\ _ (22a)			0	(23
If balanced with		0		, ,	, ,	. ,	,, .	,	) = (23a)			0	(23
		-	-	_					7h.\ (	00h) [/	1 (22 a)	0	(23
a) If balanced	o mecha	o l	ntilation	o with nea	at recove		1R) (248	$\frac{1}{10} = \frac{22}{10}$	0 (10)	23b) <b>x</b> [	0	÷ 100] 	(24
b) If balance			-	-									(-
24b)m= 0	0	o lincal ve	0	0	0	0	0	0	0	0	0		(2
c) If whole ho				-	<u> </u>								•
if (22b)m				•					5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural v	/entilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft				l	
if (22b)m	t = 1, the	en (24d)	m = (22k)	)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			•	
24d)m= 1.26	1.23	1.21	1.09	1.06	0.94	0.94	0.92	0.99	1.06	1.11	1.16		(2
Effective air	<del></del>	rate - en	<u> </u>	) or (24b	o) or (24	c) or (24	d) in box	x (25)				ı	
25)m= 1.26	1.23	1.21	1.09	1.06	0.94	0.94	0.92	0.99	1.06	1.11	1.16		(2
3. Heat losses	and he	at loss r	paramete	er:							_		
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	,	ΑΧk
	area	(m²)	m		A ,r	n²	W/m2		(W/I	K)	kJ/m²-k		kJ/K
oors					1.6	X	1.4	= [	2.24				(2
/indows Type	1				5.49	x1.	/[1/( 4.8 )+	0.04] =	22.11				(2
Vindows Type	2				4.7	x1.	/[1/( 4.8 )+	0.04] =	18.93				(2
Valls Type1	11.8	5	1.6		10.25	5 X	2.1	=	21.52	٦ [		$\neg \ \Box$	(2
Valls Type2	122	2	10.19	9	111.8	1 x	1.27	=	142.22				(2
loof	68.1	一	0		68.1	x	2.3	=	156.63				(3
otal area of el	ements	, m²			201.9	5							(3
arty wall					4.8	x	0	=	0				(3
for windows and i	roof winda	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	 /[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
include the areas	s on both	sides of in	ternal wal	s and part	titions								
abric heat loss		,	U)				(26)(30)	) + (32) =				363.65	(3
leat capacity (	,	•							.(30) + (32	, , ,	(32e) =	0	(3
leat capacity ( hermal mass	parame	ter (TMF		,				Indica	tive Value	: High		450	== `
leat capacity (hermal mass or design assession	parame	ter (TMF	tails of the	,			ecisely the	Indica	tive Value	: High			== `
leat capacity ( hermal mass por for design assession for design assession	parame ments who	ter (TMF ere the det tailed calcu	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	Indica	tive Value	: High		450	(3
leat capacity (hermal mass por design assession be used instead hermal bridge	parame ments who ad of a det es:S(L	ter (TMF ere the det tailed calcu x Y) calc	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica	tive Value	: High			== `
eat capacity (hermal mass por design assession be used insteathermal bridge details of thermal	parame ments who ad of a det es:S(L I bridging	ter (TMF ere the det tailed calcu x Y) calc	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica indicative	tive Value	: High		450	(3
leat capacity ( hermal mass	parame ments who ad of a det es : S (L I bridging at loss	ter (TMF ere the dec tailed calcu x Y) calcu are not kn	tails of the ulation. culated u	constructi	ion are not pendix l	t known pr	ecisely the	Indicative indicative	tive Value	: High	able 1f	450 30.4	(3
leat capacity (hermal mass por design assession be used instead hermal bridge details of thermal total fabric head	parame ments who ad of a det es : S (L I bridging at loss	ter (TMF ere the dec tailed calcu x Y) calcu are not kn	tails of the ulation. culated u	constructi	ion are not pendix l	t known pr	ecisely the	Indicative indicative	tive Value values of	: High	able 1f	450 30.4	(3
leat capacity (hermal mass por design assession be used instead hermal bridge details of thermal otal fabric head fentilation head	parame ments who ad of a det es: S (L I bridging at loss t loss ca	ter (TMF ere the de tailed calcu x Y) calc are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed as the construction of the constructio	ppendix I	t known pr	, ,	Indica e indicative (33) + (38)m	(36) = = 0.33 × (	: High : TMP in Ta	able 1f	450 30.4	(3
eat capacity (hermal mass or design assession be used instead hermal bridge details of thermal otal fabric head entilation head	parame ments who ad of a det es : S (L I bridging at loss t loss ca Feb	ter (TMF ere the detailed calcul x Y) calcul are not known alculated Mar	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.15 x (3)	ppendix I  Jun	t known pr	Aug	Indica e indicative  (33) +  (38)m  Sep  95.82	tive Value values of  (36) = = 0.33 × (  Oct	25)m x (5) Nov	able 1f	450 30.4	(3

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 4.16	4.14	4.12	4.03	4.01	3.91	3.91	3.9	3.95	4.01	4.05	4.09		
	Į		<u> </u>	<u> </u>	<u> </u>	ļ	ļ		L Average =	Sum(40) <sub>1</sub>	12 /12=	4.02	(40)
Number of day	ys in mo	nth (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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		88		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $c$	lwelling is	designed t			se target o		2.54		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!		•			
(44)m= 112.8	108.69	104.59	100.49	96.39	92.29	92.29	96.39	100.49	104.59	108.69	112.8		
		•								m(44) <sub>112</sub> =		1230.5	(44)
Energy content of	f hot water	used - cal	culated m	onthly = $4$ .	190 x Vd,r	n x nm x D	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 167.27	146.3	150.97	131.62	126.29	108.98	100.98	115.88	117.26	136.66	149.18	161.99		_
If ins <mark>tantane</mark> ous v	vator hoati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) <sub>112</sub> =		1613.38	(45)
	_			-					20.5	20.00	24.2		(46)
(46)m= 25.09 Water storage	21.94 loss:	22.64	19.74	18.94	16.35	15.15	17.38	17.59	20.5	22.38	24.3		(40)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	•			•			` '	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community h	-			C 2 (KVV	11/11(10/00	·y /				0.	02		(51)
Volume factor	•									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nual) fro	m Tahla	·	•	•	•	•	•		0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	ım					. ,
(modified by				,	•	. ,	, ,		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 (	aclaulatad	for ooob	month (	(61)m -	(60) · 2(	SE v. (41)	١m						
Combi loss $(61)$ m= $0$	balculated 0	or each		0 1)m =	(60) ÷ 30	05 × (41)	0	0	0	0	0	]	(61)
	_!						<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	(50)m + (61)m	(01)
(62)m= 222.5	<del>-i</del>	206.24	185.11	181.57	162.47	156.26	171.16	170.76	191.94	202.67	217.27	(59)m + (61)m	(62)
Solar DHW inpu		<u> </u>	<u> </u>										(02)
(add addition									ii contribut	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter	l				<u> </u>	<u>I</u>				l	
(64)m= 222.5		206.24	185.11	181.57	162.47	156.26	171.16	170.76	191.94	202.67	217.27		
		•				•	Out	put from w	ater heate	r (annual)₁	I12	2264.22	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 74.23	1	68.81	61.77	60.6	54.24	52.19	57.14	57	64.05	67.61	72.47		(65)
include (5	7)m in cal	culation (	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):	-		_						
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 143.8	8 143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 51.64	45.87	37.3	28.24	21.11	17.82	19.26	25.03	33.6	42.66	49.79	53.08		(67)
App <mark>liance</mark> s g	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5				
(68)m= 290.3	3 293.35	285.75	269.59	249.19	230.01	217.2	214.19	221.78	237.95	258.35	277.52		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	), also s	ee Table	5				
(69)m= 37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39		(69)
Pumps and	fans gains	(Table 5	 5a)									•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)		-						
(71)m= -115.	1 -115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1		(71)
Water heating	ng gains (1	Table 5)	-	_			-	-					
(72)m= 99.77	7 97.4	92.48	85.79	81.45	75.34	70.14	76.8	79.17	86.09	93.9	97.41		(72)
Total intern	al gains =	•			(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72)	)m		
(73)m= 507.9	1 502.78	481.7	449.79	417.91	389.34	372.77	382.19	400.71	432.85	468.2	494.17		(73)
6. Solar gai	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ Table 6b	_	FF		Gains	
	Table 6d		m²		Ta	ble 6a	. —	Table 6b	_ '	able 6c		(W)	,
North 0.9	× 0.77	X	5.4	19	X 1	10.63	x	0.85	x	0.7	=	24.07	(74)
North 0.9	× 0.77	X	5.4	19	x 2	20.32	х	0.85	x	0.7	=	46	(74)
North 0.9	× 0.77	х	5.4	19	X 3	34.53	х	0.85	x	0.7	=	78.17	(74)
North 0.9	× 0.77	X	5.4	19	X 5	55.46	х	0.85	x	0.7	=	125.56	(74)
North 0.9	× 0.77	X	5.4	19	x	74.72	x	0.85	x	0.7	=	169.14	(74)

N 1 41					_				_				_
North	0.9x 0.7	7 ×	5.49	×	7	79.99	X	0.85	X	0.7	=	181.06	(74)
North	0.9x 0.7	7 ×	5.49	) ×	7	74.68	X	0.85	X	0.7	=	169.05	(74)
North	0.9x 0.7	7 ×	5.49	×	5	59.25	X	0.85	X	0.7	=	134.12	(74)
North	0.9x 0.7	7 ×	5.49	X	4	11.52	X	0.85	X	0.7	=	93.98	(74)
North	0.9x 0.7	7 x	5.49	X	2	24.19	X	0.85	X	0.7	=	54.76	(74)
North	0.9x 0.7	7 ×	5.49	X	1	3.12	X	0.85	X	0.7	=	29.69	(74)
North	0.9x 0.7	7 ×	5.49	X		8.86	X	0.85	X	0.7	=	20.07	(74)
South	0.9x 0.7	7 x	4.7	Х	4	16.75	x	0.85	X	0.7	=	90.6	(78)
South	0.9x 0.7	7 x	4.7	Х	7	6.57	X	0.85	X	0.7	=	148.39	(78)
South	0.9x 0.7	7 ×	4.7	X	9	7.53	x	0.85	X	0.7	=	189.02	(78)
South	0.9x 0.7	7 x	4.7	Х	1	10.23	X	0.85	x	0.7	=	213.63	(78)
South	0.9x 0.7	7 x	4.7	X	1	14.87	X	0.85	X	0.7	=	222.62	(78)
South	0.9x 0.7	7 x	4.7	х	1	10.55	x	0.85	x	0.7	_	214.24	(78)
South	0.9x 0.7	7 ×	4.7	Х	1	08.01	x	0.85	X	0.7	=	209.32	(78)
South	0.9x 0.7	7 ×	4.7	X	1	04.89	х	0.85	x	0.7		203.28	(78)
South	0.9x 0.7	7 ×	4.7	X	1	01.89	x	0.85	x	0.7	<u> </u>	197.45	(78)
South	0.9x 0.7	7 ×	4.7	х	8	32.59	X	0.85	x	0.7	=	160.05	(78)
South	0.9x 0.7	7 X	4.7	X	5	55.42	Х	0.85	Х	0.7	=	107.4	(78)
South	0.9x 0.7	7 x	4.7	x		40.4	х	0.85	х	0.7		78.29	(78)
Solar gai	ins in watts,	calculated	for each	month			(83)m	= Sum(74)m .	(82)m				
(83)m= 1	114.68 194.39	207.40	339.19	391.75	395.3	378.37	227	4 004 40	0440	407.00	00.00		(00)
(00)=	114.00 194.59	267.18	339.19	391.73	393.3	3/0.3/	337	.4 291.43	214.8°	1 137.09	98.36		(83)
	ins – internal						33/	.4 291.43	214.8	1 137.09	98.36		(83)
Total gai		and solar	(84)m = (	(73)m +			719.		647.66		592.53	]	(84)
Total gai	ins – internal	and solar	(84)m = (	(73)m + 809.67	(83)m	, watts					1		
Total gai (84)m= 6	ins – internal 622.58 697.16	and solar 748.88	(84)m = ( 788.98 (heating s	(73)m + 809.67	(83)m 784.64	, watts	719.	59 692.14			1	21	
Total gai (84)m= 6  7. Mear Temper	ins – internal 622.58   697.16 n internal tem	748.88 perature heating p	(84)m = ( 788.98 (heating seriods in the	(73)m + 809.67 season) the living	(83)m 784.64 g area	rom Tak	719.	59 692.14			1	21	(84)
Total gai (84)m= 6  7. Mear Temper	ins – internal 622.58 697.16 n internal terr rature during	748.88 perature heating p	(84)m = ( 788.98 (heating seriods in the	(73)m + 809.67 season) the living	(83)m 784.64 g area	rom Tak	719.	59 692.14 Th1 (°C)		605.29	1	21	(84)
Total gai (84)m= 6  7. Mear Temper	ins – internal 622.58 697.16 In internal terr rature during ion factor for	748.88 perature heating p	(84)m = ( 788.98 (heating seriods in tiving area	(73)m + 809.67 season) the living a, h1,m (	(83)m 784.64 g area	rom Table 9a)	719. ole 9,	59 692.14  Th1 (°C)	647.60	605.29	592.53	21	(84)
Total gai (84)m= 6  7. Mear Temper Utilisatio (86)m=	ins – internal 622.58 697.16 n internal tem rature during on factor for Jan Feb 1 1	748.88  perature heating p gains for I  Mar	(84)m = (heating seriods in triving area Apr	(73)m + 809.67 season) the living a, h1,m ( May	(83)m 784.64 g area (see Ta Jun 0.99	from Table 9a) Jul 0.98	719. ole 9,	59 692.14  Th1 (°C)  ug Sep 8 0.99	647.60 Oct	605.29 Nov	592.53	21	(84)
Total gai (84)m=  7. Mear Temper Utilisatio (86)m=  Mean ir	ins – internal 622.58 697.16 n internal tem rature during on factor for Jan Feb	748.88  perature heating p gains for I  Mar	(84)m = (heating seriods in triving area Apr	(73)m + 809.67 season) the living a, h1,m ( May	(83)m 784.64 g area (see Ta Jun 0.99	from Table 9a) Jul 0.98	719. ole 9,	59 692.14  Th1 (°C)  ug Sep 8 0.99  able 9c)	647.60 Oct	Nov 1	592.53	21	(84)
Total gai (84)m=  7. Mear Temper Utilisatio (86)m=  Mean ir (87)m=	ins – internal 222.58 697.16 n internal tem rature during on factor for Jan Feb 1 1 nternal tempe 18.22 18.37	748.88 perature heating p gains for I Mar 1 erature in 18.68	(84)m = (788.98) (heating seriods in riving area Apr 1	(73)m + 809.67   season) the living a, h1,m ( May	(83)m 784.64 g area see Ta Jun 0.99 low ste 20.17	, watts 751.14  from Table 9a) Jul 0.98 ps 3 to 7 20.5	719. DIE 9, Au 0.9 7 in T 20.4	59 692.14  Th1 (°C)  ug Sep 8 0.99  able 9c) 46 20.05	Oct	Nov 1	592.53  Dec 1	21	(84)
Total gai (84)m= 6  7. Mear Temper Utilisati (86)m= Mean ir (87)m= Temper	ins – internal 22.58 697.16 In internal tem rature during on factor for Jan Feb 1 1 Internal tempe 18.22 18.37 rature during	748.88  748.88  perature heating p gains for I Mar 1 erature in 18.68 heating p	(84)m = (heating seriods in fiving area 19.15 eriods in five residues in f	(73)m + 809.67  season) the living a, h1,m (	g area g area Jun 0.99 low ste 20.17 welling	from Takable 9a)  Jul  0.98  ps 3 to 7  20.5	719. DIE 9, O.9 7 in T 20.4	Th1 (°C)  ug Sep 8 0.99  able 9c) 46 20.05  0, Th2 (°C)	Oct 1 19.41	Nov 1 18.77	592.53  Dec 1	21	(84)
Total gai (84)m= 6  7. Mear Temper Utilisati (86)m=    Mean ir (87)m=    Temper (88)m=	ins – internal 622.58 697.16 In internal tem rature during on factor for Jan Feb 1 1 Internal tempe 18.22 18.37 rature during 18.92 18.93	748.88  748.88  perature heating p gains for I Mar 1 erature in 18.68 heating p 18.94	(84)m = ( 788.98  (heating seriods in the seriod in	(73)m + 809.67  season) the living a, h1,m (	g area g area Jun 0.99 low ste 20.17 welling	ywatts 751.14  from Takable 9a) Jul 0.98 ps 3 to 7 20.5 from Takable 9a)	719.  Ole 9,  O.9  7 in T  20.4  able 9	Th1 (°C)  ug Sep 8 0.99  able 9c) 46 20.05  0, Th2 (°C)	Oct	Nov 1	Dec 1 18.23	21	(84) (85) (86) (87)
Total gai (84)m=  7. Mear Temper Utilisation (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisation	ins – internal 222.58 697.16 In internal terrature during on factor for Jan Feb 1 1 Internal tempe 18.22 18.37 rature during 18.92 18.93 on factor for	rature in 18.68 heating p 18.94 gains for I	(84)m = (788.98) (heating seriods in riving area 19.15) eriods in 18.99 rest of dwg	the living a, h1,m ( May 1  a T1 (foll 19.66 19  rest of d relling, h2	(83)m 784.64 g area see Ta Jun 0.99 low ste 20.17 welling 19.04 2,m (se	, watts 751.14  from Takable 9a) Jul 0.98 ps 3 to 7 20.5  from Ta	719.  Ole 9,  Ole 9,	Th1 (°C)  ug Sep 8 0.99  able 9c) 46 20.05 0, Th2 (°C) 05 19.02	Oct 1 19.41	Nov 1 18.77	Dec 1 18.23 18.96	21	(84) (85) (86) (87) (88)
Total gai (84)m=  7. Mear Temper Utilisation (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisation (89)m=	ins – internal 222.58 697.16 In internal terrature during Ion factor for Jan Feb 1 1 Internal tempe 18.22 18.37 rature during 18.92 18.93 Ion factor for 1 1	rature in 18.68 heating p 18.94 gains for I 1	(84)m = (788.98) (heating seriods in riving area 19.15) eriods in 18.99 rest of dw	(73)m + 809.67  season) the living a, h1,m ( May  1 19.66  rest of d 19 relling, h2 0.99	(83)m 784.64 g area see Ta Jun 0.99 low ste 20.17 welling 19.04 2,m (se 0.97	, watts 751.14  from Takable 9a) Jul 0.98 ps 3 to 7 20.5 from Ta 19.04 ee Table 0.9	719.  Ole 9,  Ole 9,	Th1 (°C)  ug Sep 8 0.99  able 9c) 46 20.05 0, Th2 (°C) 05 19.02	Oct 1 19.41 19	Nov 1 18.77	Dec 1 18.23	21	(84) (85) (86) (87)
Total gai (84)m=  7. Mear Temper Utilisati (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisati (89)m=  Mean ir	ins – internal continue during on factor for Jan Feb 1 1 nternal tempe 18.22 18.37 rature during 18.92 18.93 con factor for 1 1 nternal tempe	rature in 18.94 perature in 19.94 prature in 19.94 prature in 19.94 prature in 19.94 prature in 19.94	(84)m = ( 788.98  (heating seriods in fiving area  Apr 1  living area 19.15  eriods in fiving area 19.15  eriods in fiving area 19.15  the rest of dw 1	(73)m + 809.67  season) the living a, h1,m ( May  1 19.66  rest of d 19 velling, h2 0.99  f dwellin	(83)m 784.64 g area See Ta Jun 0.99 low ste 20.17 welling 19.04 2,m (se 0.97 g T2 (fi	from Take ble 9a)  Jul  0.98  ps 3 to 7  20.5  from Take ble 9a)  19.04  ee Table  0.9  ollow ste	719.  Au  0.9  7 in T  20.4  able 9  19.0  9a)  0.9	Th1 (°C)  Ig Sep 8 0.99  able 9c) 46 20.05  9, Th2 (°C) 05 19.02  2 0.99  to 7 in Table	Oct 1 19.41 19 1 e 9c)	Nov 1 18.77 18.98	Dec 1 18.23 18.96	21	(84) (85) (86) (87) (88) (89)
Total gai (84)m=  7. Mear Temper Utilisati (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisati (89)m=  Mean ir	ins – internal 222.58 697.16 In internal terrature during Ion factor for Jan Feb 1 1 Internal tempe 18.22 18.37 rature during 18.92 18.93 Ion factor for 1 1	rature in 18.68 heating p 18.94 gains for I 1	(84)m = (788.98) (heating seriods in riving area 19.15) eriods in 18.99 rest of dw	(73)m + 809.67  season) the living a, h1,m ( May  1 19.66  rest of d 19 relling, h2 0.99	(83)m 784.64 g area see Ta Jun 0.99 low ste 20.17 welling 19.04 2,m (se 0.97	, watts 751.14  from Takable 9a) Jul 0.98 ps 3 to 7 20.5 from Ta 19.04 ee Table 0.9	719.  Ole 9,  Ole 9,	Th1 (°C)  Ig Sep 8 0.99  able 9c) 46 20.05 0, Th2 (°C) 20 0.99  to 7 in Table 33 18.41	Oct 1 19.41 19 1 e 9c) 17.76	Nov 1 18.77 18.98	592.53  Dec 1  18.23  18.96		(84) (85) (86) (87) (88) (89)
Total gai (84)m=  7. Mear Temper Utilisati (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisati (89)m=  Mean ir	ins – internal continue during on factor for Jan Feb 1 1 nternal tempe 18.22 18.37 rature during 18.92 18.93 con factor for 1 1 nternal tempe	rature in 18.94 perature in 19.94 prature in 19.94 prature in 19.94 prature in 19.94 prature in 19.94	(84)m = ( 788.98  (heating seriods in fiving area  Apr 1  living area 19.15  eriods in fiving area 19.15  eriods in fiving area 19.15  the rest of dw 1	(73)m + 809.67  season) the living a, h1,m ( May  1 19.66  rest of d 19 velling, h2 0.99  f dwellin	(83)m 784.64 g area See Ta Jun 0.99 low ste 20.17 welling 19.04 2,m (se 0.97 g T2 (fi	from Take ble 9a)  Jul  0.98  ps 3 to 7  20.5  from Take ble 9a)  19.04  ee Table  0.9  ollow ste	719.  Au  0.9  7 in T  20.4  able 9  19.0  9a)  0.9  eps 3	Th1 (°C)  Ig Sep 8 0.99  able 9c) 46 20.05 0, Th2 (°C) 20 0.99  to 7 in Table 33 18.41	Oct 1 19.41 19 1 e 9c) 17.76	Nov 1 18.77 18.98	592.53  Dec 1  18.23  18.96	21	(84) (85) (86) (87) (88) (89)
Total gai (84)m=  7. Mear Temper Utilisation (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisation (89)m=  Mean ir (90)m=	ins – internal continue during on factor for Jan Feb 1 1 nternal tempe 18.22 18.37 rature during 18.92 18.93 con factor for 1 1 nternal tempe	rature in 18.94 gains for I 18.94 gains for I 18.94 gains for I 18.94 gains for I 1 16.98	(84)m = 6 788.98  (heating seriods in riving area Apr 1 living area 19.15 eriods in riving area 19.15 eriods in riving area 19.15 eriods in riving area 18.99 est of dw 1 the rest of	(73)m + 809.67  season) the living a, h1,m ( May  1 19.66  rest of d 19 relling, h2 0.99 f dwellin 18	(83)m 784.64 g area see Ta Jun 0.99 low stee 20.17 welling 19.04 2,m (see 0.97 g T2 (find 18.55)	ywatts 751.14  from Takable 9a) Jul 0.98 ps 3 to 7 20.5 from Takable 19.04 ee Table 0.9 ollow stee	719.  Ole 9,  Ole 9,	59 692.14  Th1 (°C)  ug Sep 8 0.99  able 9c) 46 20.05 0, Th2 (°C) 05 19.02  2 0.99  to 7 in Tabl 33 18.41	Oct 1 19.41 19 1 e 9c) 17.76	Nov 1 18.77 18.98	592.53  Dec 1  18.23  18.96		(84) (85) (86) (87) (88) (89)
Total gai (84)m=  7. Mear Temper Utilisation (86)m=  Mean ir (87)m=  Temper (88)m=  Utilisation (89)m=  Mean ir (90)m=  Mean ir (90)m=	ins – internal c22.58 697.16 In internal terrature during on factor for Jan Feb 1 1 Internal tempe 18.22 18.37 rature during 18.92 18.93 Ion factor for 1 1 Internal tempe 16.51 16.66	rature in 16.98	(84)m = (788.98) (heating seriods in riving area 19.15) eriods in 18.99 rest of dw 1 the rest of 17.49	(73)m + 809.67  season) the living a, h1,m ( May  1 19.66 rest of d 19 relling, h2 0.99 f dwellin 18	(83)m 784.64 g area see Ta Jun 0.99 low stee 20.17 welling 19.04 2,m (see 0.97 g T2 (find 18.55) ng) = find 19.04	ywatts 751.14  from Takable 9a) Jul 0.98 ps 3 to 7 20.5 from Takable 19.04 ee Table 0.9 ollow stee 18.86  LA × T1 19.36	719.  719.  Au  0.9  7 in T  20.4  19.0  9a)  0.9  18.8  + (1 - 19.6	Th1 (°C)  Ig Sep 8 0.99  able 9c) 46 20.05 0, Th2 (°C) 2 0.99  to 7 in Tabl 33 18.41 f  - fLA) × T2 32 18.91	Oct 1 19.41 19 1 e 9c) 17.76 LA = Liv	Nov 1 18.77 18.98 1 17.1 ving area ÷ (-	592.53  Dec 1  18.23  18.96		(84) (85) (86) (87) (88) (89)

	ı		I				1	1		1			(00)
(93)m= 17.03	17.18	17.49	17.99	18.5	19.04	19.36	19.32	18.91	18.25	17.6	17.06		(93)
8. Space hea				o obtoin	and at at	on 11 of	Table 0	o co tha	t Ti m_/	76)m an	d ro colo	ulato	
the utilisation			•		icu ai sii	ър п ог	i abic 3i	J, 50 III <i>a</i>	ıt 11,111—(	i Ojili ali	u ie-caic	uiate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	1:										
(94)m= 1	1	1	1	0.99	0.97	0.92	0.94	0.98	1	1	1		(94)
Useful gains,		W = (94)	<del></del>	4)m				T		T			
(95)m= 622.1	696.35	747.41	785.94	802.09	763.16	691.52	674.31	681.21	645.35	604.58	592.16		(95)
Monthly aver			<del>.                                      </del>										(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 (97)m= 6571.1	6307.98						x [(93)m 1412.34	<u> </u>		5270 1 <i>4</i>	6514.35		(97)
(97)m= 6571.1 Space heatin			L					L		L	0014.30		(97)
(98)m= 4426.05	<del></del>				0	0.02	0	0	2350.28	r e	4406.11		
(00)111= 1120.00	0771.02	0020.00	2701.00	1010.00					<u> </u>	) = Sum(9	<u>.                                    </u>	26562.59	(98)
Chase bestin	a roauir	am ant in	Is\A/b/m2	hioor			7010	ii poi youi	(ittiii) jou	) = <b>Ga</b> m( <b>G</b>	<b>O</b> /15,912		╡``
Space heatin	• .			•								214.21	(99)
9b. Energy red			The state of the s	Ĭ									
This part is us Fraction of spa										unity sch	neme.	0	(301)
							1 0001	., 0	OHO				=
Fraction of spa											_	1	(302)
The c <mark>ommu</mark> nity so includes boilers, h	_								up to four	other heat	sources; th	ne latter	
Fraction of hea					iom power	Stations.	осс Аррсі	idix O.				1	(303a)
Fraction of total					oilers				(3	02) x (303	a) =	1	(304a)
Factor for con						r commu	unity hea	ating sys		)	<u> </u>	1.05	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				ļ	1.1	(306)
Space heatin	α										·	kWh/yea	
Annual space	_	requiren	nent									26562.59	7
Space heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	30679.79	(307a)
Efficiency of s	econdary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =	ĺ	0	(309)
Water heating	<b>,</b>										•		
Annual water		equirem	ent									2264.22	7
If DHW from c	ommunit	ty schem	ne:										<b>-</b>
Water heat fro	m Comn	nunity bo	oilers					(64) x (30	03a) x (30	5) x (306) :	=	2615.17	(310a)
Electricity use	d for hea	ıt distribu	ution				0.01	× [(307a)	(307e) +	(310a)(	(310e)] =	332.95	(313)
Cooling Syste	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity for p							ata!-l-				Ī		7(200-)
mechanical ve	entilation	- palanc	ea, extra	act or po	sitive in	out 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	0b) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L)				911.99	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  If there is CHP	HP) using two fuels repeat (363) to	(366) for the second	d fuel	65	(367a)
	7h) (240h)] y 400 + (267h) y		=		」` ′
Kees	7b)+(310b)] x 100 ÷ (367b) x	0		11064.17	<u> </u> (367)
Electrical energy for heat distribution	[(313) x	0.52	=	172.8	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	11236.97	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			11236.97	(376)
CO2 associated with electricity for pumps and fans within do	welling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	473.32	(379)
Total CO2, kg/year sum of (376)(382) =				11710.3	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				94.44	(384)
El rating (section 14)				25.14	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAF		lron orb	Strom Softwa	are Ve	rsion:		Versio	on: 1.0.3.4	
Address :	, london	P	roperty	Address	: Unit 10	)				
1. Overall dwelling dime	ensions:									
Basement			Area	<b>a(m²)</b> 79	(1a) x		<b>ight(m)</b> 2.6	(2a) =	Volume(m³)	) (3a)
Total floor area TFA = (1)	a)+(1b)+(1c)+(1d	\_(1 <u>0</u> \_ (1r	, <u> </u>		(4)			](=0)	200.4	
·	a)+(1b)+(1c)+(1d	)+(16)+(11	"	79		) . (20) . (20	1) . (20) .	(2n)	Г	٦
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	205.4	(5)
2. Ventilation rate:	main	secondar	·v	other		total			m³ per hou	r
Number of chimneys	heating	heating + 0	,   +	0	7 = F	0	x	40 =	0	(6a)
Number of open flues	0	+ 0	┪╻	0	」	0	x	20 =	0	(6b)
Number of intermittent fa					J <u>L</u>			10 =		」 <sup>(05)</sup> ] <sub>(7a)</sub>
					L	2		10 =	20	╡`´
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas fi	res				L	0	X 2	40 =	0	(7c)
								Air ch	nanges per ho	ur
Infiltration due to chimne	vs. flues and fans	s = (6a) + (6b) + (7a)	7a)+(7b)+(	7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has b					continue fr			. (5)	0.1	(-/
Number of storeys in the	he dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration			2.25 (				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are pa					•	ruction			0	(11)
deducting areas of opening			the great	or wall arc	a (anti-					
If suspended wooden f	•	,	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
Percentage of windows Window infiltration	s and doors drau	gnt stripped		0.25 - [0.2	' x (14) ∸ 1	1001 =			0	(14)
Infiltration rate				(8) + (10)		_	+ (15) =		0	(15)
Air permeability value,	q50, expressed i	n cubic metre						area	20	(17)
If based on air permeabil	ity value, then (18	$B) = [(17) \div 20] + (8)$	8), otherw	ise (18) = (	(16)		·		1.1	(18)
Air permeability value applie		est has been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	[0 075 x (*	19)] =			1	(19)
Infiltration rate incorporat	ting shelter factor			(21) = (18)		. 0/] —			1.02	(20)
Infiltration rate modified f	_			<b>( )</b>	, ( -,				1.02	(21)
Jan Feb		May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				<u>.                                     </u>		•	•		1	
(22)m= 5.1 5		4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (CC-)	2) 1	•		•		•	•		•	
Wind Factor $(22a)m = (22a)m = 1.27$	<del>'                                    </del>	.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(220)111= 1.21 1.25	1.23   1.1   1	.08 0.95	0.95	0.92	<u> </u>	1.08	1.12	1.10	J	

1.29	1.27	1.24	1.12	1.09	0.96	0.96	0.94	(22a)m 1.02	1.09	1.14	1.19	1	
Calculate effe		l				l	0.94	1.02	1.09	1.14	1.19	J	
If mechanica	al ventila	ition:										0	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =				0	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	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		(24
c) If whole h				•	•								
if (22b)n		<u> </u>	<u> </u>	<u> </u>	ŕ –	· ` `	ŕ	ŕ	· ` `	ŕ	ı	1	(0.
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural if (22b)n									0.51				
24d)m= 1.29	1.27	1.24	1.12	1.09	0.96	0.96	0.94	1.02	1.09	1.14	1.19	1	(24
Effective air		<u> </u>										J	•
25)m= 1.29	1.27	1.24	1.12	1.09	0.96	0.96	0.94	1.02	1.09	1.14	1.19	]	(25
												J	`
3. Heat losse	s and he	eat loss							_			_	
ELEMENT	Gros area		Openin	-	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
oors	aroa	(111)			1.6	×	1.4	= [	2.24		10/111		(26
Vindows Type	1				3.12	╡.	/[1/( 4.8 )+		12.56	Ħ			(27
Vindows Type						<del>-</del>	/[1/( 4.8 )+			Ħ			`
	_				3.66				14.74	븍 ,			(27
Valls Type1	89.2	_	6.78		82.42	=	1.27	= <u> </u>	104.83			<b>-</b>	(29
Valls Type2	26.6	=	1.6		25.03	=	2.1	= [	52.56	<u> </u>		┥	(29
loof	46.		0		46.5	X	2.3	=	106.95				(30
otal area of e	lements	, m²			162.3	3							(3′
arty wall					5.3	X	0	= [	0				(32
for windows and ' include the area						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
abric heat los				o ana pan			(26)(30)	) + (32) =				293.8	9 (3:
eat capacity		•	-,					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass		,	P = Cm ÷	- TFA) ir	n kJ/m²K				tive Value	, , ,	,	450	(35
or design assess	•	`		,			ecisely the				able 1f	400	(0.
an be used inste	ad of a de	tailed calc	ulation.				-						
hermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix I	<						24.8	(36
details of therma		are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)				
otal fabric he									(36) =	·		318.6	9 (37
entilation hea		i				·		1	= 0.33 × (		1	1	
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(0)
Jan	00	04.00	75.00	70.00									
8)m= 87.72	86	84.28	75.68	73.96	65.41	65.41	63.77	68.8	73.96	77.4	80.84	J	(38
			75.68	73.96	384.1	384.1	382.46	<u> </u>	= (37) + (3 392.65		399.53	]	(38

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 5.14	5.12	5.1	4.99	4.97	4.86	4.86	4.84	4.9	4.97	5.01	5.06		
	!	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>		L Average =	Sum(40) <sub>1</sub>	12 /12=	4.99	(40)
Number of day	s in mo	nth (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 heat	ting ene	rgy requi	rement:								kWh/ye	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 ( <sup>-</sup>	TFA -13		44		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t			se target o		.24		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage is	n litres pe	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!		•			
(44)m= 101.46	97.77	94.08	90.39	86.7	83.01	83.01	86.7	90.39	94.08	97.77	101.46		
						•				m(44) <sub>112</sub> =		1106.83	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 150.46	131.59	135.79	118.39	113.6	98.02	90.83	104.23	105.48	122.93	134.18	145.71		_
If inst <mark>antane</mark> ous w	vator hoati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) <sub>112</sub> =		1451.23	(45)
				-		_			40.44	00.40	04.00		(46)
(46)m= 22.57 Water storage	19.74	20.37	17.76	17.04	14.7	13.63	15.64	15.82	18.44	20.13	21.86		(46)
Storage volum		includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•			!4		(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								02		(51)
If community h	-			0 2 (	. I, III O, GC	-97				0.	02		(01)
Volume factor	_									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (	(54) in (5	55)								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by				,	•	` '	, ,		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	alculated	for each	month (	(61)m –	(60) · 3(	65 × (41)	\m						
(61)m= 0	0 0	0	0	0	00) + 3	05 x (41)	0	0	0	0	0	1	(61)
				<u> </u>			<u> </u>	ļ		ļ		J (59)m + (61)m	, ,
(62)m= 205.7	<del></del>	191.07	171.88	168.87	151.52	146.11	159.51	158.97	178.2	187.68	200.99	[	(62)
Solar DHW inpo						<u> </u>				ion to wate		l	` '
(add addition											3,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter						_				1	
(64)m= 205.7	4 181.52	191.07	171.88	168.87	151.52	146.11	159.51	158.97	178.2	187.68	200.99	]	
							Ou	put from w	ater heate	r (annual)₁	12	2102.07	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)ı	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 68.64	4 60.56	63.76	57.37	56.38	50.6	48.81	53.27	53.08	59.48	62.63	67.06		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 122.1	8 122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 38.3°	1 34.03	27.68	20.95	15.66	13.22	14.29	18.57	24.93	31.65	36.94	39.38		(67)
App <mark>liance</mark> s (	gains (ca <mark>lc</mark>	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 217.3	219.59	213.91	201.81	186.54	172.18	162.59	160.34	166.02	178.12	193.39	207.75		(68)
Cooking gair	ns (calcula	nted in A	ppendix	L, equat	ion L15	or L15a)	), also s	ee Table	5				
(69)m= 35.22	2 35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22		(69)
Pumps and	fans gains	(Table 5	5a)							-			
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (negat	tive valu	es) (Tab	le 5)					-	-		
(71)m= -97.7	4 -97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74		(71)
Water heating	ng gains (T	able 5)		-			-		-		-		
(72)m= 92.26	90.13	85.7	79.69	75.78	70.28	65.61	71.6	73.72	79.95	86.98	90.13		(72)
Total intern	al gains =	:			(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	)m		
(73)m= 407.5	66 403.4	386.94	362.1	337.64	315.34	302.14	310.16	324.33	349.38	376.97	396.92		(73)
6. Solar ga	ins:												
Solar gains ar		•	r flux from	Table 6a			itions to c	onvert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains	
						DIE Ga	. –	able ob	_ '	able 60		(W)	,
North 0.9		X	3.6	66	x 1	10.63	X	0.85	x	0.7	=	16.05	(74)
North 0.9		X	3.6	66	X 2	20.32	X	0.85	X	0.7	=	30.67	(74)
North 0.9		X	3.6	66	x 3	34.53	x	0.85	x	0.7	=	52.11	(74)
North 0.9		X	3.6	66	x 5	55.46	x	0.85	x	0.7	=	83.7	(74)
North 0.9	× 0.77	X	3.6	66	x 7	74.72	X	0.85	X	0.7	=	112.76	(74)

North $0.9x$ North $0.9x$ North $0.9x$		1		٦.		-						_
	0.77	X	3.66	X	79.99	X	0.85	×	0.7	=	120.71	(74)
North 0.9x	0.77	X	3.66	X	74.68	X	0.85	X	0.7	=	112.7	(74)
J.J.K	0.77	X	3.66	X	59.25	X	0.85	X	0.7	=	89.41	(74)
North 0.9x	0.77	X	3.66	X	41.52	X	0.85	X	0.7	=	62.65	(74)
North 0.9x	0.77	X	3.66	x	24.19	x	0.85	X	0.7	=	36.51	(74)
North 0.9x	0.77	X	3.66	X	13.12	x	0.85	X	0.7	=	19.8	(74)
North 0.9x	0.77	X	3.66	x	8.86	x	0.85	x	0.7	=	13.38	(74)
South 0.9x	0.77	X	3.12	X	46.75	x	0.85	x	0.7	=	60.15	(78)
South 0.9x	0.77	X	3.12	X	76.57	x	0.85	X	0.7	=	98.5	(78)
South 0.9x	0.77	X	3.12	x	97.53	x	0.85	X	0.7	=	125.48	(78)
South 0.9x	0.77	x	3.12	X	110.23	×	0.85	x	0.7	=	141.81	(78)
South 0.9x	0.77	x	3.12	x	114.87	T x	0.85	x	0.7	=	147.78	(78)
South 0.9x	0.77	x	3.12	Īx	110.55	X	0.85	×	0.7	=	142.22	(78)
South 0.9x	0.77	X	3.12	j x	108.01	X	0.85	×	0.7		138.96	(78)
South 0.9x	0.77	X	3.12	×	104.89	i x	0.85	X	0.7	=	134.95	(78)
South 0.9x	0.77	X	3.12	i x	101.89	i x	0.85	٦ x	0.7	=	131.07	(78)
South 0.9x	0.77	X	3.12	X	82.59	×	0.85	= x	0.7	=	106.25	(78)
South 0.9x	0.77	X	3.12	X	55.42	X	0.85	Х	0.7	=	71.29	(78)
South 0.9x	0.77	X	3.12	i x	40.4	7 x	0.85	x	0.7		51.97	(78)
L .		1										
Solar gains in	watts, calcul	ated	for each mor	nth		(83)m	= Sum(74)m .	(82)m				
(83)m= 76.19	129.17 177	-	225.52 260.5		62.93 251.65	224	.36 193.73	142.75	91.09	65.35		(83)
Tota <mark>l gain</mark> s – i	internal and s	solar	(84)m = $(73)$	m + (	33)m , watts							
(84)m= 483.76	532.57 564	.53	587.62 598.	7 5	78.27 553.8	534	.52 518.06	492.13	468.06	462.27		(84)
7. Mean inter	rnal temperat	ure (	heating seas	on)								
Temperature					area from Ta	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	•	•		•			, ,					
Jan	<del></del>	1ar	Apr Ma	Ť	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 '	1	1 0.99	) (	0.98 0.97	0.9	0.99	1	1	1		(86)
Mean interna	al temperatur	e in I	iving area T1	(follo	w stens 3 to	7 in T	able 9c)		<u>'</u>			
(87)m= 17.82	<del> </del>	.33	18.87 19.4	<u> </u>	0.03 20.41	20.		19.17	18.44	17.83		(87)
` ′	! !		ļ.		<u> </u>							
Taman a ratia	18.44 18.	<del></del>	18.5 18.5		8.57 18.57	18.5	<u> </u>	18.51	18.49	18.47		(88)
Temperature		. <del>-</del> ->	10.5		!		10.55	10.51	10.49	10.47		(00)
(88)m= 18.43	<u> </u>			~ 60	m (see Table	e 9a)						
(88)m= 18.43 Utilisation fac	ctor for gains		1		<del>'</del>	T						(00)
(88)m= 18.43	ctor for gains	for r	est of dwellin 0.99 0.99		0.95 0.83	0.8	0.97	0.99	1	1		(89)
Utilisation factors (89)m= 1  Mean internal	ctor for gains  1  1 ctor for gains	e in t	0.99 0.99	elling	0.83 T2 (follow st	eps 3	to 7 in Tabl		1	1		, ,
(88)m= 18.43  Utilisation factors (89)m= 1	ctor for gains	e in t	0.99 0.99	elling	0.95 0.83	Į	to 7 in Tabl	e 9c) 17.18	16.43	15.81		(90)
Utilisation factors (89)m= 1  Mean internal	ctor for gains  1  1 ctor for gains	e in t	0.99 0.99	elling	0.83 T2 (follow st	eps 3	to 7 in Tabl	e 9c) 17.18	1	15.81	0.28	, ,
Utilisation factors (89)m= 1  Mean internal	ctor for gains  1  Al temperature 15.94 16	e in t	0.99 0.99 he rest of dw 16.87 17.4	elling	0.95 0.83 T2 (follow st 8.07 18.42	eps 3	to 7 in Tabl	e 9c) 17.18	16.43	15.81	0.28	(90)
(88)m= 18.43  Utilisation factors (89)m= 1  Mean internation (90)m= 15.78	ctor for gains  1  Al temperature 15.94 16	e in t	0.99 0.99 he rest of dw 16.87 17.4	elling 5 1	0.95 0.83 T2 (follow st 8.07 18.42	eps 3	to 7 in Tabl 39 17.92 f - fLA) × T2	e 9c) 17.18	16.43	15.81	0.28	(90)

		•	•		•	•				•			
(93)m= 16.34	16.5	16.86	17.42	18	18.61	18.97	18.93	18.47	17.73	16.99	16.37		(93)
8. Space hea							<b>T</b>	.1	. —	-0)			
Set Ti to the rethe utilisation			•		ied at ste	ep 11 of	Table 9	o, so tha	t II,m=(	/6)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	<u> </u>	,									
(94)m= 1	1	1	0.99	0.98	0.96	0.88	0.9	0.97	0.99	1	1		(94)
Useful gains,		, W = (94	4)m x (8	4)m	r	ı	ī			ī			
(95)m= 482.74	531.02	562.01	583	587.96	552.27	486.72	481.18	503.12	488.25	466.61	461.44		(95)
Monthly avera		T T	<del>-</del>		r								(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 (97)m= 4894.57	4696.37		3360.71				x [(93)m   <sub>968.7</sub>			3916.09	4862.41		(97)
Space heating					l .	l .				l .	4002.41		(01)
(98)m= 3282.4	2799.11		1999.95	1402.58	0	0	0	0	1718.57		3274.32		
` /		ļ	ļ				ITota	l per year	kWh/yeaı	) = Sum(9	8) <sub>15,912</sub> =	19648.68	(98)
Space heating	a requir	ement in	k\/\/h/m²	?/vear					`	,	′	248.72	(99)
·	• .										l	240.72	
9b. Energy records  This part is use			· ·	Ĭ			ting prov	idad by	o comm	unity cok	nomo		
Fraction of spa							<b>.</b>	•		urnity SCI	ienie.	0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 - (30)	1) =					[	1	(302)
The community so							allows for	CHP and i	ın to four	other heat	sources: th		` ′
inclu <mark>des boi</mark> lers, h									ap to rour	Janor Hoat	-	io iditor	
Fraction of hea	at from (	Commun	ity boiler	s								1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem		j	1.05	(305)
Distribution los				,	` ,,		•	0,				1.1	(306)
		(10010	. 20, 10. (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ity modul	.9 0,010					l	kWh/yea	_
Space heating Annual space	-	reauiren	nent								[	19648.68	٦
Space heat fro	•	•						(08) v (3(	14a) v (30)	5) x (306) :	_ _ [	22694.22	(307a)
•		•				. 0/ /	<b>-</b>	, , ,	, ,	, , ,	_ [ 		<u> </u>
Efficiency of se	econdar	y/supple	mentary	neating	system	ın % (frc	m rable			,	إ	0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	I												
Annual water h		equirem	ent									2102.07	
If DHW from co											-		_ 
Water heat fro	m Comr	nunity bo	oilers					(64) x (30	)3a) x (30	5) x (306) :	= [	2427.89	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	251.22	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		Ī	0	(315)
Electricity for p	umps a	nd fans v	within dv	vellina (1	Γable 4f)	:					L		_
mechanical ve							outside					0	(330a)
											L		_

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)				676.65	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factoring kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%)	CHP) P using two fuels repeat (363) to	(366) for the second	d fuel	65	(367a)
CO2 associated with heat source 1	307b)+(310b)] x 100 ÷ (367b) x	0	=	8348.27	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	130.38	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	8478.65	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or insta	intaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			8478.65	(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	=	351.18	(379)
Total CO2, kg/year sum of (376)(382) =				8829.84	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				111.77	(384)
El rating (section 14)				24.01	(385)

		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versio	on: 1.0.3.4	
		Property	Address:	Unit 11					
Address: 1. Overall dwelling dimer	, london								
1. Overall dwelling diffiel	1510115.	Δre	a(m²)		Av He	ight(m)		Volume(m <sup>3</sup>	)
Basement		\(\frac{7.1.5}{1}\)	<u> </u>	(1a) x		.9	(2a) =	96.9	<b>)</b> (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	51	(4)			_		
Dwelling volume					)+(3c)+(3d	l)+(3e)+	.(3n) =	96.9	(5)
2. Ventilation rate:									
<u> </u>	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys		+ [	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b> + -	0	j = [	0	x 2	20 =	0	(6b)
Number of intermittent far	ns				2	<b>x</b>	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fir	es			Ī	0	X 4	40 =	0	(7c)
				_			Air ch	nanges per ho	
Infiltration due to objection	to fluor and fano (63) (6b) (7	7a) ı (7b) ı (	(70) -	_		_			_
	s, flues and fans = (6a)+(6b)+( een carried out or is intended, procee			ontinue fr	20 rom (9) to (		÷ (5) =	0.21	(8)
Number of storeys in th					(2) 22 (			0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding to	o the great	ter wall area	a (after					
, ,	oor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ento	,	`	,,					0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	nvelope	area	20	(17)
•	ty value, then $(18) = [(17) \div 20] + (18)$							1.21	(18)
	s if a pressurisation test has been do	ne or a de	gree air pei	meability	is being us	sed			¬
Number of sides sheltered Shelter factor			(20) = 1 - [	0.075 x (1	19)1 =			1	(19)
Infiltration rate incorporati	ng shelter factor		(21) = (18)		- /1			0.92	(21)
Infiltration rate modified for			(= 1)	(==)				1.12	(21)
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7					•		1	
<del> </del>	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (OC.)	))	1	1		1	1		I	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25 1	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
(22a)m= 1.27 1.25 1	1.1 1.00 0.95	0.95	0.92	ı	1.08	1.12	1.10	I	

1.42	1.39	1.37	1.23	1.2	1.06	1.06	1.03	1.12	1.2	1.26	1.31		
Calculate effec		•	rate for t	he appli	cable ca	se				•	•		
If mechanicate of the street o			andiv N. (2	3h) - (22c	a) × Emy (c	auation (N	JEN otho	nuico (22h	\ _ (222)			0	(2:
If balanced with		0 11		, ,	,	. `	,, .	•	) = (23a)			0	(2:
		-	-	_					21- \ <i>(</i>	005) [	4 (00-)	0	(2:
a) If balance	a mecna	anicai ve	entilation 0	with ne	at recove	ery (MVI	1R) (24a	0 = (22)	2b)m + (2 0	23b) × [	1 – (23c)	i ÷ 100] I	(24
′		<u> </u>	<u> </u>			<u> </u>	<u> </u>					J	(2
b) If balance	ea mecha	anicai ve	entilation 0	without	neat rec	overy (N	//V) (24b	0)m = $(22)$	<u> </u>	<del>-                                    </del>		1	(2
- /	<u> </u>	<u> </u>			<u> </u>	<u> </u>	<u> </u>		0	0	0	J	(2
c) If whole h				•	/e input v o); otherv				5 v (23h	<b>,</b> )			
24c)m= 0	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural		<u> </u>										J	•
					erwise (2				0.5]				
24d)m= 1.42	1.39	1.37	1.23	1.2	1.06	1.06	1.03	1.12	1.2	1.26	1.31	]	(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			!		
25)m= 1.42	1.39	1.37	1.23	1.2	1.06	1.06	1.03	1.12	1.2	1.26	1.31		(2
	- 11												
3. Heat losse					Not Ar	00	LI voli		A V I I		le volue		A V I
LEMENT	Gros area		Openin m	-	Net Ar A ,r		U-valu W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
oors					1.9	x	1.4	= [	2.66				(2
/indows Type	e 1				1.67	x1,	 /[1/( 4.8 )+	0.04] =	6.72	Ħ			(2
Vindows Type					0.84		/[1/( 4.8 )+	\ \ \ \ \	3.38	Ħ			(2
/alls Type1	45.3	<u>,                                    </u>	2.51		42.79		2.1		89.86	╡ ,			(2
Valls Type1				_		=		=		북 남		╣	
• •	15.3		1.9	_	13.49	=	2.1	=	28.33	ᆗ ¦		┥	(2
loof	31.9		0		31.9	×	2.3	=	73.37				(3
otal area of e					92.59								(3
for windows and include the area						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	
abric heat los							(26)(30)	+ (32) =				204.33	3 (3
eat capacity		,	,					((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass	`	,	P = Cm ÷	- TFA) ir	n kJ/m²K				tive Value		` ,	450	(3
or design assess	-						ecisely the	e indicative	values of	TMP in Ta	able 1f	100	(
an be used inste	ad of a de	tailed calc	ulation.				•						
hermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						14	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	31)			(00)	(0.0)				
otal fabric he									(36) =			218.33	3 (3
entilation hea		i	<u> </u>					` '		25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	44.6	43.71	39.25	38.36	33.9	33.9	33.01	35.68	38.36	40.14	41.93		(3
8)m= 45.5													
8)m= 45.5 eat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	

Heat Ic	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	5.17	5.16	5.14	5.05	5.03	4.95	4.95	4.93	4.98	5.03	5.07	5.1		
			/=				-	-	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	5.05	(40)
Numbe	i		nth (Tab								l			
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 207												1.20/1./		
4. VVa	ter neat	ing enei	rgy requi	rement:								kWh/ye	ar:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		72		(42)
Reduce	the annua	al average	ater usaç hot water person per	usage by	5% if the d	lwelling is	designed t			se target o		.04		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			•			
(44)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		
Enorgy	contant of	hot water	used - cal	culated me	anthly = 1	100 v Vd r	n v nm v F	Tm / 2600			m(44) <sub>112</sub> =		900.48	(44)
	122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	100.01	109.17	118.55		
(45)m=	122.41	107.00	110.40	90.32	92.42	79.75	73.9	04.0			m(45) <sub>112</sub> =	<u> </u>	1180.67	(45)
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – ou	111(40)112 -		1100.07	(,
(46)m=	18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
	storage		7		. \									
			includir						ame ves	sel		160		(47)
	-	_	ind no ta hot wate		_			, ,	ers) ente	er 'O' in <i>(</i>	47)			
	storage		not wate	, (uno ii	ioiaaoo ii	notantai	10000 00	THE ECH	010) 01110	) III (	11)			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
•			storage	-				(48) x (49)	) =		1	10		(50)
•			eclared of factor fr	-								00		(51)
		_	ee secti		C Z (KVVI	ii/iiti G/GC	iy <i>)</i>				0.	02		(31)
	•	from Ta									1.	03		(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
	` ' '	(54) in (5	,								1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	r contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (	H11)] ÷ (5	0), else (57	7)m = (56)	m where (	H11) is fro	m Appendi	кH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	m Table	3							0		(58)
			culated t		,	•	. ,	, ,		_				
`			rom Tab				ı —	<del></del>			<u> </u>			(50)
(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 x (41)m = (60) m = (61) m =	Combines calculated for each month (61)m = (60) ÷ 365 x (41)m	(04)
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 177.88   169.08   166.76   149.81   147.09   133.24   129.18   140.08   139.31   156.28   162.66   173.82   (62)   Solar D-MV input calculated using Appendix G or Appendix H (negative quantity) (enter f) if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHS applies, see Appendix G) (63)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
(62)   (62)   (77.69   156.99   105.75   149.81   147.69   133.24   129.18   140.08   139.31   155.28   162.66   173.82   (62)		(01)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter for if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		(62)
Casima		(62)
Column   C		
Output from water heater  (64)m= 177.69   156.99   165.75   149.81   147.69   133.24   129.18   140.08   139.31   155.28   162.66   173.82    Output from water heater (annual):		(63)
		(00)
Couput from water heater (annual)		
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		(64)
(65)ms		(04)
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		(05)
Metabolic gains (Table 5), Watts   Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (66)m   85.98   8		(65)
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (66)nl= 85.98	include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	5. Internal gains (see Table 5 and 5a):	
Cooking gains (calculated in Appendix L, equation L9 or L9a), also see Table 5   Cooking gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	Metabolic gains (Table 5), Watts	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5  (67)m= 29.11	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(67)   29.11   25.86   21.03   15.92   11.9   10.05   10.86   14.11   18.94   24.05   28.07   29.92   (67)   Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5   (68)   149.83   151.39   147.47   139.13   128.6   118.7   112.09   110.54   114.45   122.8   133.32   143.22   (68)   Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5   (69)   31.6	(66)m= 85.98 85.98 85.98 85.98 85.98 85.98 85.98 85.98 85.98 85.98 85.98 85.98	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5  (68)m= 149.83 151.39 147.47 139.13 128.6 118.7 112.09 110.54 114.45 122.8 133.32 143.22 (68)  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6	Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(68)   149.83   151.39   147.47   138.13   128.6   118.7   112.09   110.54   114.45   122.8   133.32   143.22   (68)   Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5   (69)   31.6   31.	(67)m= 29.11 25.86 21.03 15.92 11.9 10.05 10.86 14.11 18.94 24.05 28.07 29.92	(67)
Cooking gains (calculated in Appendix L, equation L15 of L15a), also see Table 5  (69)m= 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6	App <mark>liance</mark> s gains (ca <mark>lculat</mark> ed in Appendix L, equation L13 or L13a), also see Table 5	
Rest   Color	(68)m= 149.83 151.39 147.47 139.13 128.6 118.7 112.09 110.54 114.45 122.8 133.32 143.22	(68)
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	Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(70)m=	(69)m= 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6	(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m=	Pumps and fans gains (Table 5a)	
(71)m=	(70)m= 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Water heating gains (Table 5) (72)m= 79.72 77.99 74.39 69.49 66.32 61.84 58.04 62.91 64.64 69.71 75.43 77.99 (72)  Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 307.46 304.02 291.68 273.33 255.61 239.38 229.78 236.35 246.83 265.35 285.61 299.93 (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 Table 6d Table 6b Table 6c (W)  East 0.9x 1 x 1.67 x 19.64 x 0.85 x 0.7 = 13.52 (76) East 0.9x 1 x 1.67 x 38.42 x 0.85 x 0.7 = 26.46 (76) East 0.9x 1 x 1.67 x 63.27 x 0.85 x 0.7 = 43.57 (76)	Losses e.g. evaporation (negative values) (Table 5)	
(72)m=       79.72       77.99       74.39       69.49       66.32       61.84       58.04       62.91       64.64       69.71       75.43       77.99       (72)         Total internal gains =       (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m         (73)m=       307.46       304.02       291.68       273.33       255.61       239.38       229.78       236.35       246.83       265.35       285.61       299.93       (73)         6. 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 Table 6a Table 6b Table 6c       (W)         East 0.9x 1       x       1.67       x       19.64       x       0.85       x       0.7       =       13.52       (76)         East 0.9x 1       x       1.67       x       38.42       x       0.85       x       0.7       =       26.46       (76)         East 0.9x 1       x       1.67       x       63.27       x       0.85       x       0.7       =       43.57	(71)m= -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78 -68.78	(71)
Total internal gains =	Water heating gains (Table 5)	
(73)m=       307.46       304.02       291.68       273.33       255.61       239.38       229.78       236.35       246.83       265.35       285.61       299.93       (73)         6. 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 Table 6a       Flux Table 6b       Table 6b       FF Table 6c       Gains (W)         East 0.9x 1       x 1.67       x 19.64       x 0.85       x 0.7       = 13.52       (76)         East 0.9x 1       x 1.67       x 38.42       x 0.85       x 0.7       = 26.46       (76)         East 0.9x 1       x 1.67       x 63.27       x 0.85       x 0.7       = 43.57       (76)	(72)m= 79.72 77.99 74.39 69.49 66.32 61.84 58.04 62.91 64.64 69.71 75.43 77.99	(72)
(73)m=       307.46       304.02       291.68       273.33       255.61       239.38       229.78       236.35       246.83       265.35       285.61       299.93       (73)         6. 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 Table 6a       Flux Table 6b       Table 6b       FF Table 6c       Gains (W)         East 0.9x 1       x 1.67       x 19.64       x 0.85       x 0.7       = 13.52       (76)         East 0.9x 1       x 1.67       x 38.42       x 0.85       x 0.7       = 26.46       (76)         East 0.9x 1       x 1.67       x 63.27       x 0.85       x 0.7       = 43.57       (76)	Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
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 Table 6d $m^2$ Table 6a Table 6b Table 6c (W)  East $0.9x$ 1 x $1.67$ x $19.64$ x $0.85$ x $0.7$ = $13.52$ (76)  East $0.9x$ 1 x $1.67$ x $1.67$ x $18.42$ x $1.67$ x $19.64$ x $19.$		(73)
Orientation:       Access Factor Table 6d       Area m²       Flux Table 6a $g_{-}$ Table 6b       FF Table 6c       Gains (W)         East 0.9x 1	6. Solar gains:	
Table 6d m <sup>2</sup> Table 6a Table 6b Table 6c (W)  East 0.9x 1 x 1.67 x 19.64 x 0.85 x 0.7 = 13.52 (76)  East 0.9x 1 x 1.67 x 38.42 x 0.85 x 0.7 = 26.46 (76)  East 0.9x 1 x 1.67 x 63.27 x 0.85 x 0.7 = 43.57 (76)	Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
East 0.9x 1 x 1.67 x 19.64 x 0.85 x 0.7 = 13.52 (76)  East 0.9x 1 x 1.67 x 38.42 x 0.85 x 0.7 = 26.46 (76)  East 0.9x 1 x 1.67 x 63.27 x 0.85 x 0.7 = 43.57 (76)	<b>0</b> –	
East 0.9x 1 x 1.67 x 38.42 x 0.85 x 0.7 = 26.46 (76) East 0.9x 1 x 1.67 x 63.27 x 0.85 x 0.7 = 43.57 (76)	Table 6d m² Table 6a Table 6b Table 6c (W)	
East 0.9x 1 x 1.67 x 63.27 x 0.85 x 0.7 = 43.57 (76)	East 0.9x 1 x 1.67 x 19.64 x 0.85 x 0.7 = 13.52	(76)
	East 0.9x 1 x 1.67 x 38.42 x 0.85 x 0.7 = 26.46	(76)
East 0.9x 1 x 1.67 x 92.28 x 0.85 x 0.7 = 63.54 (76)	East 0.9x 1 x 1.67 x 63.27 x 0.85 x 0.7 = 43.57	(76)
	East 0.9x 1 x 1.67 x 92.28 x 0.85 x 0.7 = 63.54	(76)
East 0.9x 1 x 1.67 x 113.09 x 0.85 x 0.7 = 77.88 (76)	East 0.9x 1 x 1.67 x 113.09 x 0.85 x 0.7 = 77.88	(76)

							_ ,		_				
East	0.9x 1	X	1.6	67	x	115.77	X	0.85	X	0.7	=	79.72	(76)
East	0.9x 1	x	1.6	67	X	110.22	x	0.85	X	0.7	=	75.9	(76)
East	0.9x 1	x	1.6	67	X	94.68	x	0.85	X	0.7	=	65.19	(76)
East	0.9x 1	x	1.6	67	X	73.59	X	0.85	X	0.7	=	50.67	(76)
East	0.9x 1	x	1.6	67	X	45.59	X	0.85	X	0.7	=	31.39	(76)
East	0.9x 1	x	1.6	67	X	24.49	x	0.85	X	0.7	=	16.86	(76)
East	0.9x 1	x	1.6	67	X	16.15	x	0.85	X	0.7	=	11.12	(76)
West	0.9x 0.77	x	3.0	34	X	19.64	x [	0.85	x	0.7	=	6.8	(80)
West	0.9x 0.77	x	3.0	34	X	38.42	x	0.85	x	0.7	=	13.31	(80)
West	0.9x 0.77	×	0.8	34	X	63.27	x	0.85	X	0.7	=	21.92	(80)
West	0.9x 0.77	x	0.8	34	x	92.28	X	0.85	x	0.7		31.96	(80)
West	0.9x 0.77	×	0.8	34	x	113.09	×	0.85	x	0.7		39.17	(80)
West	0.9x 0.77	×	0.0	34	x	115.77	x	0.85	x	0.7	=	40.1	(80)
West	0.9x 0.77	x	0.0	34	x	110.22	T x	0.85	x	0.7	=	38.18	(80)
West	0.9x 0.77	x	0.0	34	x	94.68	X	0.85	x	0.7	=	32.79	(80)
West	0.9x 0.77	x	0.0	34	x	73.59	X	0.85	×	0.7	=	25.49	(80)
West	0.9x 0.77	x	0.0	34	x	45.59	X	0.85	x	0.7	=	15.79	(80)
West	0.9x 0.77	x	0.0	34	X	24.49	Х	0.85	Х	0.7	=	8.48	(80)
West	0.9x 0.77	x	0.8	34	х	16.15	7 x	0.85	x	0.7		5.59	(80)
Solar gai	ns in watts, c	alculated	for eac	h month			(83)m	= Sum(74)m .	(82)m				
(83)m= 2	20.33 39.76	65.49	95.51	117.05	11	19.82 114.07	97.9	76.16	47.18	25.35	16.72		(83)
Total gair	ns – internal	and solar	(84)m =	= (73)m	3) +	33)m , watts							
(84)m = 3	27.78 343.79	357.16	368.84	372.65	3	59.2 343.85	334.	322.99	312.53	310.96	316.64		(84)
7. Mean	n internal tem	perature	(heating	seasor	n)								
Temper	ature during	neating p	eriods ir	n the livi	ng a	area from Ta	ıble 9,	Th1 (°C)				21	(85)
Utilisatio	on factor for g	ains for l	iving are	ea, h1,m	า (ระ	ee Table 9a)							_
	Jan Feb	Mar	Apr	May		Jun Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m=	1 1	1	1	0.99	(	0.99	0.9	7 0.99	1	1	1		(86)
Mean in	iternal tempe	rature in	living ar	ea T1 (f	ollo	w steps 3 to	7 in T	able 9c)					
(87)m= 1	17.82 17.97	18.31	18.84	19.41		20 20.38	20.3	19.87	19.14	18.42	17.83		(87)
Temper	ature during	neating p	eriods ir	rest of	dw	elling from T	able 9	). Th2 (°C)		•	•	•	
· · · · ·	18.41 18.42	18.43	18.47	18.48	1	8.53 18.53	18.5	<del>`                                    </del>	18.48	18.47	18.45		(88)
Litilication	on factor for g	uaine for i	ract of d	wolling	h2	m (soo Table	2 (22)				<u> </u>		
(89)m=	1 1	1	0.99	0.99	1	0.96 0.84	0.8	7 0.97	0.99	1	1		(89)
		ļ		<u> </u>		<u> </u>	-	!			'		()
	iternal tempe	1		I	Ť	<u> </u>	T T			16.4	15.70		(90)
(90)m= 1	15.77 15.92	16.27	16.82	17.4	1	8.01 18.37	18.3		17.14	16.4	15.79	0.50	
								I	LA = LIV	ing area - (4	+) =	0.56	(91)
_	iternal tempe				_	· ·	<del></del>	<del>- i</del> -				ı	
(92)m= 1	nternal tempe 16.93 17.08 djustment to	17.42	17.96	18.54	1	9.14 19.51	19.4	19	18.27		16.94		(92)

										1	·		
(93)m= 16.93	17.08	17.42	17.96	18.54	19.14	19.51	19.47	19	18.27	17.54	16.94		(93)
8. Space hea													
Set Ti to the return the utilisation			•		ed at ste	ep 11 of	Table 9	o, 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 fac		l	<u> </u>				_ 3						
(94)m= 1	1	1	0.99	0.99	0.97	0.93	0.94	0.98	0.99	1	1		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m			•						
(95)m= 327.09	342.89	355.83	366.5	367.85	348.07	318.4	313.43	316.45	310.54	310.05	316.05		(95)
Monthly avera		T T	·							·	T 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		(96)
Heat loss rate			2334.25				x [(93)m 771.75	- (96)m 1244.54		2600 55	3315.79		(97)
. ,							l .				3315.79		(97)
Space heatin (98)m= 2235.7	1920.8		1416.78	1032.13	0	0.02	0	0	1233.67	r -	2231.8		
(66)	.020.0	10000		.0020	Ů					) = Sum(9	<u> </u>	13655.97	(98)
Space heatin	a roquir	omont in	k\\/b/m2	2/voor			. 01.0	. poi you	(	<i>)</i> •••••(•	C)10,312		(99)
·	• .										Į	267.76	(99)
9b. Energy rec			The state of the s	Ĭ									
This part is use Fraction of spa					_		<b>.</b>	•		unity scr	neme.	0	(301)
Fraction of spa								, -				1	(302)
							-// for	CUID and	un to form	- 11 11 1			(302)
The community so includes boilers, h									ip to tour	otner neat	sources; tr	ie iaπer	
Fraction of hea	at from C	Commun	ity boiler	s								1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commi	unity hea	ting sys	tem		[	1.05	(305)
Distribution los	s factor	(Table 1	12c) for c	commun	ity heatir	ng syste	m				[	1.1	(306)
Space heating					•						L	kWh/yea	 r
Annual space	-	requiren	nent									13655.97	Ī
Space heat fro	m Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	<u> </u>	15772.65	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	[	0	(308
Space heating	require	ment fro	m secon	dary/sur	plemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =	[	0	(309)
<b>18</b> /-4	_										L		_
Water heating Annual water h		equirem	ent								[	1831.51	٦
If DHW from co	_	•									L		
Water heat fro								(64) x (30	03a) x (30	5) x (306) :	= [	2115.39	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	178.88	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		Ī	0	(315)
Electricity for p	umps a	nd fans v	within dv	velling (1	Γable 4f)	:					_		_
mechanical ve							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	a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)		514.14	(332)
12b. CO2 Emissions – Community heating scheme			
Energy kWh/year	Emission factor kg CO2/kWh	or 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 the second	fuel 65	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (3	367b) x 0	= 5944.33	(367)
Electrical energy for heat distribution [(313) x	0.52	92.84	(372)
Total CO2 associated with community systems (363)(366) + (3	68)(372)	= 6037.17	(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) + (374)	375) =	6037.17	(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	= 266.84	(379)
Total CO2, kg/year sum of (376)(382) =		6304.01	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		123.61	(384)
El rating (section 14)		27.35	(385)



# Appendix B - SAP outputs for the 'Be Lean' stage

The DER outputs from the FSAP modelling of the proposed development with the upgraded fabric and building services systems were used to calculate the 'Be Lean' stage  ${\rm CO_2}$  emissions of the development.



		Lloor Dotaile:			
		User Details:			
Assessor Name:	0. 5045.0040	Stroma Nu			
Software Name:	Stroma FSAP 2012	Software \		ersion: 1.0.3.4	
		roperty Address: Unit	1		
Address :	, london, NW3 4PB				
1. Overall dwelling dimen	SIONS:	A ( 0)	A 11 1 1 4 1	V 1 ( 2)	
Basement		Area(m²)	Av. Height(m)	Volume(m³)	(20)
		33 (1a)			(3a)
Ground floor		19 (1b)	x 1.65 (2b	) = 31.35	(3b)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)+(1e)+(1n	) 52 (4)			
Dwelling volume		(3a)+	-(3b)+(3c)+(3d)+(3e)+(3n)	105.6	(5)
2. Ventilation rate:					
	main secondar heating heating	y other	total	m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fans	s		2 x 10 =	20	(7a)
Number of passive vents			0 x 10 =	0	(7b)
Number of flueless gas fire	es		0 x 40 =		(7c)
					(1.0)
			A	ir change <mark>s per</mark> hour	r
Infiltration due to chimneys	s, flues and fans = $(6a)+(6b)+(7a)$	a)+(7b)+(7c) =	20 ÷ (5)	= 0.19	(8)
If a pressurisation test has bee	en ca <mark>rried o</mark> ut or is int <mark>ended,</mark> proceed	to (17), otherwise continu	ue from (9) to (16)		
Number of storeys in the	e dw <mark>elling</mark> (ns)			0	(9)
Additional infiltration			[(9)-1]x0	0.1 = 0	(10)
	5 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 s): if equal user 0.35	the greater wall area (afte	r		
	or, enter 0.2 (unsealed) or 0.	1 (sealed), else enter	. 0	0	(12)
If no draught lobby, ente	,	, , ,			(13)
• • • • • • • • • • • • • • • • • • • •	and doors draught stripped				(14)
Window infiltration		0.25 - [0.2 x (14)	÷ 100] =		(15)
Infiltration rate			+ (12) + (13) + (15) =		(16)
	50, expressed in cubic metre	s per hour per square	e metre of envelope are		(17)
	$y$ value, then $(18) = [(17) \div 20] + (8)$				(18)
·	if a pressurisation test has been don		ility is being used		1, -,
Number of sides sheltered				1	(19)
Shelter factor		(20) = 1 - [0.075	x (19)] =		(20)
Infiltration rate incorporating	g shelter factor	$(21) = (18) \times (20)$	) =	0.64	(21)
Infiltration rate modified for	monthly wind speed				
Jan Feb M	Mar Apr May Jun	Jul Aug Se	ep Oct Nov [	Dec	
Monthly average wind spe	ed from Table 7				

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	]		
A divisted infiltr	otion rot	e (allawi	na for ok	oltor on	d wind a		(210) 1	(22a)m		•		_		
Adjusted infiltr	0.8	0.78	0.7	0.69	0.61	0.61	0.59	(22a)III 0.64	0.69	0.72	0.75	1		
Calculate effe		1		l		l	1 0.00	0.04	0.00	0.72	0.70	J		
If mechanic													0	(23a)
If exhaust air h		0		, ,	, ,	. ,	,, .	,	) = (23a)				0	(23b)
If balanced with		-	•	_									0	(23c)
a) If balance	1	1				<del>-                                    </del>	<del></del>	<del>í `</del>	<del> </del>	<del>-                                    </del>	<del>1 ` ` </del>	) ÷ 100]		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If balance	1		1		i	<del>-                                    </del>	<del>- ^ ` ` - </del>	<del>í `</del>	<del>r ´       `</del>	<del></del>	ı	1		(5.41)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole h if (22b)r		tract ven < (23b), t		-	-				.5 × (23k	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]		(24c)
d) If natural		on or wh en (24d)		•	•				0.51	•	•	_		
$(24d)_{m=}$ 0.83	0.82	0.81	0.75	0.73	0.68	0.68	0.5 + [(2	0.7	0.3	0.76	0.78			(24d)
Effective air			_			_			3.70	0.70	0.10	J		
(25)m= 0.83	0.82	0.81	0.75	0.73	0.68	0.68	0.67	0.7	0.73	0.76	0.78	1		(25)
_														
2 Hoot loops	o and by	oot loog r	ooromot	or:					_	_	_		_	
3. Heat losse					Net Ar	rea	I I-val	III.	ΔXII	_	k-valu	Δ	Δ)	( k
3. Heat losse ELEMENT	es and he Gros area	ss	oaramet Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-valu kJ/m²·		A >	
	Gros	ss	Openin	gs						K)				
ELEMENT	Gros	ss	Openin	gs	A ,r	m²	W/m2	2K	(W/	K)				′K
ELEMENT  Doors Type 1	Gros area	ss	Openin	gs	A ,r	m² x x	W/m2	=   =	(W/ 10.22	K)				(26)
Doors Type 1 Doors Type 2	Gros area	ss	Openin	gs	A ,r 7.3 4.3	m <sup>2</sup>	1.4	= = = = = = = = = = = = = = = = = = =	10.22 6.02	K)				(26) (26)
Doors Type 1 Doors Type 2 Windows Type	Gros area	ss	Openin	gs	A ,r 7.3 4.3	x x x1 x1	W/m2 1.4 1.4 /[1/( 2.1 )+	= = = = = = = = = = = = = = = = = = =	(W/ 10.22 6.02 3.1	<) 				(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area	ss (m²)	Openin	gs 1 <sup>2</sup>	A ,r 7.3 4.3 1.6	x x x1 x1 x	W/m <sup>2</sup> 1.4 1.4 1.4 /[1/( 2.1 )+ /[1/( 2.1 )+	= = = = = = = = = = = = = = = = = = =	(W/ 10.22 6.02 3.1 3.82	K)				(K (26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Floor	Gros area	ss (m²)	Openin m	gs 1 <sup>2</sup>	A ,r 7.3 4.3 1.6 1.97 34.3	x x x1 x1 x	W/m <sup>2</sup> 1.4 1.4 /[1/( 2.1 )+ /[1/( 2.1 )+	= = = = = = = = = = = = = = = = = = =	(W/ 10.22 6.02 3.1 3.82 7.546	k)				(K (26) (26) (27) (27) (28)
Doors Type 1 Doors Type 2 Windows Type Windows Type Floor Walls Type1	Gros area	(m²)	Openin m	gs 1 <sup>2</sup>	A ,r 7.3 4.3 1.6 1.97 34.3 14.23	x x x1 x1 x x x x x x x x x x x x x x x	W/m <sup>2</sup> 1.4 1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28	= = = = = = = = = = = = = = = = = = =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98	K)				(K (26) (26) (27) (27) (28) (29)
Doors Type 1 Doors Type 2 Windows Type Windows Type Floor Walls Type1 Walls Type2	Gros area 2 29.	4 1	15.1°	gs 1 <sup>2</sup>	A ,r 7.3 4.3 1.6 1.97 34.3 14.23	x x x1 x1 x x x x x x x x x x x x x x x	W/m <sup>2</sup> 1.4 1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28 0.28	= 0.04] = 0.04] = = = = = = = =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35	K)				(26) (26) (27) (27) (28) (29) (29)
Doors Type 1 Doors Type 2 Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof	Gros area 2 29.	4 1	15.1°	gs 1 <sup>2</sup>	A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1	x x x1 x1 x x x1 x x x x x x x x x x x	W/m <sup>2</sup> 1.4 1.4 /[1/( 2.1 )+ /[1/( 2.1 )+ 0.22 0.28 0.28	= 0.04] = 0.04] = = = = = = = =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35	K)				(26) (26) (27) (27) (28) (29) (29) (30)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and	Gros area  e 1  e 2  29.  44.  19 elements	4 1 3, m <sup>2</sup> dows, use e	15.1  0  effective wi	gs 7 7	A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9	x x x1 x1 x1 x x x x x x x x x x x x x	W/m <sup>2</sup> 1.4  1.4  /[1/( 2.1 )+  /[1/( 2.1 )+  0.22  0.28  0.28  0.16	= = = = = = = = = = = = = = = = = = =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		kJ/m²-	K		(26) (26) (27) (27) (28) (29) (29) (30) (31)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area	Gros area  e 1  e 2  29.  44.  19  elements  d roof wind as on both	4 1 0 1, m <sup>2</sup> ows, use e	15.1 0 0 effective winternal wall	gs 7 7	A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9	x x x1 x1 x1 x x x x x x x x x x x x x	W/m <sup>2</sup> 1.4  1.4  /[1/( 2.1 )+  /[1/( 2.1 )+  0.22  0.28  0.28  0.16	=   -0.04  =   -0.04  =   =   =   =   =   =   =   =   =   =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		kJ/m²-	h 3.2	kJ/	(K (26) (26) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	Gros area  e 1  e 2  29.  44.  19  elements  d roof wind as on both as on both as s, W/K	4 1 1 3, m <sup>2</sup> lows, use e sides of in = S (A x	15.1 0 0 effective winternal wall	gs 7 7	A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9	x x x1 x1 x1 x x x x x x x x x x x x x	W/m <sup>2</sup> 1.4  1.4  /[1/( 2.1 )+  /[1/( 2.1 )+  0.22  0.28  0.16  0  formula 1	= \bigcup 0.04] = \bigcup 0.04	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 (e)+0.04] &		kJ/m²-	h 3.2	0.07	(26) (26) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area	Gros area  e 1  e 2  29.  44.  19 elements d roof wind as on both ss, W/K  Cm = Si	4 1 2 3 3 4 1 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Openin m  15.1  0  offective winternal wall U)	gs 7 Indow U-vals and part	A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 14.9 titions	x x x1 x1 x1 x2 x x x1 x1 x1 x x x x x x	W/m <sup>2</sup> 1.4  1.4  /[1/( 2.1 )+  /[1/( 2.1 )+  0.22  0.28  0.16  0  formula 1	2K =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 (e)+0.04] &	as given in [2] + (32a).	kJ/m²-	h 3.2	kJ/	(26) (26) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design asses	Gros area  e 1  e 2  29.  44.  19  elements  froof wind as on both as on both ss, W/K  Cm = So parame sments wh	4 1 1 2 3 3 4 1 1 3 3 3 5 4 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Openin m  15.1  0  offective with the internal walk  U)  P = Cm - internal soft the	gs 7 7 Indow U-va Is and part	A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 14.9 kJ/m²K	x x x1 x1 x1 x2 x x2 x1 x1 x1 x x x x x	W/m <sup>2</sup> 1.4  1.4  /[1/( 2.1 )+ /[1/( 2.1 )+  0.22  0.28  0.16  0  formula 1  (26)(30	2K =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] at tive Value	as given in (2) + (32a).	kJ/m²-	h 3.2	0.07 0	(26) (26) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e Party wall * for windows and ** include the are Fabric heat los Heat capacity Thermal mass	Gros area  e 1  e 2  29.  44.  19 elements d roof wind as on both ss, W/K  Cm = So s parame sments whe ad of a de	4 1 2 3 3 4 1 3 5 5 6 6 7 7 8 7 8 8 8 8 9 8 9 9 9 9 9 9 9 9 9 9	Openin m  15.1  0  offective winternal wall U)  P = Cm - tails of the pulation.	gs 7 7 Indow U-valls and part E-TFA) in construction	A ,r 7.3 4.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculations	x x x1 x1 x1 x2 x x x x x x x x x x x x	W/m <sup>2</sup> 1.4  1.4  /[1/( 2.1 )+ /[1/( 2.1 )+  0.22  0.28  0.16  0  formula 1  (26)(30	2K =	(W/ 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] at tive Value	as given in (2) + (32a).	kJ/m²-	h 3.2	0.07 0	(26) (26) (27) (27) (28) (29) (30) (31) (32)

if details of therma	0 0	are not kn	own (36) =	= 0.15 x (3	1)				4				_
Total fabric hea								• •	(36) =	(a=) (=)		70.07	(37)
Ventilation hea			· ·	<u> </u>			_	· · ·		(25)m x (5)	) 		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 28.94	28.49	28.06	26	25.61	23.82	23.82	23.49	24.51	25.61	26.39	27.21		(38)
Heat transfer of	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 99.02	98.57	98.13	96.07	95.69	93.89	93.89	93.56	94.58	95.69	96.47	97.28		_
lleet lees name		II D) \\\	/ma 21/						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	96.07	(39)
Heat loss para	1.9	1.89	1.85	1.84	1.81	1.81	1.8	1.82	1.84	1.86	1.87		
(40)m= 1.9	1.9	1.09	1.00	1.04	1.01	1.01	1.0			Sum(40) <sub>1</sub>		1.85	(40)
Number of day	s in moi	nth (Tab	le 1a)						-verage =	3um(40)1	12 / 12=	1.03	(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	ing ener	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	inanov I	NI.									75	1	(40)
if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x (	ΓFA -13		.75		(42)
if TFA £ 13.9					,			,					
Annual averag									o torget c		5.74		(43)
not more that 125	1				_	-	o acriieve	a water us	se largel o	"			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in					l .		Aug (43)	Sep	Oct	INOV	Dec		
(44)m= 83.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		
(11)= 66.61	00.20	11.20	7 1.20	1 11.	00.11	00.11	, <u>.</u>			m(44) <sub>112</sub> =		908.89	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	0Tm / 3600						` ′
(45)m= 123.55	108.06	111.51	97.22	93.28	80.49	74.59	85.59	86.62	100.94	110.19	119.65		
									Γotal = Su	m(45) <sub>112</sub> =	=	1191.69	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)				•	
(46)m= 18.53	16.21	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(46)
Water storage Storage volum		includin	na any c	olar or M	WHDC	ctorogo	within co	amo voc	col		100	l	(47)
If community h	` ,		•			•		airie ves	3 <b>C</b> I		160		(47)
Otherwise if no	•			•			` '	ers) ente	er 'O' in <i>(</i>	(47)			
Water storage		not wate	» (u.iio ii	10144001	notanta	10000	11101 0011	010) 01110	)	. 17)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			•										, ,
Hot water stora	-			e 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community h Volume factor	_		on 4.3								20	1	(50)
Temperature fa			2b								.03		(52) (53)
·				oor			(A7) v (E4)	\ v (E2\ v /	53) –		0.6		. ,
Energy lost fro Enter (50) or (		_	;, KVVII/Y	zai			(47) x (51)	)	JJ) =		.03		(54) (55)
(55) 51 (	/ (0	-,								<u> </u>		I	(55)

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(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= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(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 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 $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m + (61)m$	)m
(62)m= 178.83 157.99 166.79 150.71 148.56 133.99 129.87 140.87 140.11 156.22 163.68 174.93	(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	(63)
Output from water heater	
(64)m= 178.83 157.99 166.79 150.71 148.56 133.99 129.87 140.87 140.11 156.22 163.68 174.93	
Output from water heater (annual) <sub>112</sub> 1842.53	(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= 59.69 52.74 55.69 50.33 49.63 44.77 43.41 47.07 46.81 52.17 54.65 58.4	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
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):	
5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	(66)
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)
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= 87.45 87.45 87.45 87.45 87.45 87.45 87.45 87.45 87.45 87.45 87.45 87.45	(66) (67)
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= 87.45 87	` ,
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	` ,
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= 87.45 87	(67)
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= 87.45 87	(67)
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= 87.45 87	(67) (68)
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= 87.45 87	(67) (68)
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	(67) (68) (69)
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	(67) (68) (69)
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= 87.45 87	(67) (68) (69) (70)
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= 87.45 87	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Ju Aug Sep Oct Nov Dec (66)m= 87.45 87.	(67) (68) (69) (70)

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

Orienta	ition:	Access Fa Table 6d	actor		Area m²			Flu Tal	x ole 6a		Т	g_ able 6b		Т	FF able 6c			Gains (W)	
North	0.9x	0.77		x	1.9	7	X	1	0.63	x		0.76	×		0.7		=	7.72	(74)
North	0.9x	0.77		X	1.9	7	X	2	0.32	X		0.76	x	Ī	0.7		=	14.76	(74)
North	0.9x	0.77		x	1.9	7	X	3	4.53	×		0.76	x		0.7		=	25.08	(74)
North	0.9x	0.77		x	1.9	7	X	5	5.46	×		0.76	X		0.7		=	40.28	(74)
North	0.9x	0.77		X	1.9	7	X	7	4.72	X		0.76	X		0.7		=	54.27	(74)
North	0.9x	0.77		X	1.9	7	X	7	9.99	X		0.76	x		0.7		=	58.09	(74)
North	0.9x	0.77		X	1.9	7	X	7	4.68	X		0.76	x		0.7		=	54.24	(74)
North	0.9x	0.77		X	1.9	7	X	5	9.25	X		0.76	x		0.7		=	43.03	(74)
North	0.9x	0.77		X	1.9	7	X	4	1.52	X		0.76	X		0.7		=	30.15	(74)
North	0.9x	0.77		X	1.9	7	X	2	4.19	X		0.76	х		0.7		=	17.57	(74)
North	0.9x	0.77		X	1.9	7	X	1	3.12	X		0.76	х		0.7		=	9.53	(74)
North	0.9x	0.77		x	1.9	7	X	8	3.86	X		0.76	X		0.7		=	6.44	(74)
South	0.9x	0.77		x	1.0	6	X	4	6.75	×		0.76	x		0.7		=	27.58	(78)
South	0.9x	0.77		x	1.0	6	X	7	6.57	×		0.76	x		0.7		=	45.17	(78)
South	0.9x	0.77		X	1.0	6	X	9	7.53	×		0.76	x		0.7		=	57.53	(78)
South	0.9x	0.77		X	1.0	6	X	1	10.23	X		0.76	X		0.7		=	65.03	(78)
South	0.9x	0.77		x	1.0	5	х	1	14.87	] x		0.76	X		0.7		-	67.76	(78)
South	0.9x	0.77		x	1.0	3	х	1	10.55	x		0.76	Х		0.7		=	65.21	(78)
South	0.9x	0.77		x	1.0	3	x	10	08.01	x		0.76	Х		0.7		=	63.71	(78)
South	0.9x	0.77		x	1.0	6	X	10	04.89	X		0.76	Х	Ī	0.7		=	61.88	(78)
South	0.9x	0.77		x	1.0	5	X	10	01.89	×		0.76	X	Ē	0.7		=	60.1	(78)
South	0.9x	0.77		x	1.0	6	Х	8	2.59	×		0.76	x	Ē	0.7		=	48.72	(78)
South	0.9x	0.77		X	1.0	6	x	5	5.42	X		0.76	x		0.7		=	32.69	(78)
South	0.9x	0.77		X	1.0	6	x		10.4	×		0.76	X	Ī	0.7		=	23.83	(78)
										_			_						
Solar g	ains ir 35.3	watts, ca	llcula 82.6	$\neg$	for eac 105.31	n mont 122.03	$\neg$	123.3	117.95	<del>–</del>	n = S 1.91	um(74)m 90.25	( <mark>82)</mark> 66.2		42.22	30.	27		(83)
		internal a		-						10.	+.91	90.23	00.2		42.22	30.	21		(00)
(84)m=	333.85		368.7	_	375.1	375.6	<del></del>	61.23	345.78	33	7.93	331.78	324.	33	319.05	320	.82		(84)
` ′																			
		ernal temp						oroo f	rom Tok	olo C	Th	1 (°C)						0.4	(05)
-		e during h		•			_			ole s	, 111	I ( C)						21	(85)
Otilisa	Jan	ctor for ga	Ma	$\overline{}$	Apr	May	Ť	Jun	Jul	Γ,	ша	Sep	00	ot.	Nov		ес		
(86)m=	1	1	1	+	<b>Дрі</b> 1	1 1	+	0.98	0.91	_	ug 93	0.99	1		1	1			(86)
				<u> </u>						<u> </u>		<u> </u>				'			(33)
Mean (87)m=	intern 19.65	al tempera	19.9	_	20.19	20.47		ow ste 20.74	ps 3 to 7 20.9	1	88 able	e 9c) <sub>20.67</sub>	20.3	31	19.95	19.	65		(87)
		e during h		!											1				` '
(88)m=	19.4	19.4	19.4	<del></del>	19.44	19.44	_	19.47	19.47	1	.47	19.46	19.4	14	19.43	19.	42		(88)
(89)m=	ition ta	ctor for ga	ains to	ונ אונ	est of a	veiling 0.99	$\neg$	,m (se 0.93	0.73	T	77	0.97	1		1	1			(89)
(00)111–	1	1 '	'	[	,	0.00		0.00	0.73	<u> </u>	. ,	0.07	- 1				•		(55)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 17.66 17.8 18.06 18.48 18.89 19.28 19.44 19.43 19.18 18.66 18.12 17.68	(90)
fLA = Living area ÷ (4) =	0.66 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.98 19.08 19.29 19.61 19.93 20.25 20.4 20.39 20.16 19.75 19.33 18.98	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_
(93)m= 18.98 19.08 19.29 19.61 19.93 20.25 20.4 20.39 20.16 19.75 19.33 18.98	(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-cal-	culate
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	1
Utilisation factor for gains, hm:	_
(94)m= 1 1 1 1 0.99 0.96 0.86 0.89 0.98 1 1 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	_
(95)m= 333.76 356.28 368.41 374.18 372.3 346.74 298.09 300.02 324.98 323.49 318.87 320.75	(95)
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]	7 (07)
(97)m= 1453.12 1397.82 1255.08 1028.73 787.57 530.19 357.02 373.04 573.05 875.26 1179.74 1438.11 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	(97)
(98)m= 832.81 699.91 659.68 471.27 308.96 0 0 0 410.52 619.82 831.32	1
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	4834.29 (98)
Space heating requirement in kWh/m²/year	92.97 (99)
	92.97
9b. Energy requirements – Community heating scheme	
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.  Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0 (301
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =	1 (302)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	1 (302)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;	1 (302)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	1 (302)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers	1 (302) the latter 1 (303)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  (302) x (303a) =	1 (302) the latter  1 (303) 1 (304)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system $1 - (301) = $ The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system	1 (302 the latter  1 (303 1 (304 1 ) (305 1.05 (306 )
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community heating system	1 (302) the latter  1 (303) 1 (304) 1 (305)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system $1 - (301) = $ The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  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 (302  the latter  1 (303  1 (304  1 (305)  1.05 (306)  kWh/year
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  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 (302  the latter  1 (303  1 (304  1 (305)  1.05 (306)  kWh/year  4834.29
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) x (304a) x (305) x (306) =	1 (302  the latter  1 (303  1 (304  1 (305)  1.05 (306)  kWh/year  4834.29  5076.01 (307)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system	1 (302  the latter  1 (303  1 (304  1 (305  1.05 (306)  kWh/year  4834.29  5076.01 (307  0 (308)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	1 (302  the latter  1 (303  1 (304  1 (305  1.05 (306)  kWh/year  4834.29  5076.01 (307  0 (308)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor 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) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating	1 (302  the latter  1 (303  1 (304  1 (305)  1.05 (306)  kWh/year  4834.29  5076.01 (307)  0 (308)  0 (309)

			_
(64) x (303a) x	(305) x (306) =	1934.66	(310a)
0.01 × [(307a)(307	7e) + (310a)(310e)] =	70.11	(313)
		0	(314)
= (107) ÷ (314)	) =	0	(315)
outside		0	(330a)
		0	(330b)
		0	(330g)
=(330a) + (330	0b) + (330g) =	0	(331)
		294.24	(332)
Energy	<b>Emission factor</b>		
kWh/year	kg CO2/kWh	kg CO2/year	
kWh/year two fuels repeat (363) to	(366) for the second fu	el 90	(367a)
kWh/year	(366) for the second fu		(367a) (367)
kWh/year two fuels repeat (363) to	(366) for the second fu	el 90	<u></u>
kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x	0 (366) for the second full 0 (0.52	el 90 = 1682.56	(367)
kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x	0 0.52	el 90 = 1682.56 = 36.39	(367)
kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372	0 0.52 0	el 90 = 1682.56 = 36.39 = 1718.95	(367) (372) (373)
kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(373	0 0.52 0	el 90 = 1682.56 = 36.39 = 1718.95 = 0	(367) (372) (373) (374)
kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(37369) x (309) x (312) x	0 0.52 0 0.22	el 90 = 1682.56 = 36.39 = 1718.95 = 0	(367) (372) (373) (374) (375)
kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(37369) x (312) x (312) x (373) + (374) + (375) =	0 0.52 0.52 0.52	el 90 = 1682.56 = 36.39 = 1718.95 = 0 = 0	(367) (372) (373) (374) (375) (376)
kWh/year  two fuels repeat (363) to  (10b)] x 100 ÷ (367b) x  (313) x  (63)(366) + (368)(37369) x  (us heater (312) x  (373) + (374) + (375) =  (9 (331)) x	0 0.52 0.52 0.52	el 90 = 1682.56 = 36.39 = 1718.95 = 0 = 0 1718.95 = 0	(367) (372) (373) (374) (375) (376) (378)
kWh/year  two fuels repeat (363) to  (10b)] x 100 ÷ (367b) x  (313) x  (63)(366) + (368)(37369) x  (us heater (312) x  (373) + (374) + (375) =  (9 (331)) x	0 0.52 0.52 0.52	el 90 = 1682.56 = 36.39 = 1718.95 = 0 = 0 1718.95 = 0 = 152.71	(367) (372) (373) (374) (375) (376) (378) (379)
	0.01 × [(307a)(307	= (107) ÷ (314) =  utside  =(330a) + (330b) + (330g) =	$0.01 \times [(307a)(307e) + (310a)(310e)] =$ $= (107) \div (314) =$ $0$ $0$ $0$ $0$ $0$ $= (330a) + (330b) + (330g) =$ $0$ $294.24$

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	re Ve			Versic	on: 1.0.3.4	
		Property /	Address:	Unit 2					
Address: 1. Overall dwelling dimer	, London								
1. Overall awelling aimer	1010110.	Area	a(m²)		Av. He	ight(m)		Volume(m³	)
Basement			<u> </u>	(1a) x		.17	(2a) =	119.35	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55	(4)			_		
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	119.35	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys		+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b> + -	0	Ī = [	0	x	20 =	0	(6b)
Number of intermittent far	ns			Ī	2	x -	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fir	res			Ī	0	X 4	40 =	0	(7c)
				_			Air ch	nanges <mark> per</mark> ho	our
Infiltration due to chimney	vs, flues and fans = $(6a)+(6b)+($	7a)+(7b)+(7	7c) =	Г	20		÷ (5) =	0.17	(8)
	een ca <mark>rried o</mark> ut or is intended, procee	ed to (17), o	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in the Additional infiltration	e dw <mark>elling</mark> (ns)					[(0)	11v0 1 -	0	(9)
	25 for steel or timber frame o	r 0.35 for	masonr	v consti	ruction	[(9)	-1]x0.1 =	0	(10)
	esent, use the value corresponding t			•					
deducting areas of opening	<b>5</b> /·	1 (222)	مار مامم	antar O				_	7(40)
If no draught lobby, ent	oor, enter 0.2 (unsealed) or 0	).1 (seale	ea), eise	enter 0				0	(12)
•	and doors draught stripped							0	= (13)
Window infiltration	and doors dradgin suipped		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	our per so	quare m	etre of e	nvelope	area	10	(17)
If based on air permeabili	ty value, then $(18) = [(17) \div 20] + (18)$	(8), otherwi	se (18) = (	16)				0.67	(18)
	s if a pressurisation test has been do	ne or a deg	gree air pei	meability	is being u	sed			_
Number of sides sheltered	d		(20) = 1 -	n 075 v (*	10)1 –			2	(19)
Shelter factor	ng chaltar factor		(20) = 13		19)] =			0.85	(20)
Infiltration rate incorporati			(21) - (10)	X (20) =				0.57	(21)
Infiltration rate modified fo	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind spe		Oui	_ / tag	ОСР	1 000	1 1404	1 000	J	
<del> </del>	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
` '		1			1	<u> </u>	I	J	
Wind Factor $(22a)m = (22a)m $	<del> </del>	1			T	T		1	
(22a)m= 1.27 1.25 1	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate	e (allowir	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.72	0.71	0.7	0.62	0.61	0.54	0.54	0.52	0.57	0.61	0.64	0.67		
Calculate effe		-	ate for t	he appli	cable ca	se		!					<del></del>
If mechanic			andia N. (O	ah) (aa-	· \		IT\\		) (00-)			0	(23a)
If exhaust air h									) = (23a)			0	(23b)
If balanced with												0	(23c)
a) If balance		-				<u> </u>		ŕ	<del>r ´       `</del>	<del></del>	<del>- ` ´</del>	÷ 100] I	(240)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance		r						<del>í `</del>	<del> </del>	<del>-                                    </del>	· ·	Ī	(O.4F.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	iouse exti n < 0.5 ×			•	•				5 v (22k	<b>5)</b>			
(24c)m = 0	0.5 x	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ا												(= :0)
,	n = 1, the			•	•				0.5]				
(24d)m= 0.76	0.75	0.74	0.69	0.69	0.65	0.65	0.64	0.66	0.69	0.7	0.72		(24d)
Effective air	change r	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.76	0.75	0.74	0.69	0.69	0.65	0.65	0.64	0.66	0.69	0.7	0.72		(25)
3. Heat losse	s and hea	at loss p	aramete	er:							_		_
ELEMENT	Gross		Openin		Net Ar	ea	U-valu	ue	ΑXU		k-value	9	AXk
	are <mark>a</mark> (	(m²)	· m		A ,r	n²	W/m2	!K	(W/	K)	kJ/m²-l	<	kJ/K
Doors					1.9	X	1.4	=	2.66				(26)
Windows Type	e 1	7			9.03	x1/	/[1/( 1.6 )+	0.04] =	13.58				(27)
Windows Type	2				1.82	X1/	/[1/( 4.8 )+	0.04] =	7.33				(27)
Windows Type	e 3				0.87	x1/	/[1/( 4.8 )+	0.04] =	3.5				(27)
Floor					55	X	0.93	=	51.15				(28)
Walls Type1	28.9		10.8	5	18.05	5 x	2.1	=	37.9			$\exists$ $\vdash$	(29)
Walls Type2	7.81		2.77		5.04	x	2.1	₹ - i	10.58	₹ i		7 F	(29)
Total area of e	elements,	m²			91.71								(31)
Party wall					27.9	X	0		0			$\neg$ $\vdash$	(32)
Party wall					1.13	x	0	=	0	Ħ i		<b>=</b>   =	(32)
* for windows and ** include the area					alue calcul			/[(1/U-valu		as given in	paragraph	 1 3.2	` ′
Fabric heat los				- a.ia paii			(26)(30)	) + (32) =				126.7	(33)
Heat capacity		•	-,					((28).	(30) + (3	2) + (32a).	(32e) =	0	(34)
Thermal mass	,	,	) = Cm ÷	- TFA) ir	n kJ/m²K			,	tive Value	, , ,	` '	450	(35)
For design assess	sments whe	ere the det	ails of the	,			ecisely the			· ·	able 1f	730	(55)
Thermal bridg				ısina An	pendix k	<						14.4	(36)
if details of therma	al bridging a	,		• .	•	-		(00)	(00)				
Total fabric he		ا الاعادات							(36) =	(OE) (E)		141.1	1 (37)
Ventilation hea	<del> </del>	r								(25)m x (5)	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(00)	T	T									T		(00)
(38)m= 30	29.6	29.21	27.37	27.02	25.42	25.42	25.12	26.03	27.02	27.72	28.45		(38)
Heat transfer		<del></del>	1,00,40	100.10	100.50	400.50	1,00,00		= (37) + (3	•	100.50		
(39)m= 171.11	170.71	170.32	168.48	168.13	166.53	166.53	166.23	167.14	168.13	168.83	169.56	400.47	(39)
Heat loss para	ameter (I	HLP), W	/m²K						= (39)m ÷	Sum(39) <sub>1</sub> (4)	12 /12=	168.47	(39)
(40)m= 3.11	3.1	3.1	3.06	3.06	3.03	3.03	3.02	3.04	3.06	3.07	3.08		_
Number of da	vs in mo	nth <i>(</i> Tah	le 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	3.06	(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>	<u> </u>		
4. Water hea	atina ene	rav reau	irement:								kWh/ye	ear:	
Assumed occ if TFA > 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		84		(42)
if TFA £ 13. Annual average	,	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		77	7.84		(43)
Reduce the annu	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t			se target o		.01		(10)
not more that 125		person pe		ater use, I	not and co								
Jan Hot water usage	Feb in litrog po	Mar	Apr	May	Jun	Jul Table 10 v	Aug	Sep	Oct	Nov	Dec		
(44)m= 85.62	82.51	79.39	76.28	73.17	70.05	70.05	73.17	76.28	79.39	82.51	85.62	004.05	7(44)
Ener <mark>gy cont</mark> ent o	f hot wa <mark>ter</mark>	used - ca	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	934.05	(44)
(45)m= 126.97	111.05	114.6	99.91	95.86	82.72	76.65	87.96	89.01	103.74	113.24	122.97		
If instantaneous	water boot	ing of poin	t of upo (no	bot water	t atamana)	antar O in	havaa (46		Total = Su	m(45) <sub>112</sub> =	=	1224.68	(45)
If instantaneous		· ·		1		1		, ,					(40)
(46)m= 19.05 Water storage	16.66 loss:	17.19	14.99	14.38	12.41	11.5	13.19	13.35	15.56	16.99	18.45		(46)
Storage volun		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If community	heating a	and no ta	ank in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n		hot water	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage		a alarad l	ana fant	ar ia kaa		2/dox/\							(40)
a) If manufac				JI IS KIIO	WII (KVVI	i/uay).					0		(48)
Temperature				201			(40) × (40)				0		(49)
Energy lost from b) If manufact		_	-		or is not		(48) x (49)	) =		1	10		(50)
Hot water stor			-							0.	.02		(51)
If community	_		on 4.3										
Volume factor			. Oh							<b>—</b>	.03		(52)
Temperature							·	>	>	0	.6		(53)
Energy lost from Enter (50) or		-	e, KVVh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54) (55)
Water storage	, , ,	•	for each	month			((56)m = (	55) × (41)r	m	1.	.03		(33)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
(56)m= 32.01 If cylinder contain												x H	(50)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(57)m= 32.01	20.92	J2.01	30.90	JZ.U1	50.30	JZ.U1	JZ.U1	50.90	JZ.U1	30.90	JZ.U1		(01)

Primary circuit loss (annual) from Table 3	0 (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 t	hermostat)
(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 = $0.85 \times (48)$	5)m + (46)m + (57)m + (59)m + (61)m
	159.01
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar c	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	g,
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
	159.01 166.73 178.24
	er heater (annual) <sub>112</sub> 1875.52 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 × (45)m + (61)m] + 0.8 x [	
(65)m= 60.83 53.73 56.71 51.23 50.48 45.51 44.1 47.86 47.61	53.1 55.66 59.5 (65)
	, ,
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot wat	er 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= 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87 91.87	91.87 91.87 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 14.29 12.69 10.32 7.81 5.84 4.93 5.33 6.93 9.29	11.8 13.77 14.68 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table	e 5
(68)m= 160.19 161.85 157.66 148.74 137.49 126.91 119.84 118.18 122.36	131.28 142.54 153.12 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	· · · · · · · · · · · · · · · · · · ·
(69)m= 32.19 32.19 32.19 32.19 32.19 32.19 32.19 32.19 32.19	32.19 32.19 32.19 (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 values) (Table 5)	
	-73.49 -73.49 -73.49 (71)
Water heating gains (Table 5)	
	71.37 77.31 79.97 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (60)m + (60)m$	
	265.02 284.18 298.33 (73)
6. Solar gains:	205.02 204.10 290.55
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the	applicable orientation
	FF Gains
Orientation: Access Factor Area Flux g_ Table 6d m² Table 6a Table 6b	Table 6c (W)
North 0.9x 0.77 x 1.82 x 10.63 x 0.85	
0.00 A 0.00	
North 0.9x 0.77	X 0.7 = 3.81 (74)

				(heating s			rea from Tab	olo O	Th1 (°C)	,	•	•	21	(85)
(84)m=	474.23		657.77	<del>` ´                                     </del>	727.04	·	2.36 677.41	654	.91 633.58	566.79	9 483.22	442.65	]	(84)
(83)m= Total q							6.75   442.42 3)m , watts	414	.92 385.24	301.7	199.04	144.32	J	(03)
1	ains in \ 167.44	watts, cal	culated 363	for each 428.51	month 465.3		i	(83)m	.92 385.24	( <mark>82)m</mark>	7 199.04	144.32	1	(83)
	_		_			_						_		
South	0.9x	0.77	×	9.03		x	40.4	x	0.76	×	0.7	=	134.49	(78)
South	0.9x	0.77	×	9.03		x [	55.42	×	0.76	×	0.7		184.49	(78)
South	0.9x	0.77	×	9.03	_	x	82.59	X	0.76	×	0.7	_ =	274.94	(78)
South	0.9x	0.77	×	9.03		x	101.89	) x	0.76	×	0.7		339.19	(78)
South	0.9x	0.77	⊢ ^	9.03		^ L x [	104.89	] ^ ] x	0.76	=  ^	0.7	= =	349.21	(78)
South	0.9x 0.9x	0.77		9.03	=	^ L x Г	108.01	]	0.76		0.7	╡ ፟፟	359.59	(78)
South	0.9x 0.9x	0.77	x	9.03		x L	114.87	] x ] x	0.76 0.76	X x	0.7	=	382.42 368.03	(78)
South South	0.9x	0.77	×	9.03		х <u>Г</u>	110.23	X	0.76	→   ×     →	0.7	=	366.99	(78)
South	0.9x	0.77	×	9.03	_	х 	97.53	X	0.76	X	0.7	╡ =	324.7	(78)
South	0.9x	0.77	×	9.03	=	X	76.57	X	0.76	X	0.7	=	254.91	(78)
South	0.9x	0.77	×	9.03		x	46.75	X	0.76	×	0.7	=	155.64	(78)
North	0.9x	0.77	×	0.87		×	8.86	Х	0.85	X	0.7	=	3.18	(74)
North	0.9x	0.77	×	1.82		X	8.86	X	0.85	х	0.7	=	6.65	(74)
North	0.9x	0.77	×	0.87		x	13.12	×	0.85	×	0.7	=	4.71	(74)
North	0.9x	0.77	x	1.82		x	13.12	×	0.85	х	0.7	=	9.84	(74)
North	0.9x	0.77	×	0.87		x [	24.19	X	0.85	Х	0.7	=	8.68	(74)
North	0.9x	0.77	x	1.82		x [	24.19	×	0.85	x	0.7	=	18.15	(74)
North	0.9x	0.77	×	0.87		x [	41.52	x	0.85	x	0.7	=	14.89	(74)
North	0.9x	0.77	×	1.82		x [	41.52	x	0.85	×	0.7	=	31.16	(74)
North	0.9x	0.77	×	0.87		x	59.25	x	0.85	×	0.7		21.25	(74)
North	0.9x	0.77	×	1.82	=	x	59.25	X	0.85	×	0.7	_ =	44.46	(74)
North	0.9x	0.77	×	0.87		~ L х [	74.68	]	0.85	×	0.7	= =	26.79	(74)
North	0.9x	0.77	☐ x	1.82	==	^ L x Г	74.68	] ^ ] <sub>x</sub>	0.85	`x	0.7	_	56.04	(74)
North	0.9x	0.77	$=$ $\hat{x}$	0.87		^ L x [	79.99	] ^ ] x	0.85	$=$ $\frac{1}{x}$	0.7	<del>-</del> -	28.69	(74)
North	0.9x	0.77	⊢ ^	1.82	==	^ L x [	79.99	] ^ ] x	0.85	$=$ $\frac{1}{x}$	0.7	= -	60.02	(74)
North	0.9x	0.77	$=$ $\hat{x}$	0.87	_	^ L x Г	74.72	] ^ ] <sub>x</sub>	0.85 0.85	$=$ $\frac{1}{x}$	0.7	= -	26.8	(74)
North	0.9x 0.9x	0.77	x x	1.82		x L	55.46	] x ] x	0.85	x x	0.7	<b>- </b>	19.9	(74)
North	0.9x 0.9x	0.77	×	1.82	_	х <u>Г</u>	55.46	] X ] v	0.85	X	0.7	╡ -	41.62	(74)
North	0.9x	0.77	×	0.87		х ., Г	34.53	X l	0.85	_ x	0.7	_ =	12.39	$= \frac{(74)}{(74)}$
North North	0.9x	0.77	×	1.82	_	X	34.53	X	0.85	X	0.7	=	25.91	(74)
North	0.9x	0.77	×	0.87	==	X	20.32	X	0.85	×	0.7	_  =	7.29	(74)
	0.9x	0.77	×	1.82		× L	20.32	X	0.85	×	0.7	=	15.25	(74)

(86)m=	1	1	0.99	0.99	0.97	0.92	0.82	0.85	0.95	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	18.95	19.14	19.44	19.84	20.26	20.64	20.85	20.82	20.52	19.98	19.39	18.93		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	18.7	18.7	18.7	18.72	18.72	18.74	18.74	18.74	18.73	18.72	18.72	18.71		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.98	0.93	0.78	0.5	0.56	0.86	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	16.19	16.47	16.91	17.5	18.08	18.56	18.72	18.71	18.44	17.7	16.85	16.17		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.55	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	A × T1	+ (1 – fl	A) x T2					
(92)m=	17.71	17.93	18.3	18.79	19.28	19.7	19.89	19.87	19.58	18.95	18.25	17.68		(92)
Apply	adjustr	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	17.71	17.93	18.3	18.79	19.28	19.7	19.89	19.87	19.58	18.95	18.25	17.68		(93)
8. Sp	ace hea	iting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the u			or gains			live	l. d	A	Con	Oct	Nev	Dag		
Utilis	Jan ation fac	Feb	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.99	0.98	0.94	0.86	0.7	0.74	0.91	0.98	1	1		(94)
	ıl gains,	hmGm	, W = (94	1)m x (8	4)m									
(95)m=	473.09	579.42	650.56	689.72	685.51	602.12	473.11	482.39	574.15	555.11	480.92	441.84		(95)
Montl	nly aver	age exte	rnal 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)
		T	an intern			1				i –				(07)
		2224.91	2009.32		1274.13		547.18	576.24	916.65	1403.57	1881.75	2286.19		(97)
-		g require 1105.77	ement fo 1010.92		437.93	/vn/mon	$\ln = 0.02$	24 X [(97]	)m – (95 0	631.26	1008.6	1372.2		
(50)111=	1000.10	1100.77	1010.02	102.11	407.00		Ů			(kWh/year			7624.6	(98)
Space	o hootin	a roquir	omant in	k\\/\b/m2	Woor			7010	ii poi youi	(KVVIII) Gai	) – Gam(G	O / 15,912 —		
•		· .	ement in										138.63	(99)
			nts – Cor					lina nua.	برجا لم جاء:		الممانية			
			ace hea from se								unity Scr	ieme.	0	(301)
	•		from co	•		-			,				1	(302)
	•			•	•	,	,	allows for	CUD and	un to four	other heat	nouroon: H		(002)
	-		s, geotherr							ир то тоит с	otrier rieat	sources; tl	ie iallei	
Fractio	n of hea	at from C	Commun	ity boile	'S								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
			(Table 1		,	` ''		•	5 ,			[ [	1.05	(306)
			, , , , , , , ,			, 1100111	.9 5,510	•••						
-	heating	_	requirem	nent								ĺ	<b>kWh/y</b> 7624.6	ear
,aa	. 56400	oamig	. 54411011	.5									7.024.0	

Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	8005.83	(307a)
Efficiency of secondary/supplementary heating system	n in % (from Table 4a or Apper	ndix 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			1875.52	]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	1969.3	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	99.75	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = $(107) \div (314)$	) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4 mechanical ventilation - balanced, extract or positive i		]	0	(330a)
warm air heating system fans		[	0	(330b)
pump for solar water heating		ĺ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			252.32	(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 (i	kWh/year not CHP)	kg CO2/kWh	kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%)	kWh/year not CHP) is CHP using two fuels repeat (363) to	kg CO2/kWh	kg CO2/year	`` ¬
CO2 from other sources of space and water heating (In Efficiency of heat source 1 (%)  CO2 associated with heat source 1	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x	kg CO2/kWh  0 (366) for the second fuel  0 =  0.52 =	90 2394.03	(367)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x	kg CO2/kWh  0 (366) for the second fuel  0 =  0.52 =	90 2394.03 51.77	(367)
CO2 from other sources of space and water heating (In Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(376)	0 (366) for the second fuel 0 = 0.52 = 22) =	90 2394.03 51.77 2445.8	(367) (372) (373)
CO2 from other sources of space and water heating (refficiency 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)	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(376)	0 (366) for the second fuel 0 = 0.52 = 22) = =	90 2394.03 51.77 2445.8	(367) (372) (373) (374)
CO2 from other sources of space and water heating (refficiency 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 in	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(37  (309) x  instantaneous heater (312) x  (373) + (374) + (375) =	0 (366) for the second fuel 0 = 0.52 = 22) = =	90 2394.03 51.77 2445.8 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (refficiency 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 into total CO2 associated with space and water heating	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(37  (309) x  instantaneous heater (312) x  (373) + (374) + (375) =	0 (366) for the second fuel 0 = 0.52 = 0.52 = 0.22 = 0.22 = 0.22	90 2394.03 51.77 2445.8 0 0 2445.8	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (refficiency 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 in the control of	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(37  (309) x  instantaneous heater (312) x  (373) + (374) + (375) =  thin dwelling (331)) x  (332))) x	0 (366) for the second fuel 0 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	90 2394.03 51.77 2445.8 0 2445.8	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (refficiency 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 in the control of	kWh/year  not CHP) is CHP using two fuels repeat (363) to  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(37  (309) x  instantaneous heater (312) x  (373) + (374) + (375) =  thin dwelling (331)) x  (332))) x	0 (366) for the second fuel 0 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	90 2394.03 51.77 2445.8 0 0 2445.8 0 130.95	(367) (372) (373) (374) (375) (376) (378) (379)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20		roperty	Stroma Softwa Address	are Ve			Versic	on: 1.0.3.4	
Address :	, london		Toperty .	Addiess	Offic 5					
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	<u>')</u>
Basement				51	(1a) x	2	.17	(2a) =	110.67	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	۱)	51	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	110.67	(5)
2. Ventilation rate:										
		secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [	0	=	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent fa	ıns				, <u> </u>	2	x	10 =	20	(7a)
Number of passive vents	<b>;</b>				F	0	x	10 =	0	(7b)
Number of flueless gas fi	ires				F	0	X e	40 =	0	(7c)
					L			Air ch	nanges per ho	
Infiltration due to chimne						20		÷ (5) =	0.18	(8)
If a pressurisation test has b Number of storeys in t		ded, procee	d to (17), (	otherwise (	continue fr	om (9) to (	(16)		0	(9)
Additional infiltration	ne awening (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timbe	r frame or	0.35 fo	r masonı	y constr	uction	•		0	(11)
•••	resent, use the value corre	esponding to	the great	ter wall are	a (after					
deducting areas of openii  If suspended wooden t	<i>5</i> // 1	aled) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, en	•	alca) of o	. 1 (3001)	<i>Ju)</i> , 0100	Cittor o				0	(13)
Percentage of windows		stripped							0	(14)
Window infiltration	_			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	•		•	•	•	etre of e	envelope	area	10	(17)
If based on air permeabil									0.68	(18)
Air permeability value applie Number of sides sheltere		as been dor	ne or a de	gree air pe	rmeability	is being u	sed		3	(19)
Shelter factor	, u			(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.78	(20)
Infiltration rate incorporat	ting shelter factor			(21) = (18	) x (20) =				0.53	(21)
Infiltration rate modified f	or monthly wind spec	ed								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	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 Faster (22a) (2)	2)m : 4									
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
(224)111- 1.21 1.23	1.20 1.1 1.00	0.33	0.90	0.92	'	1.00	1.14	1.10	J	

0.67	0.66	0.65	0.58	0.57	0.5	0.5	0.49	0.53	0.57	0.59	0.62		
Calculate effe		•	rate for t	he appli	cable ca	se	<u> </u>		<u> </u>	ļ	<u>ļ</u>		
If mechanica			l' N. (0	OL) (00	\ <b>.</b>	(1	15// (1	. (20)	\ (00 \			0	(23
If exhaust air h		0		, ,	,	. `	,, .	•	) = (23a)			0	(23
If balanced with		-	-	_								0	(23
a) If balance						<u> </u>	<del>- ´ `                                  </del>	<u> </u>	<del> </del>	<del>-                                    </del>	<del>1 ` ` `</del>	) ÷ 100] 7	(2)
24a)m= 0		0	0	0	0	0	0	0	0	0	0		(24
b) If balance							<del></del>	<u> </u>	<del> </del>	<del></del>	Ι ,	7	(2
24b)m= 0	0	0	0	0	. ,	0	0	0	0	0	0	_	(2
c) If whole h		tract ver ‹ (23b), t		•					5 v (23h	<b>,</b> )			
4c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural												_	(-
,		en (24d)		•	•				0.5]				
4d)m= 0.73	0.72	0.71	0.67	0.66	0.63	0.63	0.62	0.64	0.66	0.68	0.69	1	(2
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)	!			_	
25)m= 0.73	0.72	0.71	0.67	0.66	0.63	0.63	0.62	0.64	0.66	0.68	0.69		(2
													_
B. Heat losse										_		_	
LEMENT	Gros area		Openin		Net Ar A ,r		U-valu W/m2		A X U (W/I	K)	k-valu kJ/m²·		A X k kJ/K
oors	4.04	()			1.9	x	1.4	= [	2.66		110/111		(2
in <mark>dows</mark> Type	1				9.03	_	/[1/( 1.6 )+		13.58	Ħ			(2
indows Type					2.89		/[1/( 4.8 )+	L	11.64	Ħ			(2
oor					51	×		= [		<del>╡</del> ┌			(2
/alls Type1	40.4		0.00			=	0.99	=	50.49	亅		_	
/alls Type1 /alls Type2	16.1		9.03	=	7.11	X	2.1	= [	14.93	믁 ¦			(2
	16.		4.79		11.31	=	2.1	=	23.75				(2
otal area of e	iements	, III²			83.24	<u>-</u>							(3
arty wall					33.3	Х	0	= [	0				(3
or windows and include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapi	h 3.2	
abric heat los				o arra par			(26)(30)	+ (32) =				117.0	5 (3
eat capacity	•	•	-,					((28)	(30) + (32	2) + (32a).	(32e) =	0	(3
nermal mass		,	P = Cm ÷	- TFA) ir	n kJ/m²K				tive Value	, , ,	, ,	450	(3
or design assess	•	•		•			ecisely the			· ·	able 1f	400	
n be used inste						,	,						
nermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						12.8	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	1)								
otal fabric he									(36) =			129.8	5 (3
entilation hea					_				= 0.33 × (		1	٦	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	
	26.2	25.89	24.41	24.13	22.85	22.85	22.61	23.34	24.13	24.69	25.28		(3
	20.2	<u> </u>					•		•	•	•	_	
		<u> </u>						(39)m	= (37) + (3	38)m		_	

leat lo	oss para	meter (F	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
10)m=	3.07	3.06	3.05	3.02	3.02	2.99	2.99	2.99	3	3.02	3.03	3.04		
ممسا	or of dov	o in mar	ath /Tabl	lo 1o\					,	Average =	Sum(40) <sub>1</sub>	12 /12=	3.02	(4
iumbe	Jan	Feb	nth (Tabl Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
.,	<u> </u>		0.		<b>.</b>									•
4. Wa	ater heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssum	ed occu	pancy, I	N								1	72		(4
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		12		(
								(25 x N)		44		5.04		(4
		_	not water berson per			_	_	to achieve	a water us	se target o	Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	er usage ii	n litres per	day for ea		Vd,m = fa	ctor from T	Table 1c x		•					
4)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		_
nerav (	content of	hot water	used - cal	culated mo	onthly = $4$	190 x Vd.r	n x nm x F.	Tm / 3600		Total = Su	, ,		900.48	
5)m=	122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	100.01	109.17	118.55		
			1.00	00.02	02.1.2			9.10		Total = Su		L .	1180.67	
instanı	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)					
6)m=	18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(
	storage e volum		includin	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		160		(
		,	nd no ta									100		(
	•	-			_			mbi boil	ers) ente	er '0' in (	47)			
	storage					4.144	/ I \					1		
•			eclared lo		or is kno	wn (kWh	n/day):					0		(
			m Table									0		(
			storage clared c	-		or io not		(48) x (49)	=		1	10		(
			factor fr	-							0	02		(
		_	ee sectio		- (		77					.02		Ì
olum	e factor	from Tal	ble 2a								1.	.03		(
empe	erature fa	actor fro	m Table	2b							0	.6		(
nergy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(
nter	(50) or (	54) in (5	55)								1.	.03		(
ater	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
6)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
ylinde	er contains	dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
")m=		1 (												(
7)m= rimar	v circuit	ioss (an	inual) fro	om Table	3							0		(
imar	y circuit y circuit	,				59)m = (	(58) ÷ 36	65 × (41)	m			0		,
imar imar	y circuit	loss cal	culated f	for each	month (	•	. ,	65 × (41) ng and a		r thermo		0		

Combi loca	ooloulotod	for cook	month	(64)m	(CO) + 20	GE (41	١,,,,						
Combi loss (61)m= 0	0 0	Tor each		0	(6U) ÷ 30	05 × (41)	)m   0	0	0	Ιο	0	1	(61)
( )	!			<u> </u>				ļ	<u> </u>	ļ	<u> </u>	(50)m + (61)m	(01)
(62)m= 177.6	<del></del>	165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82	(59)m + (61)m	(62)
Solar DHW inp		I	<u> </u>									J	(02)
(add additio									ii ooniinba	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	water hea	ıter	<u> </u>	<u> </u>		<u> </u>	<u> </u>		<u>!</u>	ļ	<u> </u>	J	
(64)m= 177.6		165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82	]	
						•	Out	put from w	ater heate	r (annual) <sub>1</sub>	112	1831.51	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 .]	
(65)m= 59.3	1 52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
include (5	7)m in cal	culation (	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):								-	
Metabolic ga	ains (Table	e 5), Wat	ts										
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 85.9	8 85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98		(66)
Ligh <mark>ting g</mark> ai	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.3	6 11.86	9.65	7.3	5.46	4.61	4.98	6.47	8.69	11.03	12.88	13.73		(67)
Appliances	gains (ca <mark>lc</mark>	culated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 149.8	33 151.39	147.47	139.13	128.6	118.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a	), also s	ee Table	5		-		
(69)m= 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps and	fans gains	(Table 5	5a)									_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporation	on (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -68.7	78 -68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78		(71)
Water heati	ng gains (1	Table 5)										_	
(72)m= 79.7	2 77.99	74.39	69.49	66.32	61.84	58.04	62.91	64.64	69.71	75.43	77.99	]	(72)
Total intern	al gains =	•			(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	)m	_	
(73)m= 291.	7 290.03	280.3	264.72	249.17	233.95	223.91	228.72	236.58	252.33	270.42	283.74		(73)
6. Solar ga													
Solar gains a		•				•	itions to c		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a	-	g_ Fable 6b	Т	FF able 6c		Gains (W)	
North 0.9							, –					` '	1(74)
			2.8			10.63	]	0.85	×	0.7	=	12.67	(74)
			2.8			20.32	]	0.85		0.7	=	24.22	](74) ] <sub>(74)</sub>
		_	2.8			34.53	]	0.85	×	0.7	_ =	41.15	](74) ] <sub>(74)</sub>
		_	2.8		-	55.46	]	0.85		0.7	_ =	66.09	(74)
North 0.9	X 0.77	X	2.8	39	x	74.72	X	0.85	X	0.7	=	89.03	(74)

North										_				_
North	0.9x	0.77	Х	2.89	9	X	79.99	X	0.85	X	0.7	=	95.31	(74)
North	0.9x	0.77	Х	2.89	9	X	74.68	X	0.85	X	0.7	=	88.99	(74)
North	0.9x	0.77	X	2.89	9	X	59.25	X	0.85	X	0.7	=	70.6	(74)
North	0.9x	0.77	X	2.89	Э	X	41.52	X	0.85	X	0.7	=	49.47	(74)
North	0.9x	0.77	X	2.89	Э	X	24.19	x	0.85	X	0.7	=	28.83	(74)
North	0.9x	0.77	X	2.89	9	X	13.12	x	0.85	X	0.7	=	15.63	(74)
North	0.9x	0.77	x	2.89	9	X	8.86	x	0.85	X	0.7	=	10.56	(74)
South	0.9x	0.77	х	9.03	3	X	46.75	x	0.76	x	0.7	=	155.64	(78)
South	0.9x	0.77	х	9.03	3	X	76.57	x	0.76	x	0.7	=	254.91	(78)
South	0.9x	0.77	х	9.03	3	X	97.53	x	0.76	x	0.7	=	324.7	(78)
South	0.9x	0.77	х	9.03	3	x	110.23	x	0.76	x	0.7	=	366.99	(78)
South	0.9x	0.77	х	9.03	3	x	114.87	x	0.76	×	0.7	=	382.42	(78)
South	0.9x	0.77	x	9.03	3	X	110.55	x	0.76	x	0.7	=	368.03	(78)
South	0.9x	0.77	х	9.03	3	x	108.01	x	0.76	x	0.7	=	359.59	(78)
South	0.9x	0.77	x	9.03	3	x	104.89	x	0.76	x	0.7	<del>-</del>	349.21	(78)
South	0.9x	0.77	х	9.03	3	X	101.89	x	0.76	×	0.7	=	339.19	(78)
South	0.9x	0.77	х	9.03	3	X	82.59	x	0.76	x	0.7	=	274.94	(78)
South	0.9x	0.77	x	9.03	3	X	55.42	Х	0.76	X	0.7		184.49	(78)
South	0.9x	0.77	х	9.03	3	х	40.4	7 x	0.76	х	0.7		134.49	(78)
	_													
Solar ga	ains in wa	atts, <mark>calcu</mark> la	ated	for each	month	)_		(83)m	= Sum(74)m	.(82)m				
(83)m=	168.32	279.12 365	.85	433.08	471.46	40	63.34 448.58	419	.81 388.67	303.70	200.12	145.05		(83)
Total ga	ains – inte	ernal and s	olar	(84)m =	(73)m	3) +	83)m , watts	,						
(84)m=	460.02	646	.15	697.8	720.62	69	97.29 672.48	648		556.1	470.55	428.79		
7. Mea						_		040	.53 625.25	550.1	470.00	0 0		(84)
	an interna	al temperat	ure (	heating	season	n)		040.	.53 625.25	550.1	470.00	.200		(84)
Tempe		· · · · · · · · · · · · · · · · · · ·					area from Ta			330.1	470.00	.200	21	(84)
-	erature d	uring heatir	ng pe	eriods in	the livi	ng	area from Ta ee Table 9a)	able 9,		330.1	470.00	.20.10	21	
-	erature d	uring heatir	ng pe	eriods in	the livi	ng n (s		able 9,		Oct		Dec	21	
-	erature di	uring heatir	ng pe for li ar	eriods in ving area	the livi a, h1,m	ing n (s	ee Table 9a)	able 9,	Th1 (°C)				21	
Utilisat	erature di tion facto Jan 1	uring heating for gains Feb M 1 0.9	ng pe for li ar	eriods in ving area Apr	the livi a, h1,m May	ing n (s	ee Table 9a) Jun Jul	Au 0.8	Th1 (°C) ug Sep	Oct	Nov	Dec	21	(85)
Utilisat	erature di tion facto Jan 1	uring heating for gains Feb M 1 0.9	ng pe for li ar 9	eriods in ving area Apr	the livi a, h1,m May	ing n (sa	ee Table 9a) Jun Jul 0.9 0.79	Au 0.8	Th1 (°C)  ug Sep  2 0.94  Table 9c)	Oct	Nov 1	Dec	21	(85)
(86)m= (87)m= (8	erature do tion facto Jan 1 internal to	uring heating for gains Feb M 1 0.9 emperature 19.19 19	for li ar 99 e in li	eriods in ving are: Apr 0.98 iving are 19.9	the livi a, h1,m May 0.96 ea T1 (for 20.31	ing n (se ollo	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 20.67 20.87	Au 0.8	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56	Oct 0.99	Nov 1	Dec 1	21	(85)
(86)m= (87)m= (8	tion facto  Jan  1  internal to 19  erature descriptions	uring heating for gains Feb M 1 0.9 emperature 19.19 19	for li ar 99 e in li .5	eriods in ving are: Apr 0.98 iving are 19.9	the livi a, h1,m May 0.96 ea T1 (for 20.31	ng (se	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to	Au 0.8	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  9, Th2 (°C)	Oct 0.99	Nov 1 19.43	Dec 1	21	(85)
(86)m=	tion factors Jan  1  internal to 19  erature do 18.72	uring heating for gains Feb M 1 0.9 emperature 19.19 19 uring heating 18.72 18.	for li ar 99 e in li .5	eriods in ving are Apr 0.98 iving are 19.9 eriods in 18.74	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74	ollo dw	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 20.67 20.87 relling from T 8.75 18.75	Au 0.8 7 in T 20.6 20.6 18.7	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  9, Th2 (°C)	Oct 0.99	Nov 1 19.43	Dec 1	21	(85)
Utilisation (86)m=  Mean (87)m=  Tempe (88)m=  Utilisation	internal to 18.72	uring heating for gains Feb M 1 0.9 emperature 19.19 19 uring heating 18.72 18. or for gains	for li ar 29 e in li .5	eriods in ving are 0.98 iving are 19.9 eriods in 18.74 est of dw	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling,	ng (so	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 0.67 20.87 relling from T 8.75 18.75 m (see Table	Au 0.8 7 in T 20.6 able 9 18.6 e 9a)	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56 9, Th2 (°C) 76 18.75	Oct 0.99 20.02	Nov 1 19.43	Dec 1 18.97	21	(85) (86) (87) (88)
(86)m= [  Mean (87)m= [  Tempe (88)m= [  Utilisar (89)m= [	internal to 18.72 tion facto 1	uring heating for gains Feb M 1 0.9 emperature 19.19 19 uring heating 18.72 18. ur for gains 0.99 0.9	for liling per in liling per i	eriods in ving are 0.98 iving are 19.9 eriods in 18.74 est of dw	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling, 0.92	ollo 2 h (si dw 1 h2,	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 0.67 20.87 relling from T 8.75 18.75 m (see Table 0.75 0.47	Au 0.8 7 in T 20.6 20.6 18.1 29.0 0.5	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56 0, Th2 (°C) 76 18.75	Oct 0.99 20.02 18.74 0.97	Nov 1 19.43	Dec 1	21	(85)
Utilisar  (86)m=  Mean  (87)m=  Tempe  (88)m=  Utilisar  (89)m=  Mean	internal to 18.72 tion factor 1 internal to 1	uring heating refor gains  Feb M  1 0.9  emperature 19.19 19  uring heating 18.72 18.  or for gains 0.99 0.9  emperature	for line ar li	eriods in ving are 0.98 iving are 19.9 eriods in 18.74 est of dw 0.97 he rest c	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling, 0.92 of dwell	ollo 2 h2, ing	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 20.67 20.87 velling from T 8.75 18.75 m (see Table 0.75 0.47 T2 (follow st	Au 0.8 7 in T 20.6 [able 9] 18. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  9, Th2 (°C) 76 18.75  3 0.84  to 7 in Table	Oct 0.99 20.02 18.74 0.97	Nov 1 19.43	Dec 1 18.97 18.73	21	(85) (86) (87) (88) (89)
(86)m= [  Mean (87)m= [  Tempe (88)m= [  Utilisar (89)m= [	internal to 18.72 tion factor 1 internal to 1	uring heating for gains Feb M 1 0.9 emperature 19.19 19 uring heating 18.72 18. ur for gains 0.99 0.9	for line ar li	eriods in ving are 0.98 iving are 19.9 eriods in 18.74 est of dw	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling, 0.92	ollo 2 h2, ing	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 0.67 20.87 relling from T 8.75 18.75 m (see Table 0.75 0.47	Au 0.8 7 in T 20.6 20.6 18.1 29.0 0.5	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  9, Th2 (°C) 76 18.75  13 0.84  to 7 in Table 73 18.49	Oct 0.99 20.02 18.74 0.97 9 9c)	Nov 1 19.43 18.73	Dec 1 18.97 18.73		(85) (86) (87) (88) (89)
Utilisar  (86)m=  Mean  (87)m=  Tempe  (88)m=  Utilisar  (89)m=  Mean	internal to 18.72 tion factor 1 internal to 1	uring heating refor gains  Feb M  1 0.9  emperature 19.19 19  uring heating 18.72 18.  or for gains 0.99 0.9  emperature	for line ar li	eriods in ving are 0.98 iving are 19.9 eriods in 18.74 est of dw 0.97 he rest c	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling, 0.92 of dwell	ollo 2 h2, ing	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 20.67 20.87 relling from T 8.75 18.75 m (see Table 0.75 0.47 T2 (follow st	Au 0.8 7 in T 20.6 [able 9] 18. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  9, Th2 (°C) 76 18.75  13 0.84  to 7 in Table 73 18.49	Oct 0.99 20.02 18.74 0.97 9 9c)	Nov 1 19.43	Dec 1 18.97 18.73	0.55	(85) (86) (87) (88) (89)
(86)m= [  Mean (87)m= [  Tempe (88)m= [  Utilisar (89)m= [  Mean (90)m= [	internal to 16.27	uring heating refor gains Feb M 1 0.9 emperature 19.19 19 uring heating 18.72 18. ur for gains 0.99 0.9 emperature 16.55 1	ng perfor li ar     ar     be in li 55   72   for ro 99   e in t	Apr 0.98 iving are 19.9 eriods in 18.74 est of dw 0.97 he rest of 17.59	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling, 0.92 of dwell 18.16	ng (second of the second of th	ee Table 9a)  Jun Jul  0.9 0.79  w steps 3 to  20.67 20.87  relling from T  8.75 18.75  m (see Table  0.75 0.47  T2 (follow st  18.6 18.74	Au 0.8 7 in T 20.8 7 able 9 18. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  9, Th2 (°C) 76 18.75  3 0.84  to 7 in Table 73 18.49  ft  - fLA) × T2	Oct 0.99 20.02 18.74 0.97 e 9c) 17.77 A = Liv	Nov 1 19.43 18.73 1 16.92 ring area ÷ (4	Dec 1 18.97 18.73		(85) (86) (87) (88) (89) (90) (91)
(86)m= [  Mean (87)m= [  Tempe (88)m= [  Utilisar (89)m= [  Mean (90)m= [  Mean (92)m= [	erature de tion facto Jan 1 1 internal te 18.72 tion facto 1 16.27 internal te 17.79	uring heating refor gains Feb M 1 0.9 emperature 19.19 19 uring heatin 18.72 18. or for gains 0.99 0.9 emperature 16.55 11 emperature 18.02 18.	for li ar   ar   be in li 5 for re ge in t 7	eriods in ving are 19.9 eriods in 18.74 est of dw 0.97 he rest of 17.59 r the who	the livi a, h1,m May 0.96 ea T1 (for 20.31 rest of 18.74 velling, 0.92 of dwell 18.16  ole dwe 19.35	ollo dw 1 h2, ing	ee Table 9a) Jun Jul 0.9 0.79 w steps 3 to 20.67 20.87 relling from T 8.75 18.75 m (see Table 0.75 0.47 T2 (follow st	Au 0.8 7 in T 20.6 able 9 18. e 9a) 0.5 eps 3 18. 1 + (1 19.	Th1 (°C)  ug Sep 2 0.94  Table 9c) 84 20.56  0, Th2 (°C) 76 18.75  3 0.84  to 7 in Table 73 18.49  fl  — fLA) × T2 9 19.64	Oct 0.99  20.02  18.74  0.97  9 9c)  17.77  A = Liv	Nov 1 19.43 18.73 1 16.92 ring area ÷ (4	Dec 1 18.97 18.73		(85) (86) (87) (88) (89)

					•					,	<del></del>		
(93)m= 17.79	18.02	18.38	18.87	19.35	19.75	19.92	19.9	19.64	19.02	18.31	17.76		(93)
8. Space hea													
Set Ti to the return the utilisation			•		ed at ste	ep 11 of	Table 9	o, 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 fac													
(94)m= 1	0.99	0.99	0.97	0.93	0.84	0.67	0.71	0.89	0.98	0.99	1		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m						•			
(95)m= 458.76	565.64	637.78	677.73	671.88	582.75	449.14	459.36	557.53	542.67	467.96	427.9		(95)
Monthly avera	_	1	<del>i                                      </del>		r	i	·				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		(96)
Heat loss rate		1	<del> </del>				· · ·	<u> </u>		4700.45	0400.70		(07)
(97)m= 2108.88					786.6	506.95	533.92	848.6	1295.9		2102.73		(97)
Space heatin (98)m= 1227.68	<u> </u>	902.55	619.48	376.88	0	0.02	0	0 0	560.4	910.94	1246.08		
(00)111= 1227.00	000.11	002.00	010.10	010.00						r) = Sum(9	L	6839.48	(98)
Space heatin	a roquir	omont in	k\\/h/m2	2/voor			. 0.10	. poi youi	(	, <b>Ga</b> (6	C)15,512		(99)
·	• .										L	134.11	(99)
9b. Energy rec	•		· ·	Ĭ									
This part is use Fraction of spa							<b>.</b>	•		unity scr	neme.	0	(301)
Fraction of spa								, -				1	(302)
							-// for	CLID and	un to form	- 4l 11 l 4			(302)
The community so includes boilers, h									ip to rour	otner neat	sources; tr	ne iaπer	
Fraction of hea	at from (	Commun	ity boiler	s							[	1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting sys	tem		[	1	(305)
Distribution los	s factor	(Table 1	12c) for (	commun	ity heatii	ng syste	m				[	1.05	(306)
Space heating											L	kWh/yea	 r
Annual space	-	requiren	nent									6839.48	<u> </u>
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	= [	7181.45	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308)
Space heating	require	ment fro	m secon	dary/su	plemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =	Ī	0	(309)
Water beating											L		
Water heating Annual water h		equirem	ent									1831.51	$\neg$
If DHW from c	_	•									L		
Water heat fro								(64) x (30	03a) x (30	5) x (306)	=	1923.08	(310a)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	- (310a)(	(310e)] =	91.05	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											-		_
mechanical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put 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)				235.9	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fac		nissions CO2/year	
CO2 from other sources of space and water heating (not CHF		(222) ()			_
Efficiency of heat source 1 (%) If there is CHP us	sing two fuels repeat (363) to	(366) for the secon	d fuel	90	(367a)
CO2 associated with heat source 1 [(307b)	o)+(310b)] x 100 ÷ (367b) x	0	= [	2185.09	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [	47.25	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= [	2232.34	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	neous heater (312) x	0.22	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		[	2232.34	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x	0.52	= [	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	122.43	(379)
Total CO2, kg/year sum of (376)(382) =				2354.77	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				46.17	(384)
El rating (section 14)				67.13	(385)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	re Ve			Versio	on: 1.0.3.4	
		Property A	Address:	Unit 4					
Address: 1. Overall dwelling dime	, london								
1. Overall dwelling diffle	11310113.	Area	a(m²)		Av. He	ight(m)		Volume(m³	)
Basement			<u> </u>	(1a) x		.18	(2a) =	111.18	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	51	(4)			J		
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	111.18	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys		+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	T + F	0	j = [	0	x 2	20 =	0	(6b)
Number of intermittent far	ns			Ī	2	x -	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X 4	40 =	0	(7c)
				_			Air ch	nanges per ho	
Infiltration due to chimney	/s, flues and fans = (6a)+(6b)+(	7a)+(7b)+(	7c) =	Г	20		÷ (5) =	0.18	(8)
If a pressurisation test has b	een ca <mark>rried o</mark> ut or is intended, procee	ed to (17), o	otherwise o	ontinue fr	om (9) to (	(16)			_
Number of storeys in the	ne dw <mark>elling</mark> (ns)							0	(9)
Additional infiltration	25 for steel or timber frame of	r 0.25 for	r maaan	v const	untion	[(9)	-1]x0.1 =	0	(10)
	esent, use the value corresponding to			•	uction			0	(11)
deducting areas of opening	gs); if equal user 0.35								_
·	loor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	·							0	(13)
<u>-</u>	s and doors draught stripped		0.25 - [0.2	v (1.4) · 4	001 -			0	(14)
Window infiltration Infiltration rate			(8) + (10)	, ,	-	± (15) =		0	(15)
	q50, expressed in cubic metre						aroa	0	(16)
•	ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	elle oi e	invelope	aica	0.68	(17)
·	s if a pressurisation test has been do				is being u	sed		0.00	(10)
Number of sides sheltere					-			2	(19)
Shelter factor			(20) = 1 -	0.075 x (′	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.58	(21)
Infiltration rate modified for	or monthly wind speed							_	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	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	2\m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
					<u> </u>			ı	

0.74	0.72	e (allowi	0.64	0.62	0.55	0.55	0.53	0.58	0.62	0.65	0.68	7	
Calculate effe		_	rate for t	he appli	cable ca	se				l		J ,	
If mechanic												0	(23
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0	(23
If balanced wit		-	-	_								0	(23
a) If balance	1					<del>-                                    </del>	<del>- ^ `</del>	ŕ	<u> </u>	<del>-                                    </del>	<del>` ` ` </del>	:) ÷ 100] ¬	(0
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1					<del>-                                    </del>	<del>É Ì</del>	<del>i `</del>	<u> </u>	· ·		7	(2)
24b)m= 0	0	0	0	0	. ,	0	0	0	0	0	0	J	(2
c) If whole h		tract ven ‹ (23b), t		•					5 v (23h	<b>,</b> )			
$\frac{11(220)1}{(24c)m} = 0$	0.5 7	0	0	0	0	0	0	0	0	0	0	7	(2
d) If natural			, i						Ů			_	(-
,		en (24d)		•	•				0.5]				
24d)m= 0.77	0.76	0.75	0.7	0.69	0.65	0.65	0.64	0.67	0.69	0.71	0.73	1	(2
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				-	
25)m= 0.77	0.76	0.75	0.7	0.69	0.65	0.65	0.64	0.67	0.69	0.71	0.73		(2
													_
3. Heat losse												_	
LEMENT	Gros area		Openin		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-valu kJ/m².		A X k kJ/K
oors	aroa	(111)			1.9	x	1.4	= [	2.66		10/111		(2
/indows Type	e 1				9.03	_	/[1/( 1.6 )+		13.58	Ħ			(2
/indows Type					0.39		/[1/( 4.8 )+	L .	1.57	Ħ			(2
loor					51	×		] = [		<del>╡</del> ┌			(2
/alls Type1			0.00			=	0.97	<b>-</b>	49.47	亅		_	
Valls Type1	39.2		0.39	_	38.81	=	2.1	<u> </u>	81.5	믁 ¦		၂ 는	(2
	10.9		10.93	3	0.06	x	2.1	= [	0.13				(2
otal area of e	ements	, III²			101.1	9							(3
arty wall					16.1	Х	0	= [	0				(3
for windows and include the are						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	n paragrap	h 3.2	
abric heat lo				o arra par			(26)(30)	) + (32) =				148.91	(3
eat capacity			-,					((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass			P = Cm ÷	- TFA) ir	n kJ/m²K				tive Value:	, , ,	,	450	(3
or design asses	•	•		,			ecisely the	e indicative	values of	TMP in T	able 1f	400	(
an be used inste						·	ĺ						
hermal bridg	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						15.2	(3
		are not kn	own (36) =	= 0.15 x (3	1)			4					
	at loss								(36) =			164.11	(3
otal fabric he			دا ما 4 من مصر ،					(38)m	= 0.33 × (	25)m x (5	5)	7	
details of thermotal fabric he	i	i					I -						
otal fabric he entilation hea	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	,-
otal fabric he entilation hea	i	i			Jun 23.87	Jul 23.87	Aug 23.59	Sep 24.47	Oct 25.42	Nov 26.1	26.8	_	(3
otal fabric he entilation hea	Feb 27.92	Mar 27.54	Apr	May			⊢ <u> </u>	24.47		26.1	+	<del>]</del> -	(3

at loss para	ameter (F	ILP), W/	m²K		г	Г	Г	(40)m	= (39)m ÷	- (4)			
)m= 3.77	3.77	3.76	3.72	3.72	3.69	3.69	3.68	3.7	3.72	3.73	3.74		
ımber of day	vs in moi	nth (Tabl	le 1a)						Average =	Sum(40) <sub>1</sub>	12 /12=	3.72	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
	•							•	•	•			
. Water hea	ting ener	gy requi	rement:								kWh/ye	ar:	
sumed occi	upancy. I	N								1	72		(4
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9	)2)] + 0.0	0013 x (	TFA -13		,,,		`
f TFA £ 13. nual averag	•	iter iisad	ne in litre	s ner da	y Vd av	erane –	(25 x N)	+ 36		75	.04		(4
duce the annu	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.04		(
more that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)	•						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
water usage			ach month		1	1	· <i>'</i>		•				
)m= 82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		
ergy content of	f hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd.r	n x nm x D	Tm / 3600			m(44) <sub>112</sub> = ables 1b. 1		900.48	(
m= 122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	100.01	109.17	118.55		
122.41	107.00	110.40	90.52	32.42	79.75	73.9	04.0			m(45) <sub>112</sub> =	l	1180.67	
stantaneous v	vater he <mark>atii</mark>	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotal – oa	111(40)112		1100.07	
)m= 18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(
ater storage	loss:	7											
orage volum	ne (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(
community h	_			-			' '		(01 : . /	· 4 ¬ \			
nerwise if na ater storage		not wate	er (tnis in	iciuaes i	nstantar	eous co	ilod idmo	ers) ente	er o in (	(47)			
If manufac		eclared le	oss facto	or is kno	wn (kWh	n/day):					0		(
mperature f					`	• ,					0		(
ergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(
If manufac	turer's de	eclared o	ylinder l	oss fact									·
t water stor	•			e 2 (kW	h/litre/da	ıy)				0.	02		(
ommunity home factor	_		on 4.3								00		,
mperature f			2b							-	.6		(
ergy lost fro				ear			(47) x (51)	) x (52) x (	53) =		03		(
nter (50) or		-	, 1	Jui			( ) ( ,	, (==, (	,		03		(
iter storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
linder contain												хH	·
)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
		امریما/ فرم	m Tabla	. 2			<u> </u>	ļ	!		0		(
mary circuit mary circuit	•				59)m = 1	(58) <u>–</u> 36	65 × (41)	m			<u> </u>		(
ary on our				,	•	. ,	, ,						
modified by	/ factor fi	om Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			

Combi loss of	alculated	for each	month (	(61)m –	(60) ·	265 v (41	\m							
(61)m= 0	0 0	0	0	0 1)111 =	00) +	0 0 0	0	Т	0	0	0	0	1	(61)
								<u> </u>					J (59)m + (61)m	(0.)
(62)m= 177.6	<del>-i</del>	165.75	149.81	147.69	133.2		140.	_	139.31	155.28	162.66	173.82	(39)111 + (01)111	(62)
Solar DHW inpu							ļ							(02)
(add addition										CONTINUE	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	Ī	0	0	0	0	1	(63)
Output from	water hea	ter				_!	I				Į.	<u> </u>	ı	
(64)m= 177.6		165.75	149.81	147.69	133.2	129.18	140.	08	139.31	155.28	162.66	173.82		
	I	<u> </u>	<u> </u>	ļ.			(	Outpu	ut from wa	ater heat	 er (annual)₁	l12	1831.51	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	3.0] ` 5	85 × (45)m	า + (6 <sup>-</sup>	1)m	] + 0.8 x	(46)m	n + (57)m	+ (59)m	]	-
(65)m= 59.3°		55.34	50.03	49.34	44.53	<del></del>	46.8	<del></del>	46.54	51.86	54.31	58.03	]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	vlinde	is in the	dwelli	ng c	or hot w	ater is t	from com	munity h	ı neating	
5. Internal	<u> </u>				•							,		
Metabolic ga														
Jar	T	Mar	Apr	May	Jun	Jul	Αι	ıg T	Sep	Oct	Nov	Dec		
(66)m= 85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.9	98	85.98	85.98	85.98	85.98		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equ <mark>at</mark>	ion L9	or L9a),	lso se	ee T	able 5					
(67)m= 13.58	3 12.06	9.81	7.43	5.55	4.69	5.06	6.5	8	8.83	11.22	13.09	13.96		(67)
Appliances (	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5				
(68)m= 149.8	3 151.39	147.47	139.13	128.6	118.7	112.09	110.	54	114.45	122.8	133.32	143.22		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a	), also	se	e Table	5		•	•	
(69)m= 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.0	6	31.6	31.6	31.6	31.6		(69)
Pumps and	fans gains	(Table 5	5a)								•	•		
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	_					•		•	
(71)m= -68.7	8 -68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.	78	-68.78	-68.78	-68.78	-68.78		(71)
Water heating	ng gains (T	able 5)				-					•		•	
(72)m= 79.72	2 77.99	74.39	69.49	66.32	61.84	58.04	62.9	91	64.64	69.71	75.43	77.99		(72)
Total intern	al gains =				(6	66)m + (67)n	n + (68)	)m +	(69)m + (	(70)m + (	71)m + (72)	)m	•	
(73)m= 291.9	2 290.23	280.46	264.84	249.26	234.0	2 223.99	228.	82	236.72	252.51	270.64	283.96		(73)
6. Solar gai	ins:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and ass	ociated equa	ations t	o cor	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			lux able 6a			g_ able 6b	-	FF Table 6c		Gains	
						able ba	, ,	1 6	able ob		able 60		(W)	,
North 0.9		X	0.3	39	X	10.63	] x [		0.85	x	0.7	=	1.71	(74)
North 0.9		X	0.3	39	X	20.32	_ x [		0.85	x [	0.7	=	3.27	(74)
North 0.9		X	0.3	39	x	34.53	X		0.85	x [	0.7	=	5.55	(74)
North 0.93		X	0.3	39	X	55.46	X		0.85	x [	0.7	=	8.92	(74)
North 0.9	× 0.77	X	0.3	39	X	74.72	X		0.85	X	0.7	=	12.02	(74)

					-		_		_				_
North	0.9x 0.7	7 ×	0.3	39	X	79.99	X	0.85	X	0.7	=	12.86	(74)
North	0.9x 0.7	7 ×	0.3	39	x	74.68	X	0.85	X	0.7	=	12.01	(74)
North	0.9x 0.7	7 ×	0.3	39	x [	59.25	X	0.85	X	0.7	=	9.53	(74)
North	0.9x 0.7	7 ×	0.3	39	x [	41.52	X	0.85	X	0.7	=	6.68	(74)
North	0.9x 0.7	7 ×	0.3	39	x	24.19	X	0.85	X	0.7	=	3.89	(74)
North	0.9x 0.7	7 ×	0.3	39	<b>x</b> [	13.12	X	0.85	X	0.7	=	2.11	(74)
North	0.9x 0.7	7 ×	0.3	39	x	8.86	X	0.85	X	0.7	=	1.43	(74)
South	0.9x 0.7	7 ×	9.0	)3	x	46.75	X	0.76	X	0.7	=	155.64	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	76.57	X	0.76	X	0.7	=	254.91	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	97.53	X	0.76	х	0.7	=	324.7	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	110.23	X	0.76	x	0.7	=	366.99	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	114.87	x	0.76	x	0.7	=	382.42	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	110.55	×	0.76	x	0.7	=	368.03	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	108.01	x	0.76	x	0.7	=	359.59	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	104.89	x	0.76	x	0.7	=	349.21	(78)
South	0.9x 0.7	7 ×	9.0	)3	×	101.89	×	0.76	x	0.7	=	339.19	(78)
South	0.9x 0.7	7 ×	9.0	)3	×	82.59	x	0.76	x	0.7	=	274.94	(78)
South	0.9x 0.7	7 ×	9.0	)3	×	55.42	X	0.76	Х	0.7	=	184.49	(78)
South	0.9x 0.7	7 ×	9.0	)3	x	40.4	x	0.76	X	0.7	= -	134.49	(78)
													_
Solar ga	ins in watts,	calculated	d for eac	h month	1		(83)n	n = Sum(74)m	(82)m				
(83)m= 1	157.35 258.17	330.26	375.91	394.44	38	30.89 371.	6 358	345.87	278.8	3 186.6	135.92		(83)
Total gai	ins – internal	and sola	r (84)m =	= (73)m	8) +	33)m , watt	S						
(84)m= 4	449.28 548.4	610.71	640.74	643.7	61	4.92 595.5	8 587	7.56 582.59	531.3	4 457.24	419.88		(84)
7. Mear	n internal tem	perature	(heating	seasor	n)								
Tempe	rature during	heating p	eriods i	n the livi	ng a	area from <sup>-</sup>	Table 9	, Th1 (°C)				21	(85)
Utilisati	on factor for	gains for	living are	ea, h1,m	n (se	ee Table 9a	a)						
	Jan Feb	Mar	Apr	May	Γ,	Jun Ju	I A	ug Sep	Oct	Nov	Dec		
(86)m=	1 1	0.99	0.99	0.98	0	0.87	7 0.8	0.96	0.99	1	1		(86)
Mean ir	nternal tempe	erature in	living ar	ea T1 (f	ollo	w steps 3 t	o 7 in 7	Fable 9c)		-			
	18.59 18.78	19.1	19.54	20	1	0.45 20.7			19.73	19.08	18.56		(87)
L	rature during	heating r	ariode ii	rest of	dw	elling from	Table	 0 Th2 (°C)	!		!		
· -	18.41 18.42	18.42	18.43	18.43	1	8.45 18.4			18.43	18.43	18.42		(88)
` '	l l	1		<u> </u>		!		1	1	1	1		` '
	on factor for	<u> </u>	1		1			50 000	1 0 00	0.00	T 4		(89)
(89)m=	1 0.99	0.99	0.98	0.94		0.54	1 0.	59 0.88	0.98	0.99	1		(09)
	nternal tempe	i e	1	i	Ť	<u> </u>	i		T	1	Ι	1	/a=1
(90)m=	15.52 15.79	16.27	16.91	17.57	18	8.17 18.4	1 18		17.19		15.48		(90)
_									tLA = Li	ving area ÷ (	4) =	0.47	(91)
_													
Mean_ir	nternal tempe	erature (fo	or the wh	ole dwe	elling	g) = fLA ×	T1 + (1	– fLA) × T2					
_	nternal tempe	erature (fo	or the wh	ole dwe	<del> </del>	g) = fLA × <sup>-</sup> 9.25   19.5	<del> </del>	<del></del>	18.39	17.59	16.94	]	(92)

	•				•	•		ı	•	1			
(93)m= 16.97	17.2	17.61	18.15	18.72	19.25	19.51	19.48	19.13	18.39	17.59	16.94		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, 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 fac	l		<u> </u>					1					
(94)m= 1	0.99	0.99	0.98	0.95	0.88	0.73	0.76	0.91	0.98	0.99	1		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 447.66	544.53	602.84	625.01	610.66	540.22	435.55	446.46	530.02	518.82	454.23	418.68		(95)
Monthly avera		1	·		r	ī	·	i	Ī	·	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		(96)
Heat loss rate			1757.19	1331.1		=[(39)m : 546.37	· · ·	<u> </u>	<del></del>	1994.9	2424 55		(97)
(97)m= 2437.25 Space heatin	l		ļ		873.45	<u> </u>	579.02	949.06	1477.12		2431.55		(97)
		1135.28		536.01	0	0.02	0	0	712.98	·	1497.58		
(66)111= 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1221110	1100.20	010.11	000.01				l per year	<u> </u>	<u> </u>	<del></del>	8508.34	(98)
Space heatin	a roquir	omont in	k\\/b/m2	2/voor			. 0.10	por you.	(	<i>)</i> • • • • • • • • • • • • • • • • • • •	710,512		(99)
·	• .			•							<u> </u>	166.83	(99)
9b. Energy rec			The state of the s	Ĭ									
This part is use Fraction of spa							<b>.</b>	•		unity scr	neme.	0	(301)
Fraction of spa								ĺ			[	1	(302)
							-// for	OUD and	45 65	- 41 11 1 4			(302)
The community so includes boilers, h									up to rour	otner neat	sources; tr	ne latter	
Fraction of hea	at from C	Commun	ity boiler	s								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	sa) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem		[	1	(305)
Distribution los	ss factor	(Table 1	12c) for d	commun	ity heatii	ng syste	m				[	1.05	(306)
Space heating											L	kWh/yea	 r
Annual space	_	requiren	nent									8508.34	_
Space heat fro	m Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	= [	8933.76	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	ĺ	0	(308)
Space heating	require	ment fro	m secon	dary/su	plemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =	ĺ	0	(309)
Water heating											L		
Annual water h		equirem	ent									1831.51	7
If DHW from c	ommuni	ty schem	ne:								L		
Water heat fro								(64) x (30	03a) x (30	5) x (306)	=	1923.08	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)	(310e)] =	108.57	(313)
Cooling System	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											-		_
mechanical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put 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)				239.8	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		nissions   CO2/year	
CO2 from other sources of space and water heating (not Cl Efficiency of heat source 1 (%)	HP) Pusing two fuels repeat (363) to	(366) for the second	d fuel	90	(367a)
CO2 associated with heat source 1 [(30	07b)+(310b)] x 100 ÷ (367b) x	0	= [	2605.64	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [	56.35	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	= [	2661.99	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instar	ntaneous heater (312) x	0.22	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			2661.99	(376)
CO2 associated with electricity for pumps and fans within d	welling (331)) x	0.52	= [	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	124.46	(379)
Total CO2, kg/year sum of (376)(382) =				2786.44	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				54.64	(384)
El rating (section 14)				61.04	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAF			Stroma Softwa Address	are Ve			Versio	n: 1.0.3.4	
Address :	, london		Toperty	Address	Onit 5					
1. Overall dwelling dime	ensions:									
Basement				a(m²)	(1a) x		ight(m)	(2a) =	Volume(m <sup>3</sup>	(3a)
	a) . (1b) . (1a) . (1d	(1)					.00	](Zu) =	322.24	(ou)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d	)+(1e)+(1	<sup>(1)</sup>	128	(4)	\	n (5 )	(a.)		_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	522.24	(5)
2. Ventilation rate:	main	seconda	r\/	other		total			m³ per hou	r
	heating	heating	· 	Other	, –	lotai		40	m per nou	_
Number of chimneys	0	+ 0	_] +	0	] = [	0		40 =	0	(6a)
Number of open flues	0	+ 0	+	0	] = <u>L</u>	0	x :	20 =	0	(6b)
Number of intermittent fa	ns					3	X ·	10 =	30	(7a)
Number of passive vents						0	X ·	10 =	0	(7b)
Number of flueless gas fi	res					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infilt <mark>ration</mark> due to chimne	ys, flues and fans	s = (6a) + (6b) + (6b)	7a)+(7b)+(	(7c) =	Г	30		÷ (5) =	0.06	(8)
If a pressurisation test has b		intended, procee	ed to (17),	otherwise o	continue fr	om (9) to (	(16)			
Number of storeys in the Additional infiltration	ne dw <mark>elling</mark> (ns)						[(0)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	25 for steel or tir	mber frame o	r 0.35 fo	r masoni	v constr	uction	[(9)	-1]XU.1 =	0	(10)
if both types of wall are p					•	dollor.			0	(/
deducting areas of opening	· ,		1 (000)	ad) alaa	ontor O			1		7(40)
If suspended wooden f If no draught lobby, en	•	ŕ	. i (Seale	ea), eise	enter 0				0	(12)
Percentage of windows	·								0	(14)
Window infiltration		9		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed i	n cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabil	•								0.56	(18)
Air permeability value applie Number of sides sheltere		est has been do	ne or a de	gree air pe	rmeability	is being u	sed		2	(19)
Shelter factor	, u			(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor			(21) = (18	) x (20) =				0.47	(21)
Infiltration rate modified f	or monthly wind s	speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7	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 = (2	2\m <i>÷ 4</i>									
	<del>·                                      </del>	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
						<u> </u>			I	

Adjusted infiltra	ation rate (all	owing for s	helter an	nd wind s	speed) =	(21a) x	(22a)m					
0.6	0.59 0.5	8 0.52	0.51	0.45	0.45	0.44	0.47	0.51	0.53	0.56	]	
Calculate effect		ge rate for	the appli	cable ca	ise	•	•	•	•	•	-	
	al ventilation: eat pump using	Annendiy N (1	23h) - (23	a) × Emy (4	aguation (	N5N othe	rwice (23h	n) = (23a)			0	
	n heat recovery:							) = (23a)			0	
	-	-	_					Oh\m ı (	22h) [:	1 (220	0	(230
(24a)m= 0	ed mechanica		T with he	at recov	ery (MV)	$\int_{0}^{\infty}$	$\frac{a)m = (2a)}{a}$	2b)m + (.   0	23b) × [	$\frac{1 - (230)}{0}$	) ÷ 100] ]	(24a
											J	(210
(24b)m= 0	ed mechanica		T o	near rec		0 (24)	$\int_{0}^{\infty} \int_{0}^{\infty} \int_{0$	0	230)	0	1	(24b
											]	(240
•	ouse extract $0.5 \times (23)$		•	•				5 × (23h	))			
(24c)m = 0	0 0	<del></del>	0	0	0	0) - (22)	0	0	0	0	1	(240
	ventilation or	whole hous	se nositi	ve innut	ventilati	on from	loft				J	•
,	n = 1, then (2)							0.5]				
(24d)m= 0.68	0.68 0.6	7 0.64	0.63	0.6	0.6	0.6	0.61	0.63	0.64	0.65	]	(24d
Effective air	change rate	- enter (24a	a) or (24l	b) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.68	0.68 0.6	7 0.64	0.63	0.6	0.6	0.6	0.61	0.63	0.64	0.65		(25)
3. Heat losse	c and heat lo	ee paramet	or:									
ELEMENT	Gross	Openir		Net Ar		U-val W/m2		A X U		k-valu- kJ/m²-	-	A X k kJ/K
Doors Type 1	area (m²)	11	-	A ,r	_			(W/I	N)	KJ/III~•	N.	
				2.8	X	1.4	_\=	3.92	H			(26)
Doors Type 2	1			1.5	X	1.4	=	2.1	H			(26)
Windows Type				17.35		/[1/( 4.8 )+		69.87	닉			(27)
Windows Type				2.48	_	/[1/( 1.6 )+		3.73	_			(27)
Windows Type	9 3			1.5	x1	/[1/( 4.8 )+	0.04] =	6.04	╛.			(27)
Floor				128	X	0.79	=	101.12				(28)
Walls Type1	74.26	18.8	5	55.4	1 X	2.1	=	116.36				(29)
Walls Type2	46.4	5.28	3	41.12	2 X	0.28	=	11.51				(29)
Walls Type3	71.16	1.5		69.66	6 X	2.1	=	146.29				(29)
Walls Type4	5.34	0		5.34	. <b>X</b>	0.3	=	1.6				(29)
Roof	17	0		17	x	2.3	=	39.1	$\overline{}$			(30)
Total area of e	lements, m <sup>2</sup>			342.1	6							(31)
Party wall				22.1	x	0	=	0				(32)
* for windows and  ** include the area					lated using	g formula 1	1/[(1/U-valu	ue)+0.04] a	as given in	paragrap	h 3.2	
Fabric heat los	ss, W/K = S (	A x U)				(26)(30	) + (32) =				501.	.64 (33)
Heat capacity	Cm = S(A x l	()					((28).	(30) + (32	2) + (32a).	(32e) =	0	
Thermal mass	,	•	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: High		45	
For design assess	. ,		,			recisely the	e indicative	e values of	TMP in Ta	able 1f		
can be used instead												
Thermal bridge	es:S(LxY)	caiculated	using Ap	ppendix I	ĸ						52	(36)

otal fa	bric he	at loss							(33) +	(36) =			553.64	(37
entila <u>'</u>	tion hea	t loss ca	alculated	monthly	У				(38)m	= 0.33 × (	25)m x (5)			
Į	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
88)m=	117.62	116.4	115.2	109.58	108.53	103.63	103.63	102.72	105.52	108.53	110.65	112.88		(38
leat tra	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
89)m=	671.26	670.04	668.84	663.22	662.16	657.27	657.27	656.36	659.15	662.16	664.29	666.52		
-							•	•		_	Sum(39) <sub>1</sub>	12 /12=	663.21	(39
г	<u> </u>		HLP), W/	1		i	i	i	·	= (39)m ÷	· /			
l0)m=	5.24	5.23	5.23	5.18	5.17	5.13	5.13	5.13	5.15	5.17	5.19	5.21		<b>–</b>
lumbe	r of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	5.18	(4
Ĺ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ar:	
201100	ad aggu	pancy, I	NI.											
				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		89		(4
	A £ 13.9				,	`			`		,			
								(25 x N)				2.83		(4
		\_	hot water person per				-	to achieve	a water us	se target o	†			
7	. 1								0	0.1	NI.	<b>5</b>		
ot wate	Jan r usage ir	Feb	Mar day for ea	Apr	Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
г		109	104.88	100.77	96.66	92.55	92.55	· /	100.77	104.88	109	112.11		
4)m= [	113.11	109	104.00	100.77	90.00	92.55	92.55	96.66			m(44) <sub>112</sub> =	113.11	1233.94	(4
nergy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			· /	L	1233.94	(-,
5)m=	167.74	146.71	151.39	131.98	126.64	109.28	101.27	116.2	117.59	137.04	149.59	162.45		
							l	l		Γotal = Su	m(45) <sub>112</sub> =	<u> </u>	1617.89	(4
instanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)		•			
6)m=	25.16	22.01	22.71	19.8	19	16.39	15.19	17.43	17.64	20.56	22.44	24.37		(4
	storage		الماريطانم		مامت مت ۸۸	WHDC	otoro ao	within or	.m.o. 1/00	- o l				
•		,					•	within sa	ame ves	sei		160		(4
	•	•	nd no ta		•			` '	oro) onto	or 'O' in (	47)			
	ise ii no storage		not wate	er (uns ir	iciudes i	nstantar	ieous cc	mbi boil	ers) erite	er o in (	47)			
	•		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(4
			m Table			•	,					0		(4
			storage		ear			(48) x (49)	) =		_	10		(5
			eclared o	-		or is not		(1-) // (10)	•			10		(0
,	ter stora	age loss	factor fr	om Tabl							0.	02		(5
	-	_	ee secti	on 4.3										
comn	factor	from Tal									1.	03		(5
comn olume											1 ^	_		(5
comn olume	rature fa	actor fro	m Table	2b								.6		(-
comn olume empe			m Table storage		ear			(47) x (51)	) x (52) x (	53) =		03		(5

Water storage loss cale	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 32.01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit loss (an	nual) fro	m Table	3							0		(58)
Primary circuit loss cale	culated f	or each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by factor fr	om Tabl	e H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required for	water he	eating ca	alculated	I for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 223.02 196.63	206.67	185.48	181.92	162.78	156.54	171.48	171.09	192.32	203.09	217.72		(62)
Solar DHW input calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water hear	ter			-	-	-	-		-	-		
(64)m= 223.02 196.63	206.67	185.48	181.92	162.78	156.54	171.48	171.09	192.32	203.09	217.72		
						Outp	out from w	ater heate	r (annual)	12	2268.73	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 [0.85	× (45)m	+ (61)m	า] + 0.8 ว	c [(46)m	+ (57)m	+ (59)m	1	
(65)m= 74.38 65.59	68.95	61.89	60.72	54.35	52.28	57.25	57.44	04.40	07.75	70.00		(65)
		01.00	00.72	J4.55	32.20	97.25	57.11	64.18	67.75	72.62		(03)
in <mark>clude</mark> (57)m in calc				_							eating	(00)
include (57)m in calc 5. Internal gains (see	culation of	of (65)m	only if c	_							eating	(00)
5. Internal gains (see	culation of	of (65)m and 5a	only if c	_							eating	(00)
	culation of	of (65)m and 5a	only if c	_							eating	(00)
5. Internal gains (see Metabolic gains (Table	culation of Table 5	of (65)m and 5a)	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	(66)
5. Internal gains (see Metabolic gains (Table Jan Feb	Table 5 5), Wat Mar	of (65)m and 5a ts Apr 144.48	only if controls:  May 144.48	Jun 144.48	Jul 144.48	Aug 144.48	Sep	ater is fr	om com	munity h	eating	
5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 144.48 144.48	Table 5 5), Wat Mar	of (65)m and 5a ts Apr 144.48	only if controls:  May 144.48	Jun 144.48	Jul 144.48	Aug 144.48	Sep	ater is fr	om com	munity h	eating	
5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculated) (67)m= 26.77 23.78	Table 5 Table	of (65)m and 5a ts Apr 144.48 opendix 14.64	May 144.48 L, equati	Jun 144.48 ion L9 o	Jul 144.48 r L9a), a 9.98	Aug 144.48 Iso see	Sep 144.48 Table 5	Oct 144.48	Nov	Dec	eating	(66)
5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculate	Table 5 Table	of (65)m and 5a ts Apr 144.48 opendix 14.64	May 144.48 L, equati	Jun 144.48 ion L9 o	Jul 144.48 r L9a), a 9.98	Aug 144.48 Iso see	Sep 144.48 Table 5	Oct 144.48	Nov	Dec	eating	(66)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculated to the color of the color o	Table 5 5), Wat Mar 144.48 ted in Ap 19.34 ulated in 290.64	Apr 144.48 ppendix 14.64 Append 274.2	May 144.48  L, equati 10.94  dix L, eq 253.45	Jun 144.48 ion L9 o 9.24 uation L 233.94	Jul 144.48 r L9a), a 9.98 13 or L1 220.91	Aug 144.48 Iso see 12.98 3a), also 217.85	Sep 144.48 Table 5 17.42 see Ta 225.57	Oct 144.48  22.12 ble 5 242.01	Nov 144.48 25.81	Dec 144.48	eating	(66) (67)
5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculat (67)m= 26.77 23.78  Appliances gains (calculated)	Table 5 5), Wat Mar 144.48 ted in Ap 19.34 ulated in 290.64	Apr 144.48 ppendix 14.64 Append 274.2	May 144.48  L, equati 10.94  dix L, eq 253.45	Jun 144.48 ion L9 o 9.24 uation L 233.94	Jul 144.48 r L9a), a 9.98 13 or L1 220.91	Aug 144.48 Iso see 12.98 3a), also 217.85	Sep 144.48 Table 5 17.42 see Ta 225.57	Oct 144.48  22.12 ble 5 242.01	Nov 144.48 25.81	Dec 144.48	eating	(66) (67)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculat (67)m= 26.77 23.78  Appliances gains (calculat (68)m= 295.29 298.36  Cooking gains (calculat (69)m= 37.45 37.45	Table 5 5), Wat Mar 144.48 ted in Ap 19.34 ulated in 290.64 ted in Ap 37.45	Apr 144.48 opendix 14.64 Appendix 274.2 opendix 37.45	May 144.48 L, equati 10.94 dix L, eq 253.45 L, equat	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a)	Aug 144.48 Iso see 12.98 3a), also 217.85	Sep 144.48 Table 5 17.42 See Ta 225.57 ee Table	Oct 144.48  22.12 ble 5 242.01 5	Nov 144.48 25.81 262.76	Dec 144.48 27.52 282.26	eating	(66) (67) (68)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculat (67)m= 26.77 23.78  Appliances gains (calculat (68)m= 295.29 298.36  Cooking gains (calculat (ca	Table 5 5), Wat Mar 144.48 ted in Ap 19.34 ulated in 290.64 ted in Ap 37.45	Apr 144.48 opendix 14.64 Appendix 274.2 opendix 37.45	May 144.48 L, equati 10.94 dix L, eq 253.45 L, equat	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a)	Aug 144.48 Iso see 12.98 3a), also 217.85	Sep 144.48 Table 5 17.42 See Ta 225.57 ee Table	Oct 144.48  22.12 ble 5 242.01 5	Nov 144.48 25.81 262.76	Dec 144.48 27.52 282.26	eating	(66) (67) (68)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculated (67)m= 26.77 23.78  Appliances gains (calculated (68)m= 295.29 298.36  Cooking gains (calculated (69)m= 37.45 37.45  Pumps and fans gains (70)m= 0 0	Mar 144.48 ted in Ap 19.34 ulated in 290.64 ted in Ap 37.45 (Table 5	Apr 144.48 ppendix 14.64 Appendix 274.2 opendix 37.45 5a)	only if control is the control is control in the control is control in the control in the control is control in the control in	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15 37.45	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 12.98 3a), also 217.85 ), also se 37.45	Sep 144.48 Table 5 17.42 o see Ta 225.57 ee Table 37.45	Oct 144.48  22.12 ble 5 242.01 5 37.45	Nov 144.48 25.81 262.76	Dec 144.48 27.52 282.26 37.45	eating	(66) (67) (68) (69)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculat (67)m= 26.77 23.78  Appliances gains (calculat (68)m= 295.29 298.36  Cooking gains (calculat (69)m= 37.45 37.45  Pumps and fans gains	Mar 144.48 ted in Ap 19.34 ulated in 290.64 ted in Ap 37.45 (Table 5	Apr 144.48 ppendix 14.64 Appendix 274.2 opendix 37.45 5a)	only if control is the control is control in the control is control in the control in the control is control in the control in	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15 37.45	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 12.98 3a), also 217.85 ), also se 37.45	Sep 144.48 Table 5 17.42 o see Ta 225.57 ee Table 37.45	Oct 144.48  22.12 ble 5 242.01 5 37.45	Nov 144.48 25.81 262.76	Dec 144.48 27.52 282.26 37.45	eating	(66) (67) (68) (69)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculated (67)m= 26.77 23.78  Appliances gains (calculated (68)m= 295.29 298.36  Cooking gains (calculated (69)m= 37.45 37.45  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation	Table 5	Apr 144.48 opendix 14.64 Appendix 274.2 opendix 37.45 opendix 0	only if control is the second of the second	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15 37.45	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 12.98 3a), also 217.85 ), also se 37.45	Sep 144.48 Table 5 17.42 See Ta 225.57 ee Table 37.45	Oct 144.48  22.12 ble 5 242.01 5 37.45	Nov 144.48 25.81 262.76	Dec 144.48 27.52 282.26 37.45	eating	(66) (67) (68) (69) (70)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculated (67)m= 26.77 23.78  Appliances gains (calculated (68)m= 295.29 298.36  Cooking gains (calculated (69)m= 37.45 37.45  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporatio (71)m= -115.58 -115.58	Table 5	Apr 144.48 opendix 14.64 Appendix 274.2 opendix 37.45 opendix 0	only if control is the second of the second	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15 37.45	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 12.98 3a), also 217.85 ), also se 37.45	Sep 144.48 Table 5 17.42 See Ta 225.57 ee Table 37.45	Oct 144.48  22.12 ble 5 242.01 5 37.45	Nov 144.48 25.81 262.76	Dec 144.48 27.52 282.26 37.45	eating	(66) (67) (68) (69) (70)
Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculat (67)m= 26.77 23.78  Appliances gains (calculat (68)m= 295.29 298.36  Cooking gains (calculat (69)m= 37.45 37.45  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporatio (71)m= -115.58 -115.58  Water heating gains (T	Table 5 5), Wat Mar 144.48 ted in Ap 19.34 ulated in 290.64 ted in Ap 37.45 (Table 5 0 In (negat -115.58 Table 5) 92.67	of (65)m and 5a ts Apr 144.48 ppendix 14.64 Appendix 37.45 5a) 0 tive valu -115.58	only if control of the control of th	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15 37.45  0 lle 5) -115.58	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 12.98 3a), also 217.85 ), also se 37.45	Sep 144.48 Table 5 17.42 See Ta 225.57 ee Table 37.45	Oct 144.48  22.12 ble 5 242.01 5 37.45  0 -115.58	Nov 144.48 25.81 262.76 37.45 0 -115.58	Dec 144.48 27.52 282.26 37.45 0	eating	(66) (67) (68) (69) (70)
5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 144.48 144.48  Lighting gains (calculated (67)m= 26.77 23.78  Appliances gains (calculated (68)m= 295.29 298.36)  Cooking gains (calculated (69)m= 37.45 37.45)  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -115.58 -115.58  Water heating gains (T  (72)m= 99.98 97.6	Table 5 5), Wat Mar 144.48 ted in Ap 19.34 ulated in 290.64 ted in Ap 37.45 (Table 5 0 In (negat -115.58 Table 5) 92.67	of (65)m and 5a ts Apr 144.48 ppendix 14.64 Appendix 37.45 5a) 0 tive valu -115.58	only if control of the control of th	Jun 144.48 ion L9 of 9.24 uation L 233.94 ion L15 37.45  0 lle 5) -115.58	Jul 144.48 r L9a), a 9.98 13 or L1 220.91 or L15a) 37.45	Aug 144.48 Iso see 12.98 3a), also 217.85 ), also se 37.45	Sep 144.48 Table 5 17.42 See Ta 225.57 ee Table 37.45	Oct 144.48  22.12 ble 5 242.01 5 37.45  0 -115.58	Nov 144.48 25.81 262.76 37.45 0 -115.58	Dec 144.48 27.52 282.26 37.45 0	eating	(66) (67) (68) (69) (70)

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

Orienta		Access Factor Table 6d	or	Area m²			Flux Table 6a		g_ Table (	6b	٦	FF Table 6c			Gains (W)	
North	0.9x	0.77	x	2.48		X	10.63	x	0.76		x	0.7	=	Γ	9.72	(74)
North	0.9x	0.77	x	2.48		X	20.32	x	0.76		x	0.7	<b>=</b>	Ī	18.58	(74)
North	0.9x	0.77	x	2.48		X	34.53	x	0.76		x	0.7	_ =		31.57	(74)
North	0.9x	0.77	x	2.48		X	55.46	x	0.76		x [	0.7	_ =	Ē	50.71	(74)
North	0.9x	0.77	x	2.48		X	74.72	x	0.76		x	0.7	_ =		68.31	(74)
North	0.9x	0.77	x	2.48		X	79.99	x	0.76		x [	0.7	=		73.13	(74)
North	0.9x	0.77	x	2.48		X	74.68	x	0.76		x	0.7	=		68.28	(74)
North	0.9x	0.77	x	2.48		X	59.25	x	0.76		x	0.7	=		54.17	(74)
North	0.9x	0.77	x	2.48		X	41.52	x	0.76		x	0.7	=		37.96	(74)
North	0.9x	0.77	X	2.48		X	24.19	x	0.76		x	0.7	=		22.12	(74)
North	0.9x	0.77	X	2.48		X	13.12	x	0.76		x	0.7	=		11.99	(74)
North	0.9x	0.77	x	2.48		X	8.86	x	0.76		x	0.7	=		8.1	(74)
South	0.9x	0.77	x	17.35		X	46.75	x	0.85		x	0.7	=		334.46	(78)
South	0.9x	0.77	x	17.35		X	76.57	x	0.85		x	0.7	=		547.77	(78)
South	0.9x	0.77	x	17.35		X	97.53	x	0.85		x	0.7	=		697.76	(78)
South	0.9x	0.77	X	17.35		X	110.23	X	0.85		Х	0.7	=		788.62	(78)
South	0.9x	0.77	x	17.35		х	114.87	x	0.85		x [	0.7			821.79	(78)
South	0.9x	0.77	x	17.35		х	110.55	] x	0.85		х	0.7	=		790.86	(78)
South	0.9x	0.77	x	17.35		X	108.01	x	0.85		х	0.7	=		772.72	(78)
South	0.9x	0.77	x	17.35		X	104.89	х	0.85		х	0.7	_ =		750.42	(78)
South	0.9x	0.77	x	17.35		x	101.89	x	0.85		х	0.7	=		7 <mark>28.89</mark>	(78)
South	0.9x	0.77	x	17.35		х	82.59	x	0.85		х	0.7	=		590.82	(78)
South	0.9x	0.77	x	17.35		x	55.42	x	0.85		x	0.7	=		396.45	(78)
South	0.9x	0.77	X	17.35		X	40.4	x	0.85		x [	0.7	=		289.01	(78)
West	0.9x	0.77	X	1.5		X	19.64	x	0.85		x	0.7	=		12.15	(80)
West	0.9x	0.77	X	1.5		X	38.42	x	0.85		x	0.7	=		23.76	(80)
West	0.9x	0.77	X	1.5		X	63.27	x	0.85		x	0.7	=		39.13	(80)
West	0.9x	0.77	X	1.5		X	92.28	x	0.85		x	0.7	=		57.08	(80)
West	0.9x	0.77	X	1.5		X	113.09	x	0.85		x	0.7	=		69.95	(80)
West	0.9x	0.77	X	1.5		X	115.77	X	0.85		x	0.7	=		71.6	(80)
West	0.9x	0.77	X	1.5		X	110.22	X	0.85		x	0.7	=		68.17	(80)
West	0.9x	0.77	X	1.5		X	94.68	X	0.85		x	0.7	=		58.56	(80)
West	0.9x	0.77	X	1.5		X	73.59	x	0.85		x	0.7	=		45.52	(80)
West	0.9x	0.77	X	1.5		X	45.59	X	0.85		x	0.7	=		28.2	(80)
West	0.9x	0.77	X	1.5		X	24.49	x	0.85		x	0.7	=		15.15	(80)
West	0.9x	0.77	X	1.5		X	16.15	x	0.85		x	0.7	=		9.99	(80)
Ť		watts, calcul	_			_	<u> </u>	_	n = Sum(74)	<del></del>		<del>                                     </del>		_		
(83)m=	356.33		3.46		60.05		35.6 909.17	863	.14 812.3	37   64 <sup>-</sup>	1.13	423.6	307.1			(83)
Ī		internal and		<del>`                                    </del>		Ť	<del></del>		7 00 1 4 2 2 2	00   10-		1 070 01	70000	П		(0.4)
(84)m=	844.72	1076.2 123	7.45	1337.55 1	372.4	1;	320.6 1276.68	1237	7.26 1201.	02   105	7.86	872.61	780.84			(84)

7. Me	an inter	nal temp	perature	(heating	season	)								
				eriods ir		•	from Tab	ole 9. Th	1 (°C)				21	(85)
-		_		living are		_		··· • , ···	. ( -)					` ′
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.98	0.97	0.93	0.94	0.98	0.99	1	1		(86)
Mean	intorna	l I tompor	aturo in	living are	22 T1 /fc	llow eta	ns 3 to 7	in Tabl	) Oc)				I	
(87)m=	17.8	18	18.38	18.92	19.51	20.09	20.47	20.42	19.95	19.19	18.41	17.78		(87)
														(- )
1 emp (88)m=	18.05	18.05	18.05	eriods ir 18.06	18.06	18.06	18.06	18.06	18.06	18.06	18.05	18.05		(88)
									10.00	10.00	10.00	10.00		(00)
	tion fac	tor for g		rest of d									I	
(89)m=	1	1	0.99	0.98	0.96	0.88	0.62	0.68	0.92	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	14.26	14.55	15.11	15.9	16.75	17.56	17.98	17.95	17.38	16.29	15.15	14.22		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.36	(91)
Mean	interna	l temper	ature (fc	r the wh	ole dwel	lling) = fl	_A × T1	+ (1 – fL	A) × T2					_
(92)m=	15.54	15.8	16.29	16.99	17.74	18.47	18.88	18.84	18.31	17.33	16.32	15.5		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m=	15.54	15.8	16.29	16.99	17.74	18.47	18.88	18.84	18.31	17.33	16.32	15.5		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	mean i <mark>nt</mark>	ternal te	mperatui	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
the ut	<mark>ilis</mark> ation	factor fo	or gains	using Ta	ble 9a							1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					ı				ı		(5.1)
(94)m=	1	0.99	0.99	0.98	0.96	0.91	0.78	0.81	0.93	0.98	0.99	1		(94)
ı			<del>- `</del>	4)m x (84									1	(05)
(95)m=	842.13			1310.56			994.79	1002.17	1120.99	1038.9	867.95	778.91		(95)
ı	_	<u> </u>	1	perature		i	40.0	10.4		40.0		4.0	l	(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)
ı		7300.23	1	al tempe						_	0407.70	75040		(97)
(97)m=	7543.21		6549.17	5364.93	4001.2	2543.96		1602.18			6127.76	7534.9		(97)
(98)m=	4985.6	4186.87	3961.84	r each n 2919.14	1997.76	0	0.02	0	0 0	<del>- `</del>	3787.07	5026.45	1	
(30)111=	4303.0	4100.07	3901.04	2919.14	1991.70		U						29409.76	(98)
								Tota	i per year	(kWh/year	) = Sum(9	O)15,912 =	29409.76	╡
Space	e heatin	g require	ement in	kWh/m²	/year								229.76	(99)
9b. Ene	ergy rec	quiremer	nts – Coi	mmunity	heating	scheme								
				iting, spa		-		• .	-		unity sch	neme.		¬
Fractio	n of spa	ace heat	from se	condary/	'supplen	nentary i	neating (	Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
				eat from se						up to four o	other heat	sources; ti	he latter	
			_	mal and wa		rom powei	stations.	See Apper	ndix C.			1		7,000
ractio	n of hea	at trom C	ommun	ity boiler	S								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	community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating	ng system		1.05	(306)
Space heating			kWh/year	
Annual space heating requirement			29409.76	
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	30880.24	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplement	eary system (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2268.73	7
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2382.17	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	332.62	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	enter 0) = $(107) \div (314)$	) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in			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	0b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			472.83	(332)
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 (no Efficiency of heat source 1 (%)	ot CHP) CHP using two fuels repeat (363) to	o (366) for the second fue	90	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0 =	7982.98	(367)
Electrical energy for heat distribution	[(313) x	0.52	172.63	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	······································	8155.61	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or in:	stantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		8155.61	(376)
CO2 associated with electricity for pumps and fans with	in dwelling (331)) x	0.52	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	245.4	(379)
CO2 associated with electricity for lighting  Total CO2, kg/year sum of (376)(38		0.52	245.4 8401.01	(379)
		0.52	243.4	
Total CO2, kg/year sum of (376)(38		0.52	8401.01	(383)

			User D	etails: _						
Assessor Name: Software Name:	Stroma FSAP 2			Strom Softwa Address	are Vei			Versio	n: 1.0.3.4	
Address :	, london	Г	roperty.	Address	Offile 7					
1. Overall dwelling dime	nsions:									
5			Area	a(m²)			ight(m)	<b>1</b>	Volume(m <sup>3</sup>	<u>-</u>
Basement					(1a) x	3	.05	(2a) =	250.1	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	·(1e)+(1ı	ר)	82	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	250.1	(5)
2. Ventilation rate:				-41		4-4-1				-
	main heating	secondar heating	ту 	other		total		i	m³ per hou	r —
Number of chimneys	0 +	0	_	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	] + [	0	=	0	x 2	20 =	0	(6b)
Number of intermittent far	ns					2	X '	10 =	20	(7a)
Number of passive vents					Γ	0	X ·	10 =	0	(7b)
Number of flueless gas fin	res				Ī	0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimney						20		÷ (5) =	0.08	(8)
If a pressurisation test has be Number of storeys in the		ended, procee	d to (17), (	otherwise (	continue fr	om (9) to (	(16)		0	(9)
Additional infiltration	ic aweiling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timb	per frame of	0.35 fo	r masonı	y constr	uction	,	•	0	(11)
if both types of wall are pr		erresponding to	the great	ter wall are	a (after			'		
deducting areas of opening If suspended wooden f	· ,	sealed) or 0	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, ent	,	•	(000	, c.cc					0	(13)
Percentage of windows	and doors draugh	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	10	(17)
If based on air permeabili  Air permeability value applies	•					is heina u	sed		0.58	(18)
Number of sides sheltere		rnao boori aoi	io oi a aog	groo an po	moubling	io boiling at	304		2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor			(21) = (18	x (20) =				0.49	(21)
Infiltration rate modified for	or monthly wind sp	eed						1	Ī	
Jan Feb	Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				•			•	1	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		
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.0	8 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.63	0.62	0.6	0.54	0.53	0.47	0.47	0.46	0.49	0.53	0.55	0.58	]	
Calculate effec		-	rate for t	he appli	cable ca	se	<u>.                                    </u>			ļ.	ļ.	J	
If mechanica												0	(2
If exhaust air h									) = (23a)			0	(2
If balanced with												0	(2
a) If balance		i	1		i	<del>- ` `                                 </del>	<del></del>	<del>í `</del>	<u> </u>	<del></del>	<del>1 ` ´</del>	i ÷ 100] I	(2)
24a)m= 0	0		0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mecha	anical ve			neat red	<del></del>	<del>- ^ ` ` - </del>	0  m = (22)	2b)m + (2 0	<del>-                                    </del>	Ι ,	1	(2
24b)m= 0			0	0		0	0		0	0	0	J	(2
c) If whole h if (22b)n			ntilation of then (24d	•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				0.51	•		•	
4d)m= 0.7	0.69	0.68	m = (221) 0.65	0.64	0.61	0.61	$\frac{0.5 + [(2)]{0.6}}{1}$	0.62	0.5]	0.65	0.67	1	(2
, r	<u> </u>	<u> </u>	ļ			<u> </u>	<u> </u>		0.04	0.03	0.07	J	(2
Effective air	0.69	0.68	0.65	0.64	0.61	0.61	0.6	0.62	0.64	0.65	0.67	1	(2
0.7	0.00	0.00	0.00	0.04	0.01	0.01	0.0	0.02	0.04	0.00	0.07		(-
3. Heat losse	s and he	at loss							_			_	
LEMENT	Gros are <mark>a</mark>		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
oo <mark>rs Ty</mark> pe 1					1.8	x	3	= [	5.4				(2
oo <mark>rs Ty</mark> pe 2					1.6	x	1.4	<b>⋽</b> \- i	2.24	Ħ			(2
Vindows Type	1				5.56	x1	/[1/( 4.8 )+	0.04] =	22.39	Ħ			(2
Vindows Type	2				4	x1	/[1/( 4.8 )+	0.04] =	16.11	5			(2
Vindows Type	3				1.21	x1	/[1/( 4.8 )+	0.04] =	4.87	=			(2
loor					82	x	1.25	─ i	102.5	Ħ ſ			(2
Valls Type1	79.8	5	12.5	7	67.28	3 x	2.1	╡┇	141.29	Ħ i		<b>=</b>   =	(2
/alls Type2	20.2		1.6	=	18.63	=	2.1	≓ ₌¦	39.12	<b>=</b>		7 F	(2
loof	19.7		0	=	19.77	=	0.28	<del>-</del>	5.54	<b>=</b>		<b>i</b> i	`
otal area of e					201.8								)` (3
arty wall		,			16.8	=	0		0				(3
					5.8	x	0	╡┇	0	륵 ¦		-	(3
•		ows use 6	effective wi	ndow U-va					_	L as aiven in	paragraph		(
arty wall	roof winde						,	,1( .,	,	J. 1	,		
arty wall for windows and			nternal wal	o ana par									
arty wall for windows and include the area	as on both	sides of ir		o ana par			(26)(30	) + (32) =				339.4	6 (3
arty wall for windows and include the area abric heat los	as on both ss, W/K =	sides of ir = S (A x		o ana par			(26)(30		(30) + (32	2) + (32a).	(32e) =	339.4	6 (;
arty wall for windows and include the area abric heat los leat capacity hermal mass	as on both ss, W/K = Cm = S(	sides of ir = S (A x (A x k )	U)	·			(26)(30	((28)	(30) + (32 tive Value:	, , ,	(32e) =		(;
arty wall for windows and include the area abric heat los eat capacity	as on both ss, W/K = Cm = S( parame sments wh	sides of ir = S (A x (A x k ) ter (TMF ere the de	U) P = Cm ÷	- TFA) ir	n kJ/m²K			((28) Indica	tive Value:	: High	, ,	0	

Total fabric heat loss	(33) + (36) =	Г	357.86	(37)
Ventilation heat loss calculated monthly	$(38)$ m = $0.33 \times (25)$ m	L x (5)	337.00	
Jan Feb Mar Apr May Jun Jul	<del> </del>	lov Dec		
(38)m= 57.57 56.94 56.32 53.4 52.86 50.32 50.32	<del> </del>	.96 55.11		(38)
Heat transfer coefficient, W/K	(39)m = $(37)$ + $(38)$ m			
(39)m= 415.43 414.79 414.17 411.26 410.71 408.17 408.17	407.7 409.15 410.71 41	1.81 412.97		
Heat loss parameter (HLP), W/m²K	Average = Sum $(40)$ m = $(39)$ m $\div$ $(4)$	(39) <sub>112</sub> /12=	411.25	(39)
(40)m= 5.07 5.06 5.05 5.02 5.01 4.98 4.98	4.97 4.99 5.01 5.	02 5.04		_
Number of days in month (Table 1a)	Average = Sum	(40) <sub>112</sub> /12=	5.02	(40)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct N	lov Dec		
(41)m= 31 28 31 30 31 30 31	31 30 31 3	31		(41)
4. Water heating energy requirement:		kWh/yea	ar:	
Assessment N				
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)	2.5		(42)
if TFA £ 13.9, N = 1				
Annual average hot water usage in litres per day Vd,average =		93.57		(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to not more that 125 litres per person per day (all water use, hot and cold)	o acrileve a water use larget of			
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct N	lov Dec		
Hot water usage in litres per day for each month $Vd$ , $m = factor from Table 1c x$		10V   DC0		
(44)m= 102.93 99.18 95.44 91.7 87.95 84.21 84.21	87.95 91.7 95.44 99	.18 102.93		
	Total = Sum(44	)112 =	1122.82	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x D	Tm / 3600 k <mark>Wh/mo</mark> nth ( <mark>see Ta</mark> bles	1b, 1c, 1d)		_
(45)m= 152.63 133.5 137.76 120.1 115.24 99.44 92.15	105.74 107 124.7 136	6.12 147.82		_
Mineter de la contra del la contra d	Total = Sum(45	)112 =	1472.19	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in				(40)
(46)m=     22.9     20.02     20.66     18.01     17.29     14.92     13.82       Water storage loss:	15.86 16.05 18.71 20	.42 22.17		(46)
Storage volume (litres) including any solar or WWHRS storage	within same vessel	160		(47)
If community heating and no tank in dwelling, enter 110 litres in				` '
Otherwise if no stored hot water (this includes instantaneous co	` '			
Water storage loss:				
a) If manufacturer's declared loss factor is known (kWh/day):		0		(48)
Temperature factor from Table 2b		0		(49)
- g,	(48) x (49) =	110		(50)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day)		0.02		(51)
If community heating see section 4.3  Volume factor from Table 2a	_			(50)
Temperature factor from Table 2b		0.6		(52) (53)
·	(47) x (51) x (52) x (53) =			, ,
Enter (50) or (54) in (55)	(-1/ ^ (01/ ^ (02/ ^ (00/ -	1.03		(54) (55)
				. ,

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(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= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
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)m= 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 = $(60) \div 365 \times (41)$ 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= 207.91 183.42 193.03 173.59 170.51 152.93 147.42 161.02 160.5 179.98 189.61 203.1	(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	(63)
Output from water heater	
(64)m= 207.91 183.42 193.03 173.59 170.51 152.93 147.42 161.02 160.5 179.98 189.61 203.1	
Output from water heater (annual) <sub>112</sub> 2123.03	(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= 69.36 61.2 64.41 57.94 56.93 51.07 49.25 53.77 53.59 60.07 63.27 67.76	(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):	
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):	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
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	(66)
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)
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= 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99 124.99	(66) (67)
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= 124.99 124	` ,
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	` ,
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	(67)
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	(67)
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= 124.99 124	(67) (68)
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= 124.99 124	(67) (68)
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	(67) (68) (69)
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= 124.99 124.9	(67) (68) (69)
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	(67) (68) (69) (70)
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= 124.99 124.9	(67) (68) (69) (70)
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	(67) (68) (69) (70) (71)
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	(67) (68) (69) (70) (71)

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

Orienta	ation:	Access Factor Table 6d	or	Area m²		Flu Tal	x ole 6a		g_ Table 6b		FF Table 6c			Gains (W)	
North	0.9x	0.77	x	4	x	1	0.63	x	0.85	x	0.7		Г	17.54	(74)
North	0.9x	0.77	x	4	×	2	0.32	x	0.85	x	0.7		Ē	33.52	(74)
North	0.9x	0.77	x	4	X	3	4.53	x	0.85	x	0.7		Ē	56.95	(74)
North	0.9x	0.77	x	4	×	5	5.46	x	0.85	x	0.7		Ē	91.48	(74)
North	0.9x	0.77	x	4	×	7	4.72	x	0.85	X	0.7		Ē	123.23	(74)
North	0.9x	0.77	x	4	X	7	9.99	x	0.85	x	0.7			131.92	(74)
North	0.9x	0.77	x	4	X	7	4.68	x	0.85	x	0.7			123.17	(74)
North	0.9x	0.77	x	4	X	5	9.25	x	0.85	x	0.7			97.72	(74)
North	0.9x	0.77	x	4	X	4	1.52	x	0.85	x	0.7			68.47	(74)
North	0.9x	0.77	x	4	×	2	4.19	x	0.85	x	0.7	=		39.9	(74)
North	0.9x	0.77	x	4	X	1	3.12	x	0.85	X	0.7			21.64	(74)
North	0.9x	0.77	x	4	X		3.86	x	0.85	x	0.7			14.62	(74)
East	0.9x	1	x	5.56	×	1	9.64	x	0.85	x	0.7			45.03	(76)
East	0.9x	1	x	5.56	X	3	8.42	x	0.85	X	0.7			88.08	(76)
East	0.9x	1	x	5.56	×	6	3.27	x	0.85	x	0.7			145.06	(76)
East	0.9x	1	x	5.56	X	9	2.28	Х	0.85	X	0.7	=		211.56	(76)
East	0.9x	1	x	5.56	x	1	13.09	х	0.85	x	0.7			259.27	(76)
East	0.9x	1	x	5.56	х	1	15.77		0.85	x	0.7			265.41	(76)
East	0.9x	1	x	5.56	×	1	10.22	x	0.85	X	0.7	=	Ē	252.68	(76)
East	0.9x	1	x	5.56	x	9	4.68	х	0.85	X	0.7		Ē	217.05	(76)
East	0.9x	1	x	5.56	×	7	3.59	х	0.85	X	0.7			168.71	(76)
East	0.9x	1	x	5.56	х	4	5.59	х	0.85	x	0.7		Ē	104.52	(76)
East	0.9x	1	x	5.56	×	2	4.49	x	0.85	х	0.7			56.14	(76)
East	0.9x	1	x	5.56	X	1	6.15	x	0.85	x	0.7			37.03	(76)
West	0.9x	0.77	x	1.21	×	1	9.64	x	0.85	X	0.7			9.8	(80)
West	0.9x	0.77	x	1.21	X	3	8.42	x	0.85	x	0.7			19.17	(80)
West	0.9x	0.77	X	1.21	X	6	3.27	x	0.85	x	0.7	_		31.57	(80)
West	0.9x	0.77	x	1.21	X	9	2.28	X	0.85	X	0.7			46.04	(80)
West	0.9x	0.77	X	1.21	X	1	13.09	x	0.85	X	0.7			56.42	(80)
West	0.9x	0.77	X	1.21	X	1	15.77	x	0.85	X	0.7	=		57.76	(80)
West	0.9x	0.77	X	1.21	X	1	10.22	x	0.85	X	0.7	-		54.99	(80)
West	0.9x	0.77	X	1.21	X	9	4.68	x	0.85	X	0.7			47.24	(80)
West	0.9x	0.77	x	1.21	X	7	3.59	x	0.85	X	0.7	=		36.72	(80)
West	0.9x	0.77	x	1.21	X	4	5.59	x	0.85	X	0.7			22.75	(80)
West	0.9x	0.77	x	1.21	×	2	4.49	x	0.85	x	0.7			12.22	(80)
West	0.9x	0.77	x	1.21	X	1	6.15	х	0.85	x	0.7		Ē	8.06	(80)
			_					_							_
ו		n watts, calcul	_		-			<del></del>	n = Sum(74)m .		_	1	_		
(83)m=	72.36		3.58		3.93	455.1	430.84	362	.01 273.9	167.16	90	59.71			(83)
Ī		internal and		<u>`                                    </u>	<del>.                                      </del>					Γ_		Ι.	_		(0.1)
(84)m=	470.79	536.99 615	5.96	709.21 776	5.47	770.94	732.67	669	.95 593.36	509.09	9 457.68	446.71	Ш		(84)

7. Me	an inter	nal temp	perature	(heating	season	)								
							from Tah	ole 9, Th	1 (°C)			ı	21	(85)
-		_		living are		_		), O O, 111	. ( 0)			l	21	
Otilise	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	Дрі 1	0.99	0.97	0.94	0.96	0.99	1	1	1		(86)
										'	'	'		(00)
					·			in Table		- I		-		(n=)
(87)m=	17.84	18	18.36	18.91	19.5	20.08	20.46	20.39	19.9	19.15	18.42	17.82		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Tl	n2 (°C)					
(88)m=	18.07	18.07	18.08	18.08	18.08	18.09	18.09	18.09	18.09	18.08	18.08	18.08		(88)
Utilisa	tion fac	tor for a	ains for	rest of d	wellina. I	h2.m (se	e Table	9a)						
(89)m=	1	1	1	0.99	0.97	0.9	0.66	0.74	0.96	0.99	1	1		(89)
Maan	intorno	ltompor	oturo in	the rest	of dwalli	na T2 /f	ollow oto	no 2 to -	7 in Tabl	00)				
(90)m=	14.32	14.55	15.08	15.87	16.74	17.56	18	ps 3 to 7	17.32	16.24	15.16	14.29		(90)
(50)111=	14.02	14.00	15.00	10.07	10.74	17.50	10	17.55		LA = Livin			0.53	(91)
											g aroa . (	., –	0.55	(31)
Mean	interna	temper	ature (fo	r the wh	ole dwe	ling) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m=	16.19	16.38	16.83	17.49	18.21	18.9	19.3	19.25	18.69	17.79	16.89	16.17		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	re appro	opri <mark>ate</mark>				
(93)m=	16.19	16.38	16.83	17.49	18.21	18.9	19.3	19.25	18.69	17.79	16.89	16.17		(93)
8. Spa	ace hea	ting requ	uirement							_		_	_	
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
the ut				using Ta						0 /				
1.1611	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.07	0.00	0.00	0.00	0.07	0.00	4			(04)
(94)m=	1	1	0.99	0.99	0.97	0.93	0.86	0.89	0.97	0.99	1	1		(94)
	_			4)m x (84	_	700.07	000.00	504.00	574.00	505.40	450.44	440.00		(OE)
(95)m=	469.94	535.52	612.86	701.28	755.79	720.67	626.89	594.99	574.38	505.18	456.44	446.02		(95)
			1	perature			40.0	40.4	444	40.0	7.4	40		(96)
(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		(90)
								x [(93)m	<u> </u>		1000 10	4040.50		(97)
(97)m=	4940.07	4762.98	4277.34			1756.47		1161.27	1879.05		4033.49	4942.52		(91)
		2840.86	2726.37					24 x [(97)	)m – (95 0		_	2245.4		
(98)m=	3323.76	2640.66	2120.31	2037.63	1426.88	0	0	0		1820.68	2575.48	3345.4		7(00)
								lota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	20099.07	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								245.11	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme								
This pa	art is use	ed for sp	ace hea	iting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by	a commi	unity sch	neme.		
Fractio	n of spa	ce heat	from se	condary/	supplen/	nentary I	neating (	Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ce heat	from co	mmunity	system	1 – (301	1) =					j	1	(302)
	•			•	•	,	,	allows for	CHP and i	up to four a	other heat	sources; tl	he latter	_
	-	-						See Appei				_ Ju. Joo, ti		
Fractio	n of hea	at from C	Commun	ity boiler	'S								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	r community heating system		1	」 (305)
Distribution loss factor (Table 12c) for community heati	, , ,		1.05	(306)
Space heating	<b>0</b> ,	L	kWh/year	<b>,</b>
Annual space heating requirement		[	20099.07	
Space heat from Community boilers	(98) x (304a)	x (305) x (306) =	21104.02	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplement	tary system (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		-	2123.03	- ]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2229.18	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	233.33	(313)
Cooling System Energy Efficiency Ratio			0	(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 in			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	0b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)		Ī	373.27	(332)
12b. CO2 Emissions - Community heating scheme				
	Energy kWh/year	Emission factor I kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (no	-	Ng 002/NVIII	(g 002/) oui	
Efficiency of heat source 1 (%)	CHP using two fuels repeat (363) to	o (366) for the second fuel	90	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0 =	5599.97	(367)
Electrical energy for heat distribution	[(313) x	0.52	121.1	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	(2) =	5721.07	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or in	stantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		5721.07	(376)
CO2 associated with electricity for pumps and fans with	nin dwelling (331)) x	0.52	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	193.73	(379)
	```			(379)
Total CO2, kg/year sum of (376)(38			5914.8	
Total CO2, kg/year sum of (376)(38  Dwelling CO2 Emission Rate (383) ÷ (4) =		 [ ]	5914.8 72.13	_

			User D	etails: _						
Assessor Name: Software Name:	Stroma FSAP 20			Stroma Softwa Address:	are Vei			Versio	n: 1.0.3.4	
Address :	, london	Г	торену ,	Address	Offit 6					
1. Overall dwelling dimens	sions:									
_			Area	a(m²)		Av. He	ight(m)	,	Volume(m <sup>3</sup>	_
Basement				70	(1a) x	3	3.5	(2a) =	245	(3a)
Total floor area TFA = (1a)-	+(1b)+(1c)+(1d)+(1	e)+(1r	n)	70	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	245	(5)
2. Ventilation rate:										
	main s heating	econdar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	] + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fans					Ī	2	<b>x</b>	10 =	20	(7a)
Number of passive vents					Ī	0	x -	10 =	0	(7b)
Number of flueless gas fire	S				Ė	0	X 4	40 =	0	(7c)
					L			Air ch	nanges per ho	our
Infiltration due to chimneys						20		÷ (5) =	0.08	(8)
If a pressurisation test has been Number of storeys in the		led, procee	d to (17), o	otherwise (	ontinue fr	om (9) to (	(16)		0	(9)
Additional infiltration	dwelling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.28	5 for steel or timber	frame or	0.35 for	r masonr	y constr	uction	,	•	0	(11)
if both types of wall are pres		sponding to	the great	er wall are	a (after			'		
deducting areas of openings  If suspended wooden floor	,· •	iled) or 0.	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, enter	,		(000	,, 0.00					0	(13)
Percentage of windows a	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, q5	•		•		•	etre of e	envelope	area	10	(17)
If based on air permeability  Air permeability value applies ii	•					is boing u	sod		0.58	(18)
Number of sides sheltered	a pressurisation test ne	is been dor	ie or a deg	gree all per	meability	is being u	seu		1	(19)
Shelter factor				(20) = 1 -	(0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporating	g shelter factor			(21) = (18)	x (20) =				0.54	(21)
Infiltration rate modified for	monthly wind spee	d					-		-	
Jan Feb M	ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spee	ed from Table 7								•	
(22)m= 5.1 5 4.5	9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)r	n ÷ 4									
(22a)m= 1.27 1.25 1.2		0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infilt	ration rate	e (allowir	ng for sh	nelter an	ıd wind s	peed) =	(21a) x	(22a)m					
0.69	0.67	0.66	0.59	0.58	0.51	0.51	0.5	0.54	0.58	0.61	0.63	]	
Calculate effe		_	ate for t	he appli	cable ca	se		!					
If mechanic			andiv N. (2	2h) _ (22a	a) Em. /	auation (N	IE\\ otho	muino (22h	·) - (22a)			0	
If exhaust air									)) = (23a)			0	
If balanced wi									<b>01</b>	(001)	. (00.)	1007	(23)
a) If balance	1	1			i	<u> </u>	<u> </u>	ŕ	<del>r ´</del>	<del>`                                    </del>	<del>``</del>	) ÷ 100] 1	(0.4
(24a)m= 0	0	0	0	0	. 0	0	0	0	0	0	0	]	(24
b) If balance								<del>í `</del>	<del> </del>	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>		1	(0.4
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24)
c) If whole				•	•				E (00k	٠,			
	$m < 0.5 \times 10^{-6}$	(23b), ti	nen (240	(230) = (230)	o); otner	wise (24)	(220)	0) m + 0	.5 × (231	)   0	Ι ,	1	(24
( 1)	لــنـــلـ								0	0	0	J	(24)
d) If natura if (22b)	m = 1, the								0.5]			-	
(24d)m= 0.74	0.73	0.72	0.68	0.67	0.63	0.63	0.62	0.64	0.67	0.68	0.7		(24
Effective ai	r change	rate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.74	0.73	0.72	0.68	0.67	0.63	0.63	0.62	0.64	0.67	0.68	0.7		(25)
3. Heat loss	es and he	at loss r	paramete	jr.							_	_	
ELEMENT	Gros		Openin		Net Ar	ea	U-valu	ue	AXU		k-value	е	ΑΧk
	area		m		A ,r		W/m2		(W/		kJ/m².		kJ/K
Doors					1.9	x	3	=	5.7				(26)
Win <mark>dows</mark> Typ	e 1				8.7	x1/	/[1/( 4.8 )+	0.04] =	35.03				(27)
Windows Typ	e 2				6.5	X1/	/[1/( 4.8 )+	0.04] =	26.17	П			(27)
Windows Typ	e 3				2.2	x1/	/[1/( 4.8 )+	0.04] =	8.86	=			(27)
Floor					70	x	1.25	<b>─</b>	87.5	=		— г	(28)
Walls	116.	5	19.3		97.2		2.1	= :	204.12	<u> </u>		≓ F	(29)
Roof	26.7	=	0	_	26.7		0.28	=	7.48			<b>-</b>	(30)
Total area of						=	0.20		7.40	[			
	eieirieriis,	, 111-			213.2	=							(31)
Party wall					24.2	×	0	=	0	ᆜ !		<u> </u>	(32)
Party wall					8.6	X	0	=	0				(32)
* for windows an  ** include the are						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)	) + (32) =				374	.86 (33)
Heat capacity		•	•					((28).	(30) + (3	2) + (32a).	(32e) =	0	<del></del>
Thermal mas	•	,	? = Cm ÷	- TFA) ir	n kJ/m²K			Indica	itive Value	: High		45	
For design assec	ssments whe	ere the det	tails of the	,			ecisely the	e indicative	e values of	f TMP in Ta	able 1f		` ′
Thermal bridg				usina Ar	pendix k	<						31.	98 (36)
if details of them	,	,			-	-						<u>J1.</u>	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Total fabric h			(20)		,			(33) +	(36) =			406	.84 (37)
Ventilation he	at loss ca	alculated	monthly	,				(38)m	- 0 33 <b>v</b> 1	(25)m x (5)	١		
		a.ou.u.ou	1 1110111111	,				(00)	- 0.55 X		,		

(38)m= 59.45 58.71 57.98 54.58 53.95 50.99 50.99 50.44 52.13 53.95 55.23 56.58  Heat transfer coefficient, W/K (39)m = (37) + (38)m  (39)m= 466.29 465.55 464.83 461.43 460.79 457.83 457.83 457.28 458.97 460.79 462.08 463.42  Average = Sum(39) <sub>112</sub> /12= 461.42  Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)	(38)
(39)m= 466.29 465.55 464.83 461.43 460.79 457.83 457.83 457.28 458.97 460.79 462.08 463.42  Average = Sum(39) <sub>112</sub> /12= 461.42  Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)	
Average = Sum(39) <sub>112</sub> /12= 461.42 Heat loss parameter (HLP), W/m <sup>2</sup> K (40)m = (39)m $\div$ (4)	
Heat loss parameter (HLP), W/m <sup>2</sup> K $ (40)m = (39)m \div (4) $	7(20)
	(39)
(40)m= 6.66 6.65 6.64 6.59 6.58 6.54 6.54 6.53 6.56 6.58 6.6 6.62	_
Average = $Sum(40)_{112}/12=$ 6.59 Number of days in month (Table 1a)	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.25	(40)
Assumed occupancy, N $= 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(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= 96.3 92.8 89.3 85.79 82.29 78.79 78.79 82.29 85.79 89.3 92.8 96.3	٦,,,,
Total = Sum $(44)_{112}$ = 1050.55 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)	(44)
(45)m= 142.81 124.9 128.89 112.37 107.82 93.04 86.22 98.93 100.12 116.67 127.36 138.3	
Total = Sum(45) <sub>112</sub> = 1377.43	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	
(46)m= 21.42   18.74   19.33   16.86   16.17   13.96   12.93   14.84   15.02   17.5   19.1   20.75   Water storage loss:	(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel  160	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	(41)
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) x (49) = 110	(50)
b) If manufacturer's declared cylinder loss factor is not known:	(54)
Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3	(51)
Volume factor from Table 2a 1.03	(52)
Temperature factor from Table 2b 0.6	(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$	(54)
Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(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= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)

Primary circuit loss (annual) from Table 3	0	(58)
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 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)
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 × (45)m +	(46)m + (57)m + (	59)m + (61)m
(62)m= 198.09 174.83 184.17 165.86 163.1 146.53 141.49 154.21 153.61 171.95	180.85 193.58	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution	tion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	3,	
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		
(64)m= 198.09 174.83 184.17 165.86 163.1 146.53 141.49 154.21 153.61 171.95	180.85 193.58	
Output from water heate	!	2028.27 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m	_	
(65)m= 66.09 58.34 61.47 55.37 54.46 48.95 47.28 51.51 51.3 57.4	60.36 64.6	i (65)
		, ,
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is for	rom community ne	aung
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	(00)
(66)m= 112.31 112.31 112.31 112.31 112.31 112.31 112.31 112.31 112.31 112.31	112.31 112.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 17.59 15.62 12.71 9.62 7.19 6.07 6.56 8.53 11.44 14.53	16.96 18.08	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 197.3 199.34 194.19 183.2 169.34 156.31 147.6 145.55 150.71 161.7	175.56 188.59	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		
(69)m= 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23 34.23	34.23 34.23	(69)
Pumps and fans gains (Table 5a)	-	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	<u> </u>	
(71)m= -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84 -89.84	-89.84 -89.84	(71)
Water heating gains (Table 5)		
(72)m= 88.84 86.81 82.61 76.91 73.2 67.98 63.54 69.23 71.25 77.16	83.83 86.82	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (70)m$		
(73)m= 360.41 358.47 346.2 326.42 306.42 287.05 274.4 280 290.1 310.07	333.04 350.18	(73)
6. Solar gains:	333.04 330.10	(. 0)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applical	ole orientation.	
Orientation: Access Factor Area Flux g_	FF	Gains
<del>0-</del>	able 6c	(W)
North 0.9x 0.77 x 8.7 x 10.63 x 0.85 x	0.7 =	38.15 (74)
0.00		
North 0.9x 0.77	0.7	72.9 (74)

	_					_										_
North	0.9x	0.77		X	8.7	X	3	4.53	X	0.85	X	0.7		=	123.87	(74)
North	0.9x	0.77		X	8.7	x	5	5.46	X	0.85	X	0.7		=	198.97	(74)
North	0.9x	0.77		X	8.7	X	7	4.72	X	0.85	X	0.7		=	268.03	(74)
North	0.9x	0.77		X	8.7	x	7	9.99	X	0.85	X	0.7		=	286.93	(74)
North	0.9x	0.77		X	8.7	x	7	4.68	X	0.85	X	0.7		=	267.89	(74)
North	0.9x	0.77		X	8.7	X	5	9.25	X	0.85	X	0.7		=	212.54	(74)
North	0.9x	0.77		X	8.7	x	4	1.52	X	0.85	X	0.7		=	148.93	(74)
North	0.9x	0.77		X	8.7	x	2	4.19	X	0.85	X	0.7		=	86.78	(74)
North	0.9x	0.77		X	8.7	x	1	3.12	x	0.85	X	0.7		=	47.06	(74)
North	0.9x	0.77		X	8.7	X	8	3.86	X	0.85	X	0.7		=	31.8	(74)
South	0.9x	0.77		X	2.2	X	4	6.75	X	0.85	X	0.7		=	42.41	(78)
South	0.9x	0.77		X	2.2	x	7	6.57	X	0.85	X	0.7		=	69.46	(78)
South	0.9x	0.77		X	2.2	x	9	7.53	X	0.85	X	0.7		=	88.48	(78)
South	0.9x	0.77		X	2.2	X	11	0.23	X	0.85	X	0.7		=	100	(78)
South	0.9x	0.77		X	2.2	x	11	4.87	X	0.85	X	0.7		=	104.2	(78)
South	0.9x	0.77		X	2.2	x	11	0.55	X	0.85	X	0.7		=	100.28	(78)
South	0.9x	0.77		X	2.2	X	10	8.01	X	0.85	X	0.7		=	97.98	(78)
South	0.9x	0.77		X	2.2	X	10	)4.89	Х	0.85	X	0.7		=	95.15	(78)
South	0.9x	0.77		X	2.2	х	10	1.89	x	0.85	X	0.7		=	92.42	(78)
South	0.9x	0.77		X	2.2	х	8	2.59	x	0.85	X	0.7		=	74.92	(78)
South	0.9x	0.77		X	2.2	x	5	5.42	<b>x</b>	0.85	X	0.7		=	50.27	(78)
South	0.9x	0.77		X	2.2	x	4	0.4	Х	0.85	X	0.7		=	36.65	(78)
West	0.9x	0.77		X	6.5	x	1	9.64	X	0.85	X	0.7		=	52.64	(80)
West	0.9x	0.77		X	6.5	x	3	8.42	X	0.85	X	0.7		=	102.97	(80)
West	0.9x	0.77		X	6.5	x	6	3.27	X	0.85	X	0.7		=	169.58	(80)
West	0.9x	0.77		X	6.5	x	9	2.28	X	0.85	X	0.7		=	247.33	(80)
West	0.9x	0.77		X	6.5	X	11	3.09	X	0.85	X	0.7		=	303.11	(80)
West	0.9x	0.77		X	6.5	X	11	5.77	X	0.85	X	0.7		=	310.29	(80)
West	0.9x	0.77		X	6.5	x	11	0.22	X	0.85	X	0.7		=	295.4	(80)
West	0.9x	0.77		X	6.5	X	9	4.68	x	0.85	X	0.7		=	253.75	(80)
West	0.9x	0.77		X	6.5	x	7	3.59	X	0.85	X	0.7		=	197.23	(80)
West	0.9x	0.77		X	6.5	x	4	5.59	X	0.85	X	0.7		=	122.19	(80)
West	0.9x	0.77		X	6.5	x	2	4.49	x	0.85	X	0.7		=	65.64	(80)
West	0.9x	0.77		X	6.5	x	1	6.15	X	0.85	X	0.7		=	43.29	(80)
T				_	for each mon	_			<del></del>	= Sum(74)m .	<del></del>	-			ı	
(83)m=	133.2	245.33	381.9		546.29 675.3		697.5	661.27	561	44 438.59	283.	162.96	5 111.7	73		(83)
Ī				_	$\frac{(84)m = (73)r}{973.74 + 984.7}$	<del>`</del>			044	44 700.00	- F00	DE 100	404.6	20	1	(84)
(84)m=	493.61	603.8	728.	_	872.71 981.7		84.55	935.67	841.	728.68	593.	95 496	461.9	92		(04)
				•	heating seas											7.
•		_		• .	eriods in the li	_			ole 9,	Th1 (°C)					21	(85)
Utilisa г		Ť		-	ving area, h1	Ť						.	Τ_		Ī	
L	Jan	Feb	Ma	ar	Apr Ma	у [	Jun	Jul	L A	ug Sep	Oc	t Nov	/ De	C		

	_	
(86)m= 1 1 0.99 0.99 0.97 0.94 0.9 0.92 0.97 0.99 1 1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 17.29 17.49 17.93 18.59 19.3 19.97 20.4 20.32 19.74 18.85 17.97 17.26	]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 18 18 18 18 18 18 18 18 18 18 18 18 18		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 1 1 0.99 0.98 0.94 0.83 0.56 0.64 0.92 0.98 1 1	7	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_	
(90)m= 13.61 13.9 14.55 15.49 16.52 17.45 17.91 17.86 17.16 15.88 14.6 13.57	7	(90)
fLA = Living area ÷ (4) =	0.81	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		1
(92)m= 16.58 16.8 17.29 17.99 18.76 19.49 19.92 19.85 19.25 18.28 17.33 16.55	7	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_	
(93)m= 16.58 16.8 17.29 17.99 18.76 19.49 19.92 19.85 19.25 18.28 17.33 16.55	]	(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-ca	culate	
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= 1 0.99 0.99 0.98 0.95 0.91 0.84 0.87 0.95 0.99 0.99 1	7	(94)
Useful gains, hmGm , W = (94)m x (84)m	_	
(95)m= 491.8 600.15 720.09 852.85 935.49 893.15 785.81 733.63 693.05 585.27 493.29 460.48		(95)
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]	л	(07)
(97)m= 5727.59 5541.17 5013.65 4196.15 3254.99 2238.36 1520.54 1576.29 2361.74 3539.62 4724.93 5725.34 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	<u>'</u>	(97)
(98)m= 3895.43 3320.36 3194.41 2407.18 1725.71 0 0 0 0 2198.04 3046.78 3917.06	3]	
Total per year (kWh/year) = Sum(98) <sub>15912</sub> =	+	(98)
Space heating requirement in kWh/m²/year		(99)
<u> </u>	330.04	(00)
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	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 sources;		,
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		_
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 community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	l (306)
		,
Space heating Annual space heating requirement	kWh/year 23704.96	
, 9 - 1	_3.000	İ

Space heat from Community boilers		(98) x (304a) x (	(305) x (306) =	24890.21	(307a)
Efficiency of secondary/supplementary h	eating system in % (fron			0	」` ☐(308
Space heating requirement from second			•	0	」` □(309)
	,,	, , , ,	,		」` ′
Water heating Annual water heating requirement				2028.27	7
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (	(305) x (306) =	2129.68	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e	e) + (310a)(310e)] =	270.2	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extract	<b>.</b> ,	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) + (330b	o) + (330g) =	0	(331)
Energy for lighting (calculated in Append	ix L)			310.63	(332)
12b. CO2 Emissions - Community heating	ng scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO <mark>2/yea</mark> r	
CO2 from other sources of space and wa Efficiency of heat source 1 (%)		two fuels repeat (363) to (	(366) for the second fue	el 90	(367a)
CO2 associated with heat source 1	[(307b)+(3				
		310b)] x 100 ÷ (367b) x	0 =	6484.77	(367)
Electrical energy for heat distribution	[(	310b)] x 100 ÷ (367b) x (313) x		= 6484.77 = 140.23	(367)
Total CO2 associated with community sy			0.52	0404.77	
<b>0.</b>	vstems (3	(313) x	0.52	140.23	(372)
Total CO2 associated with community sy	vstems (3 ondary) (3	(313) x (363)(366) + (368)(372 (309) x	0.52	140.23	(372)
Total CO2 associated with community sy CO2 associated with space heating (sec	ondary) (3	(313) x (363)(366) + (368)(372 (309) x	0.52	140.23	(372) (373) (374)
Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with water from immersi	ondary) (3 on heater or instantaneo ater heating (3	(313) x (363)(366) + (368)(372) (309) x (309) bus heater (312) x (373) + (374) + (375) =	0.52	= 140.23 = 6625.01 = 0	(372) (373) (374) (375)
Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with water from immersi Total CO2 associated with space and water from immersion control	ondary) (3 on heater or instantaneo ater heating (3 s and fans within dwelling	(313) x (363)(366) + (368)(372) (309) x (309) bus heater (312) x (373) + (374) + (375) =	0.52	= 140.23 = 6625.01 = 0 = 0	(372) (373) (374) (375) (376)
Total CO2 associated with community sy CO2 associated with space heating (second CO2 associated with water from immersing Total CO2 associated with space and was CO2 associated with electricity for pumps CO2 associated with electricity for lighting CO2 associated with electricity for lighti	ondary) (3 on heater or instantaneo ater heating (3 s and fans within dwelling	(313) x (363)(366) + (368)(372) (309) x (309) x (312) x (373) + (374) + (375) = (331)) x	0.52	= 140.23 = 6625.01 = 0 = 0 = 0 = 0	(372) (373) (374) (375) (376) (378)
Total CO2 associated with community sy CO2 associated with space heating (second CO2 associated with water from immersion Total CO2 associated with space and was CO2 associated with electricity for pumps CO2 associated with electricity for lighting Total CO2, kg/year	ondary) (3 on heater or instantaneo ater heating (3 s and fans within dwelling (3	(313) x (363)(366) + (368)(372) (309) x (309) x (312) x (373) + (374) + (375) = (331)) x	0.52	6625.01 0 6625.01 0 6625.01 0 161.22	(372) (373) (374) (375) (376) (378) (379)

			User D	etails: _						
Assessor Name: Software Name:	Stroma FSAP			Strom Softwa Address	are Ve			Versio	n: 1.0.3.4	
Address :	, london	r	roperty.	Address	Onit 9					
1. Overall dwelling dime	nsions:									
Decement				a(m²)			ight(m)	٦,, ١	Volume(m <sup>3</sup>	<u>^</u>
Basement					(1a) x	2	.37	(2a) =	293.88	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)-	+(1e)+(1r	า) [	124	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	293.88	(5)
2. Ventilation rate:	main	oo oo n day		other		40401			m3 nor hou	
	main heating	secondar heating	· - –	otner	, –	total			m³ per hou	_
Number of chimneys	0	0	╛╵┖	0	<u> </u>	0	X 4	40 =	0	(6a)
Number of open flues	0	0	+	0	=	0	x :	20 =	0	(6b)
Number of intermittent far	ns					2	X '	10 =	20	(7a)
Number of passive vents						0	<b>X</b> '	10 =	0	(7b)
Number of flueless gas fin	res				Ī	0	X 4	40 =	0	(7c)
					_			Air ch	anges per ho	our
Infiltration due to chimney						20		÷ (5) =	0.07	(8)
If a pressurisation test has be Number of storeys in the		tended, procee	d to (17), (	otherwise (	continue fr	rom (9) to (	(16)		0	<b>—</b> (0)
Additional infiltration	ie dweiling (115)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	.25 for steel or tim	ber frame or	0.35 fo	r masoni	y constr	uction	,		0	(11)
if both types of wall are pr		orresponding to	the great	ter wall are	a (after			'		
deducting areas of opening If suspended wooden f	• ,. ,	sealed) or 0	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, ent	•	•	(000	, c.cc					0	(13)
Percentage of windows	s and doors draugl	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	10	(17)
If based on air permeabili  Air permeability value applies	•					is heina u	sed		0.57	(18)
Number of sides sheltere		n nao boon ao	io oi a aos	groo an po	mousinty	io boiling a	000		1	(19)
Shelter factor				(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.92	(20)
Infiltration rate incorporat	•			(21) = (18	) x (20) =				0.53	(21)
Infiltration rate modified for			1						1	
Jan Feb	Mar   Apr   M	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				T		T	T	T	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		
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.67	0.66	0.64	0.58	0.56	d wind s	0.5	0.49	0.53	0.56	0.59	0.62	]	
alculate effec		•	rate for t	he appli	cable ca	se	<u> </u>	<u> </u>	<u> </u>	!	<u>l</u>	J 	
If mechanica	al ventila	ition:										0	(2:
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(2:
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =				0	(2:
a) If balance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	p)m = (22)	2b)m + (	23b)		1	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				<b>5</b> (00)	,			
if (22b)n		<u> </u>	· ` `	<u> </u>	ŕ	· ·	ŕ	ŕ –	· ` `	ŕ	Ι ,	1	(2)
4c)m= 0	0	0		0	0	0	0	0	0	0	0	J	(24
d) If natural if (22b)n									0.51				
4d)m= 0.72	0.72	0.71	0.67	0.66	0.62	0.62	0.62	0.64	0.66	0.67	0.69	1	(2
Effective air	change	rate - er	ter (24a	L ) or (24b	o) or (24)	c) or (24	d) in box	(25)	ļ	ļ.	ļ	J	
5)m= 0.72	0.72	0.71	0.67	0.66	0.62	0.62	0.62	0.64	0.66	0.67	0.69		(2
3. Heat losse												_	
LEMENT	Gros area		Openin	-	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
oors		()	, i		1.6	×	1.4	= 1	2.24				(2
in <mark>dows</mark> Type	1				5.49	_	/[1/( 4.8 )+	\	22.11	Ħ			(2
indows Type					4.7		/[1/( 4.8 )+		18.93	Ħ			(2
alls Type1			4.0	\ <b>\</b>						╡ ,			(2
alls Type1	11.8		1.6		10.25	=	2.1	=	21.52				
	122		10.19	=	111.8	=	1.27	=	142.22			<b>-</b>	(2
oof	68.		0		68.1	X	0.28	=	19.07				(3
otal area of e	iements	, m²			201.9	5							(3
arty wall					4.8	X	0	=	0				(3
or windows and include the area						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
abric heat los							(26)(30)	) + (32) =				226.0	8 (3
eat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =	0	(3
nermal mass			P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: High	, ,	450	(3
or design assess	•	•		,			ecisely the	e indicative	values of	TMP in T	able 1f		(-
n be used inste	ad of a de	tailed calc	ulation.										
nermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						30.4	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)			(22)	(20)				
otal fabric he		_     _ 4	l a .a 41a 1.						(36) =	(DE) (E)	<b>.</b>	256.4	.8 (3
entilation hea		i			· .				= 0.33 × (		1	1	
	Feb	Mar	Apr	May	Jun	Jul 60.57	Aug 59.95	Sep 61.88	Oct 63.96	Nov 65.43	Dec 66.97		/2
Jan	60.44	60.50	64.00	62.00				. nixx					
3)m= 70.25	69.41	68.58	64.69	63.96	60.57	00.37	59.95	01.00	03.90	00.43	00.97	J	(3
		<u> </u>	64.69	63.96	60.57	00.57	39.93	<u> </u>	= (37) + (37)		00.97	]	(3

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 2.63	2.63	2.62	2.59	2.58	2.56	2.56	2.55	2.57	2.58	2.6	2.61		
	l .					ı	ı	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	2.59	(40)
Number of day	/s in mo	nth (Tab	le 1a)					1		1			
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	irement:								kWh/ye	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 ( <sup>-</sup>	TFA -13.		88		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the $c$	lwelling is	designed t			se target o		2.54		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 112.8	108.69	104.59	100.49	96.39	92.29	92.29	96.39	100.49	104.59	108.69	112.8		
										m(44) <sub>112</sub> =		1230.5	(44)
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x D	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 167.27	146.3	150.97	131.62	126.29	108.98	100.98	115.88	117.26	136.66	149.18	161.99		_
If instantaneous w	vator hoati	ng at naint	of use (no	hot water	r etorago)	ontor () in	haves (46		Total = Su	m(45) <sub>112</sub> =		1613.38	(45)
				-		_							(40)
(46)m= 25.09 Water storage	21.94 loss:	22.64	19.74	18.94	16.35	15.15	17.38	17.59	20.5	22.38	24.3		(46)
Storage volum		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If community h	,												, ,
Otherwise if no	•			•			` '	ers) ente	er '0' in (	47)			
Water storage													
<ul><li>a) If manufact</li></ul>	urer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								00		(51)
If community h	-			G Z (KVV	ii/iiti G/GC	, y )				0.	02		(31)
Volume factor	•									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (	(54) in ( <del></del>	55)								1.	03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nual) fro	m Table								0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by				,	•	` '	, ,		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 (	aclaulatad	for ooob	month (	(61)m -	(60) · 2	GE v. (41	١m						
Combi loss $(61)$ m= $0$	0 0	0	0	0	00) + 3	05 x (41)	0	0	0	0	0		(61)
	_!						<u> </u>	<u> </u>	<u> </u>	ļ	<u> </u>	(59)m + (61)m	` '
(62)m= 222.5	<del></del>	206.24	185.11	181.57	162.47	156.26	171.16	170.76	191.94	202.67	217.27	(53)111 + (61)111	(62)
Solar DHW inpo		<u> </u>	<u> </u>									I	` '
(add addition										o to mate	51 1.0ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter	Į.			•	Į.	·		•		l	
(64)m= 222.5		206.24	185.11	181.57	162.47	156.26	171.16	170.76	191.94	202.67	217.27		
	Į		ı				Out	put from w	ater heate	r (annual)₁	112	2264.22	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 74.23	1	68.81	61.77	60.6	54.24	52.19	57.14	57	64.05	67.61	72.47		(65)
include (5	7)m in cal	culation (	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):								-	
Metabolic ga													
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 143.8	8 143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88	143.88		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 30.38	3 26.98	21.94	16.61	12.42	10.48	11.33	14.72	19.76	25.09	29.29	31.22		(67)
Appliances (	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5				
(68)m= 290.3	3 293.35	285.75	269.59	249.19	230.01	217.2	214.19	221.78	237.95	258.35	277.52		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a	), also s	ee Table	5		•		
(69)m= 37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39	37.39		(69)
Pumps and	fans gains	(Table 5	 5а)								•	<u> </u>	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•	•			•		•	
(71)m= -115.	1 -115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1	-115.1		(71)
Water heatir	ng gains (1	Table 5)				•				•		•	
(72)m= 99.7	7 97.4	92.48	85.79	81.45	75.34	70.14	76.8	79.17	86.09	93.9	97.41		(72)
Total intern	al gains =	:	•		(66	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72)	)m	•	
(73)m= 486.6	4 483.89	466.34	438.16	409.22	382	364.84	371.88	386.87	415.29	447.7	472.32		(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ Fabla 6b	_	FF		Gains	
	Table 6d		m²		Ta	ble 6a	. —	Table 6b	_ '	able 6c		(W)	,
North 0.9	× 0.77	X	5.4	19	χ	10.63	x	0.85	x	0.7	=	24.07	(74)
North 0.9	× 0.77	X	5.4	19	x	20.32	х	0.85	x	0.7	=	46	(74)
North 0.9	× 0.77	X	5.4	19	x;	34.53	x	0.85	x	0.7	=	78.17	(74)
North 0.9		X	5.4	19	x (	55.46	x	0.85	x	0.7	=	125.56	(74)
North 0.9	× 0.77	X	5.4	19	x	74.72	x	0.85	x	0.7	=	169.14	(74)

	_		-						1 1		_		_		_
North	0.9x	0.77	X	5.4	19	X	7	9.99	X	0.85	X	0.7	=	181.06	(74)
North	0.9x	0.77	X	5.4	<b>!</b> 9	X	7	4.68	X	0.85	X	0.7	=	169.05	(74)
North	0.9x	0.77	X	5.4	19	X	5	9.25	X	0.85	X	0.7	=	134.12	(74)
North	0.9x	0.77	X	5.4	<b>1</b> 9	X	4	1.52	X	0.85	X	0.7	=	93.98	(74)
North	0.9x	0.77	X	5.4	19	X	2	4.19	X	0.85	X	0.7	=	54.76	(74)
North	0.9x	0.77	X	5.4	19	X	1	3.12	X	0.85	X	0.7	=	29.69	(74)
North	0.9x	0.77	X	5.4	19	X	8	3.86	X	0.85	X	0.7	=	20.07	(74)
South	0.9x	0.77	X	4.	7	x	4	6.75	x	0.85	×	0.7	=	90.6	(78)
South	0.9x	0.77	X	4.	7	x	7	6.57	X	0.85	x	0.7	=	148.39	(78)
South	0.9x	0.77	X	4.	7	x	9	7.53	X	0.85	x	0.7	=	189.02	(78)
South	0.9x	0.77	X	4.	7	x	1	10.23	x	0.85	x	0.7	=	213.63	(78)
South	0.9x	0.77	X	4.	7	x	1	14.87	x	0.85	×	0.7	=	222.62	(78)
South	0.9x	0.77	X	4.	7	x	1	10.55	x	0.85	x	0.7	=	214.24	(78)
South	0.9x	0.77	x	4.	7	x	10	08.01	x	0.85	×	0.7	_ =	209.32	(78)
South	0.9x	0.77	x	4.	7	x	10	04.89	x	0.85	x	0.7		203.28	(78)
South	0.9x	0.77	X	4.	7	x	10	01.89	x	0.85	×	0.7		197.45	(78)
South	0.9x	0.77	x	4.	7	x	8	2.59	x	0.85	×	0.7	_ =	160.05	(78)
South	0.9x	0.77	X	4.	7	X	5	5.42	Х	0.85	X	0.7	=	107.4	(78)
Sout <mark>h</mark>	0.9x	0.77	x	4.	7	x	4	10.4	х	0.85	x	0.7	_	78.29	(78)
			_												
Sola <mark>r g</mark>	ains in y	watts, <mark>calcu</mark>	lated	for eacl	h mont	h			(83)m	= Sum(74)m	.(82)m				
(83)m=	114.68	194.39 26	7.18	339.19	391.75	3	895.3	378.37	337	291.43	214.8	137.09	98.36		(83)
		nternal and	solar	(84)m =	= (73)m	+ (8	83)m	, watts							
(84)m=	601.32	678.28 733	3.53	777.35	800.97	7	77.3	743.21	709.	.28 678.31	630.1	584.79	570.67		(84)
7. Mea	an interi	nal tempera	ture (	(heating	seaso	n)									
Tempe	erature	during heat	ina n	ariads ir	41 12										
Utilisa	tion fac		9 P	CHOUS II	n the liv	/ing	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
	tion ido	tor for gains	•			_			ole 9,	Th1 (°C)				21	(85)
Į	Jan	<u>`</u> _	•			n (s			ole 9,	· · ·	Oct	Nov	Dec	21	(85)
(86)m=		Feb N	for li	iving are	ea, h1,r	m (s	ee Ta	ble 9a)		ug Sep	Oct	Nov 1	Dec 1	21	(85)
L	Jan 1	Feb N	for li	iving are Apr	ea, h1,r May	m (s	ee Ta Jun <sup>0.99</sup>	ble 9a) Jul 0.97	Au 0.9	ug Sep				21	
L	Jan 1	Feb N	for li	iving are Apr	ea, h1,r May	m (s	ee Ta Jun <sup>0.99</sup>	ble 9a) Jul 0.97	Au 0.9	ug Sep		1		21	
Mean (87)m=	Jan 1 internal	Feb N 1 temperatur 19.18 19	of for lings for	Apr 1 iving are	ea, h1,r May 1 ea T1 ( 20.13	m (s	ee Ta Jun 0.99 w ste	Jul 0.97 ps 3 to 7 20.73	0.9 in T	ug Sep 8 1 able 9c)	1	1	1	21	(86)
Mean (87)m=	Jan 1 internal	Feb N 1 temperatur 19.18 19	of for lings for	Apr 1 iving are	ea, h1,r May 1 ea T1 ( 20.13	m (s	ee Ta Jun 0.99 w ste	Jul 0.97 ps 3 to 7 20.73	0.9 in T	ug Sep 8 1 20.39 0, Th2 (°C)	1	19.45	1	21	(86)
Mean (87)m= [ Tempe (88)m= [	Jan 1 internal 19.07 erature 18.94	Feb N 1 temperatur 19.18 19 during heat 18.95 18	for limited from 1 and 1	Apr 1 iving are 19.76 eriods ir 18.97	ea, h1,r May 1 ea T1 ( 20.13 n rest o	follo	ee Ta Jun 0.99 w ste 20.49 velling 8.99	Jul 0.97 ps 3 to 7 20.73 from Ta	Au 0.97 in T 20.69 hble 9	ug Sep 8 1 20.39 0, Th2 (°C)	19.92	19.45	19.06	21	(86)
Mean (87)m=  Tempo (88)m=  Utilisa	Jan 1 internal 19.07 erature 18.94	Feb N 1 temperatur 19.18 19 during heat 18.95 18 tor for gains	for ling positions for residual for the second seco	Apr 1 iving are 19.76 eriods ir 18.97 est of deciving are	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling	m (s follo	ee Ta Jun 0.99 ww ste 20.49 velling 8.99 ,m (se	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table	Au 0.97 in T 20.69 able 9 18.9	ug Sep  8 1  able 9c)  99 20.39  0, Th2 (°C)  99 18.98	19.92	19.45	19.06	21	(86) (87) (88)
Mean (87)m=  Tempe (88)m=  Utilisa (89)m=	Jan  1 internal 19.07 erature 18.94 ition fac	Feb N 1 temperatur 19.18 19 during heat 18.95 18 tor for gains	for limited and the second and the s	Apr 1 iving are 19.76 eriods ir 18.97 est of dent	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling 0.99	m (s	ee Ta Jun 0.99 ww ste 20.49 velling 8.99 ,m (se 0.96	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table 0.82	Au 0.9 7 in T 20.6 able 9 18.9 9a) 0.8	ug Sep  8 1  able 9c)  99 20.39  0, Th2 (°C)  99 18.98	19.92	19.45	19.06	21	(86)
Mean (87)m=  Tempo (88)m=  Utilisa (89)m=  Mean	Jan  1 internal 19.07 erature 18.94 tion fac 1 internal	Feb N 1 temperatur 19.18 19 during heat 18.95 18 tor for gains 1 temperatur	for limited and li	Apr 1 iving are 19.76 eriods ir 18.97 eest of decide the rest	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling 0.99 of dwe	m (s / / / / / / / / / / / / / / / / / / /	ee Ta Jun 0.99 w ste 20.49 velling 8.99 m (se 0.96	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table 0.82 collow ste	Au 0.97 in T 20.6 able 9 18.9 9a) 0.8	ug Sep  8 1  Fable 9c) 69 20.39  9, Th2 (°C) 99 18.98  6 0.98  to 7 in Table	1 19.92 18.97 1 2 9c)	19.45	1 19.06 18.96	21	(86) (87) (88) (89)
Mean (87)m=  Tempe (88)m=  Utilisa (89)m=	Jan  1 internal 19.07 erature 18.94 ition fac	Feb N 1 temperatur 19.18 19 during heat 18.95 18 tor for gains 1 temperatur	for limited and the second and the s	Apr 1 iving are 19.76 eriods ir 18.97 est of dent	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling 0.99	m (s / / / / / / / / / / / / / / / / / / /	ee Ta Jun 0.99 ww ste 20.49 velling 8.99 ,m (se 0.96	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table 0.82	Au 0.9 7 in T 20.6 able 9 18.9 9a) 0.8	ug Sep  8 1  6able 9c) 69 20.39  9, Th2 (°C) 99 18.98  to 7 in Table 87 18.46	1 19.92 18.97 1 = 9c) 17.77	19.45 18.97 1 1 17.07	1 19.06 18.96		(86) (87) (88) (89)
Mean (87)m=  Tempo (88)m=  Utilisa (89)m=  Mean	Jan  1 internal 19.07 erature 18.94 tion fac 1 internal	Feb N 1 temperatur 19.18 19 during heat 18.95 18 tor for gains 1 temperatur	for limited and li	Apr 1 iving are 19.76 eriods ir 18.97 eest of decide the rest	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling 0.99 of dwe	m (s / / / / / / / / / / / / / / / / / / /	ee Ta Jun 0.99 w ste 20.49 velling 8.99 m (se 0.96	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table 0.82 collow ste	Au 0.97 in T 20.6 able 9 18.9 9a) 0.8	ug Sep  8 1  6able 9c) 69 20.39  9, Th2 (°C) 99 18.98  to 7 in Table 87 18.46	1 19.92 18.97 1 = 9c) 17.77	19.45	1 19.06 18.96	0.3	(86) (87) (88) (89)
Mean (87)m=  Tempo (88)m=  Utilisa (89)m=  Mean (90)m=  Mean	Jan  1 internal 19.07 erature 18.94 tion fac 1 internal 16.5 internal	Feb N 1 temperatur 19.18 19 during heat 18.95 18 tor for gains 1 temperatur 16.67 17	for limited in the second seco	Apr 1 iving are 19.76 eriods ir 18.97 est of deriods 1 the rest 17.53	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling 0.99 of dwe 18.07	follo  fo	ee Ta  Jun  0.99  w ste 20.49  velling 8.99  m (se 0.96  T2 (fo 8.61	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table 0.82 collow ste 18.9	Au 0.9 7 in T 20.6 able 9 18.9 0.8 eps 3 18.8	ug Sep  8 1  able 9c) 69 20.39  9, Th2 (°C) 99 18.98  to 7 in Table 87 18.46  ft  ft  ft  ft  ft  ft  ft  ft  ft  f	1 19.92 18.97 1 e 9c) 17.77 A = Liv	1 19.45 18.97 1 17.07	1 19.06 18.96 1 16.5 4) =		(86) (87) (88) (89) (90) (91)
Mean (87)m= [ Tempe (88)m= [ Utilisa (89)m= [ Mean (90)m= [  Mean (92)m= [	Jan  1 internal 19.07 erature 18.94 tion fac 1 internal 16.5 internal 17.28	Feb         M           1         temperatur           19.18         19           during heat         18.95         18           tor for gains         1           temperatur         16.67         17           temperatur         17.43         17	for ling per second of the sec	Apr 1 iving are 19.76 eriods ir 18.97 est of dr 1 the rest 17.53 r the wh	ea, h1,r May 1 ea T1 ( 20.13 n rest o 18.97 welling 0.99 of dwe 18.07	follo  2  f dw  1  1  1  elling  1	ee Ta  Jun  0.99  w ste  0.49  velling  8.99  m (se  0.96  T2 (fo  8.61  g) = fl  9.18	Jul 0.97 ps 3 to 7 20.73 from Ta 18.99 ee Table 0.82 ollow ste 18.9  A × T1 19.45	Au 0.9 7 in T 20.6 able 9 18.9 0.8 pps 3 18.6 + (1 - 19.6	ug Sep  8 1  able 9c) 69 20.39  9, Th2 (°C) 99 18.98  to 7 in Table 87 18.46  ft  ft  ft  ft  ft  ft  ft  ft  ft  f	1 19.92 18.97 1 = 9c) 17.77 A = Liv	1 19.45 18.97 1 1 17.07 ring area ÷ (4	1 19.06 18.96		(86) (87) (88) (89)

		1	1	Ι	Ι	1	1		i	i			(00)
(93)m= 17.28	17.43	17.74	18.2	18.69	19.18	19.45	19.42	19.04	18.42	17.79	17.27		(93)
8. Space hea				ro obtain	and at et	on 11 of	Table 0	o so tha	nt Ti m-(	76)m an	d re-calc	ulato	
the utilisation					icu ai sii	ър птог	i abic 3i	J, 50 II IA	ıı 11,111—(	rojili ali	u ie-caic	uiate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, hm	1:										
(94)m= 1	1	1	1	0.99	0.97	0.88	0.91	0.98	1	1	1		(94)
Useful gains		W = (94)	ŕ	4)m	T	T			1	1	, ,		
(95)m= 601.17	677.96	732.81	775.38	794.28	751.07	653.96	644.51	667.34	628.71	584.51	570.56		(95)
Monthly aver	<del></del>	T T	<del>-</del>	r	r						· 1		(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 rat	e for me		2987.43			=[(39) <b>m</b> 904.1	x [(93)m	- (96)m 1573.7	2505.1	3440.8	4228.68		(97)
(97)m= 4240.35 Space heating	l	l	l	L	L	l			l	l .	4220.00		(97)
(98)m= 2707.55	<del></del>				0	0.02	0	0	<del>í - `</del>	2056.52	2721 64		
(00)111=   27 07 .00	12200.21	2170.00	1002.00	1070.10					ļ	r) = Sum(9	<u> </u>	16011.93	(98)
Chase bestin	a roquir	omont in	Id M/b/pp?	2/voor			7010	i poi you	(ittili y cai	) – Cam(c	715,512 —		= ' '
Space heatir	• •										L	129.13	(99)
9b. Energy re	•		· ·	Ĭ									
This part is us Fraction of sp										unity sch	neme. [	0	(301)
							(Table I	., 0	OHO		l		=
Fraction of sp												1	(302)
The c <mark>ommu</mark> nity s includes boilers, l									up to four	other heat	sources; th	ne latter	
Fraction of he					iom power	Stations.	осс Аррсі	idix O.				1	(303a)
Fraction of tot					nilers				(3	02) x (303	ا ا – ا	1	(304a)
										02) X (303	[		╡`
Factor for con				,	. ,,		•	iting sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for d	commun	ity heatii	ng syste	m					1.05	(306)
Space heatin	_											kWh/yea	r
Annual space	heating	requiren	nent									16011.93	
Space heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	= [	16812.52	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	darv/sur	pplemen	tarv svst	tem	(98) x (30	01) x 100 ·	÷ (308) =	[	0	(309)
				, <sub>.</sub>		, -, -			,	,	L		`
Water heating	_	oguirom	ont								Γ	0004.00	
Annual water	•	•									Į	2264.22	
If DHW from o		•						(64) x (30	03a) x (30	5) x (306) :	_ [	2377.43	(310a)
Electricity use		•					0.01			· (310a)(	l r	191.9	(313)
Cooling Syste				0				L(cc sy	(22 2)	(5 5 5)	[	0	(314)
Space cooling	_	•	•		n if not a	anter (1)		= (107) ÷	- (314) –		] ]	0	(315)
	•			•		,		- (101) -	(014) =			U	(313)
Electricity for proceed the mechanical version of the mechanical versions.							outside				[	0	(330a)
Silainoai V		Jaian	. 5 m, OAH	o. po	3	0.111	22.0100				l		

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)				536.46	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fac		nissions   CO2/year	
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%)	CHP) P using two fuels repeat (363) to	(366) for the second	d fuel	90	(367a)
CO2 associated with heat source 1	807b)+(310b)] x 100 ÷ (367b) x	0	=	4605.59	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	99.6	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	4705.18	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or insta	ntaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			4705.18	(376)
CO2 associated with electricity for pumps and fans within o	dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	278.42	(379)
Total CO2, kg/year sum of (376)(382) =				4983.61	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				40.19	(384)
El rating (section 14)				60.38	(385)

	Usei	Details:				
Assessor Name: Software Name: Strom	a FSAP 2012	Stroma Nur Software Ve		Versio	n: 1.0.3.4	
	· ·	y Address: Unit 1	0			
Address: , londo  1. Overall dwelling dimensions:	on					
1. Overall awelling aimensions.	A	rea(m²)	Av. Height(m)		Volume(m³)	
Basement		79 (1a) x	2.6	(2a) =	205.4	(3a)
Total floor area TFA = (1a)+(1b)+	(1c)+(1d)+(1e)+(1n)	79 (4)				_
Dwelling volume		(3a)+(3	8b)+(3c)+(3d)+(3e)+	(3n) =	205.4	(5)
2. Ventilation rate:						
ma	nin secondary nating heating	other	total		m³ per hour	
Number of chimneys		0 =	0 x	40 =	0	(6a)
Number of open flues	0 + 0 +	0 =	0 x	20 =	0	(6b)
Number of intermittent fans			2 X	10 =	20	(7a)
Number of passive vents			0 x	10 =	0	(7b)
Number of flueless gas fires			0 x	40 =	0	(7c)
				Air ch	anges per hou	ır
		(75)			anges per hou	_
Infiltration due to chimneys, flues			20 from (9) to (16)	÷ (5) =	0.1	(8)
Number of storeys in the dwelling		), carermee continue	113111 (b) to (113)	ĺ	0	(9)
Additional infiltration			[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for st	eel or timber frame or 0.35	for masonry cons	truction	į	0	(11)
if both types of wall are present, use	, ,	eater wall area (after				_
deducting areas of openings); if equal If suspended wooden floor, enter		aled), else enter (	)	ſ	0	(12)
If no draught lobby, enter 0.05,	, , , , , , , , , , , , , , , , , , , ,	2.00), 0.00 0.1101 0	•		0	(13)
Percentage of windows and do				ļ	0	1\
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	İ	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	İ	0	(16)
Air permeability value, q50, exp	ressed in cubic metres per	hour per square r	metre of envelope	e area	10	(17)
If based on air permeability value,	, then $(18) = [(17) \div 20] + (8)$ , other	rwise (18) = (16)		Ī	0.6	(18)
Air permeability value applies if a press	surisation test has been done or a	degree air permeabilit	y is being used			7
Number of sides sheltered Shelter factor		(20) = 1 - [0.075 x	(19)] =		1	(19)
Infiltration rate incorporating shelt	er factor	(21) = (18) x (20) =		[ [	0.92	](20) ] <sub>(24)</sub>
Infiltration rate modified for month		(21) = (10) x (20) =		l	0.55	(21)
	Apr May Jun Jul	Aug Sep	Oct Nov	Dec		
Monthly average wind speed from	· · · · · ·	1 7.09	1 001   1101	1 200		
<del> </del>	4.4 4.3 3.8 3.8	3.7 4	4.3 4.5	4.7		
		1 1	1 1		I	
Wind Factor (22a)m = $(22)$ m ÷ 4	11 100 005 005	0.00 4	1.00 1.40	140	ĺ	
(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		

0.7	ation rat	0.68	0.61	0.59	0.52	0.52	0.51	0.55	0.59	0.62	0.65	]	
Calculate effe		-	rate for t	he appli	cable ca	se						<u>,                                    </u>	
If mechanic												0	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0	(2
If balanced with		•	•	_								0	(2
a) If balance	·	i				<del>- ` `                                 </del>	<del>,                                    </del>	<del>í `</del>	<del> </del>	<del>,                                    </del>	<del>1 ` '</del>	) ÷ 100] 1	(0
24a)m= 0	0		0	0	0	0	0	0	0	0	0	]	(2
b) If balance		anicai ve	ntilation	without	heat red		<del>-                                    </del>	<del>``</del>	<del>- ` `</del>	<del></del>	Ι ,	1	(2
,	0				<u> </u>	0	0	0	0	0	0	J	(2
c) If whole h	iouse ex n < 0.5 ×			•	•				5 v (23h	<i>)</i>			
$\frac{(225)^{1}}{(24c)m} = 0$	0.07	0	0	0	0	0	0) = (22.	0	0 7 (20)	0	0	]	(2
d) If natural	ventilatio	n or wh	ole hous	L nositiv	/e input	L ventilatio	n from l	oft		<u>!</u>	ļ	J	
,	n = 1, the				•				0.5]				
24d)m= 0.75	0.74	0.73	0.68	0.68	0.64	0.64	0.63	0.65	0.68	0.69	0.71	]	(2
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)		-		_	
25)m= 0.75	0.74	0.73	0.68	0.68	0.64	0.64	0.63	0.65	0.68	0.69	0.71		(2
3. Heat losse	s and he	at loss r	naramete	or.							_	_	
LEMENT	Gros		Openin		Net Ar	ea	U-val	IE	AXU		k-value	9	ΑΧk
FFIMEIAI	area		m		A ,r		W/m2		(W/I	K)	kJ/m².		kJ/K
oo <mark>rs</mark>					1.6	x	1.4	= [	2.24				(:
in <mark>dows</mark> Type	e 1				3.12	x1.	/[1/( 4.8 )+	0.04] =	12.56	П			(2
indows Type	2				3.66	x1.	/[1/( 4.8 )+	0.04] =	14.74	Ħ			(:
/alls Type1	89.2	2	6.78		82.42	2 x	1.27	=	104.83				(2
/alls Type2	26.6	3	1.6	=	25.03	3 x	2.1	<b>=</b> i	52.56	Ħ i			(2
oof	46.	5	0		46.5	x	0.28	<u> </u>	13.02			7	(;
otal area of e	elements	, m²			162.3	3							(
arty wall					5.3	×	0		0	<b>—</b> [			(;
for windows and	l roof wind	ows, use e	ffective wi	ndow U-va						as given in	paragrapl		
include the area						_			, -				
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				199.96	(
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0	(
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(:
or design asses:				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
n ha waad inata				ısina Ar	nendix k	<						24.8	(;
	C3 . O (L	,			•	`						24.0	(,
hermal bridg	al bridaina		()		•/			(33) +	(36) =			224.76	(:
nermal bridg													
nermal bridg details of therma otal fabric he	at loss	alculated	l monthly	y				(38)m	$= 0.33 \times ($	(25)m x (5	)		
n be used insternal bridgedetails of thermal otal fabric heatilation heat	at loss	alculated Mar	l monthly Apr	/ May	Jun	Jul	Aug	(38)m Sep	= 0.33 × (	25)m x (5 Nov	Dec	]	
hermal bridg details of thermand otal fabric hea	at loss	i			Jun 43.23	Jul 43.23	Aug 42.74				1		(:
nermal bridg details of therma otal fabric he entilation hea Jan	at loss cat	Mar 49.42	Apr	May	-		<del>-</del>	Sep 44.24	Oct	Nov 46.99	Dec		(3

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 3.49	3.48	3.47	3.43	3.43	3.39	3.39	3.39	3.41	3.43	3.44	3.45		
	<u> </u>	l .				ļ	ļ		L Average =	Sum(40) <sub>1</sub> .	12 /12=	3.43	(40)
Number of day	s in mo	nth (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 heat	ting ene	rgy requi	rement:								kWh/ye	ar:	
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.		44		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.24		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage is	n litres pe	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 101.46	97.77	94.08	90.39	86.7	83.01	83.01	86.7	90.39	94.08	97.77	101.46		
										m(44) <sub>112</sub> =		1106.83	(44)
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x D	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 150.46	131.59	135.79	118.39	113.6	98.02	90.83	104.23	105.48	122.93	134.18	145.71		_
If instantaneous w	vater heati	na at noint	of use (no	hot water	storage)	enter () in	hoves (46		Total = Su	m(45) <sub>112</sub> =		1451.23	(45)
						_			40.44	00.40	04.00		(46)
(46)m= 22.57 Water storage	19.74 IOSS:	20.37	17.76	17.04	14.7	13.63	15.64	15.82	18.44	20.13	21.86		(46)
Storage volum		includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
b) If manufact			-								1		(54)
Hot water storal If community h	-			e z (KVV	ii/iiti e/ua	iy)				0.	02		(51)
Volume factor	_		011 1.0							1.	03		(52)
Temperature f	actor fro	m Table	2b							-	.6		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (		_	,								03		(55)
Water storage	loss cal	culated t	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												x H	` '
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by				,		` '	, ,		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 (	aclaulatad	for oach	month (	(61)m -	(60) · 2(	SE v. (41)	١m						
Combi loss $(61)$ m= $0$	0 0	0	0	0	00) + 3	05 x (41)	0	0	0	0	0	]	(61)
	!						<u> </u>		<u> </u>	ļ.		J · (59)m + (61)m	, ,
(62)m= 205.7	<del>-</del>	191.07	171.88	168.87	151.52	146.11	159.51	158.97	178.2	187.68	200.99	]	(62)
Solar DHW inpo						<u> </u>				tion to wate		]	` '
(add addition													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter					Į.	_			l	1	
(64)m= 205.7		191.07	171.88	168.87	151.52	146.11	159.51	158.97	178.2	187.68	200.99	]	
							Ou	tput from w	ater heate	r (annual)	12	2102.07	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	ı ]	
(65)m= 68.64	4 60.56	63.76	57.37	56.38	50.6	48.81	53.27	53.08	59.48	62.63	67.06	]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 122.1	8 122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18	122.18		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 22.54	4 20.02	16.28	12.32	9.21	7.78	8.4	10.92	14.66	18.62	21.73	23.16		(67)
App <mark>liance</mark> s (	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			•	
(68)m= 217.3	4 219.59	213.91	201.81	186.54	172.18	162.59	160.34	166.02	178.12	193.39	207.75		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	), also s	ee Table	5			•	
(69)m= 35.22	2 35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22	35.22		(69)
Pumps and	fans gains	(Table 5	5a)					-				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (negat	tive valu	es) (Tab	le 5)			-	-	-	-	•	
(71)m= -97.7	4 -97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74	]	(71)
Water heating	ng gains (T	Table 5)					-				-		
(72)m= 92.26	90.13	85.7	79.69	75.78	70.28	65.61	71.6	73.72	79.95	86.98	90.13	]	(72)
Total intern	al gains =		-	-	(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	)m	•	
(73)m= 391.7	9 389.39	375.54	353.48	331.19	309.9	296.26	302.51	314.06	336.34	361.76	380.7	]	(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to d	onvert to th	ne applical	ole orientat	tion.		
Orientation:			Area		Flu			g_ Tabla 6b	_	FF		Gains	
	Table 6d		m²		Ta	ble 6a	. –	Table 6b	_ '	able 6c		(W)	,
North 0.9	× 0.77	X	3.6	66	X 1	10.63	X	0.85	x	0.7	=	16.05	(74)
North 0.9	× 0.77	X	3.6	66	x 2	20.32	X	0.85	X	0.7	=	30.67	(74)
North 0.9	× 0.77	X	3.6	66	x 3	34.53	x	0.85	x	0.7	=	52.11	(74)
North 0.9	× 0.77	X	3.6	66	X 5	55.46	x	0.85	x	0.7	=	83.7	(74)
North 0.9	× 0.77	X	3.6	66	x	74.72	x	0.85	x	0.7	=	112.76	(74)

			_												
North	0.9x	0.77	X	3.6	66	X	7	'9.99	X	0.85	X	0.7	=	120.71	(74)
North	0.9x	0.77	X	3.6	66	X	7	74.68	X	0.85	X	0.7	=	112.7	(74)
North	0.9x	0.77	X	3.6	66	x	5	9.25	X	0.85	X	0.7	=	89.41	(74)
North	0.9x	0.77	X	3.6	6	x	4	1.52	x	0.85	X	0.7	=	62.65	(74)
North	0.9x	0.77	x	3.6	6	x	2	24.19	x	0.85	X	0.7	=	36.51	(74)
North	0.9x	0.77	X	3.6	66	x	1	3.12	X	0.85	X	0.7	=	19.8	(74)
North	0.9x	0.77	х	3.6	66	x	3	8.86	x	0.85	X	0.7	=	13.38	(74)
South	0.9x	0.77	x	3.1	2	x	4	6.75	x	0.85	X	0.7	=	60.15	(78)
South	0.9x	0.77	х	3.1	2	x	7	6.57	x	0.85	X	0.7	=	98.5	(78)
South	0.9x	0.77	x	3.1	2	x	9	7.53	x	0.85	x	0.7	=	125.48	(78)
South	0.9x	0.77	x	3.1	2	x	1	10.23	x	0.85	x	0.7		141.81	(78)
South	0.9x	0.77	x	3.1	2	x	1	14.87	x	0.85	x	0.7		147.78	(78)
South	0.9x	0.77	x	3.1	2	x	1	10.55	х	0.85	X	0.7		142.22	(78)
South	0.9x	0.77	x	3.1	2	X	1	08.01	x	0.85	x	0.7		138.96	(78)
South	0.9x	0.77	x	3.1	2	x	1	04.89	x	0.85	x	0.7	=	134.95	(78)
South	0.9x	0.77	X	3.1	2	x	1	01.89	x	0.85	x	0.7		131.07	(78)
South	0.9x	0.77	x	3.1	2	x	8	32.59	x	0.85	x	0.7	=	106.25	(78)
South	0.9x	0.77	x	3.1	2	X	5	55.42	Х	0.85	X	0.7	=	71.29	(78)
South	0.9x	0.77	j x	3.1	2	х	,	40.4	Х	0.85	X	0.7		51.97	(78)
			1												
Solar ga	ains in w	atts, calcul	lated	for eacl	n montl	1			(83)m	= Sum(74)r	m(82)m	1			
T T			7.59	225.52	260.54	_	62.93	251.65	224	.36 193.7	3 142.7	5 91.09	65.35	]	(83)
Total ga	ains – int	ernal and	solar	(84)m =	(73)m	+ (8	33)m	, watts					•	-	
(84)m=	467.98	518.56 553	3.13	578.99	591.72	5	72.83	547.91	526	.87 507.7	9 479.0	9 452.85	446.05		(84)
7. Mea	ın interna	al tempera	ture (	heating	seaso	n)									
		uring heati					area	from Tab	ole 9,	Th1 (°C)				21	(85)
•		or for gains	•			_				, ,					
Γ	Jan	Feb N	/lar	Apr	May	Ť	Jun	Jul	Aı	ug Ser	o Oc	t Nov	Dec		
(86)m=	1	1	1	1	0.99	(	0.98	0.96	0.9	7 0.99	1	1	1		(86)
Mean i	internal t	emperatur	e in I	iving are	ea T1 (	follo	w ste	ns 3 to 7	7 in T	able 9c)	•	•	•	_	
(87)m=	T I		.02	19.43	19.88		20.33	20.62	20.		1 19.6	4 19.07	18.6	1	(87)
	roturo d	uring booti	na n	oriodo ir	root o	-L	منالم	from To	hlo (			<u> </u>	<u>I</u>	_	
(88)m=	T I	uring heati	.53	18.55	18.55	1	8.57	18.57	18.5	`_	<u> </u>	5 18.55	18.54	Ī	(88)
(00)	10.00	Į						<u> </u>		10.00	10.0	7 10.00	10.01	_	()
				est ot di	welling,	h2,	•	T	T	4 0 07	1 4	1 4	1 4	7	(90)
	tion facto				0.00			0.76	0.8	1 0.97	1	1	1		(89)
(89)m=	1	1	1	1	0.99		0.94	<u> </u>			-	•		-	
(89)m= Mean i	1 internal t	1 emperatur	e in t	1 he rest	of dwel	ling	T2 (f	ollow ste	Ė			· ·		<u>.</u> 1	
(89)m=	1	1 emperatur	1	1		ling		<u> </u>	eps 3		5 17.1		15.6	- ]	(90)
(89)m= Mean i	1 internal t	1 emperatur	e in t	1 he rest	of dwel	ling	T2 (f	ollow ste	Ė		5 17.1	3 16.29 ving area ÷		0.28	(90)
(89)m= Mean i	1 internal t	1 emperatur	1 e in t	1 he rest 16.81	of dwel 17.47	ling 1	T2 (fo	ollow ste	18.4	17.96	5 17.13 fLA = Li			0.28	`
(89)m= Mean i	1 internal t	1 emperatur 15.8 16	1 e in t	1 he rest 16.81	of dwel 17.47	ling 1	T2 (fo	ollow ste	18.4	44   17.96 – fLA) × T	6 17.13 fLA = Li	ving area ÷		0.28	`

	•				•	•			•				
(93)m= 16.44	16.61	16.98	17.54	18.14	18.73	19.07	19.03	18.58	17.82	17.06	16.43		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, 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 fac	l		· · ·										
(94)m= 1	1	1	0.99	0.98	0.95	0.84	0.87	0.97	0.99	1	1		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 467.47	517.68	551.49	575.36	582.04	542.87	461.32	459.76	492.54	476.19	452.02	445.65		(95)
Monthly avera		1	<del>.                                      </del>		r				1				4
(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 (97)m= 3343.15	i	an intern			Lm , W =	=[(39)m : 660.6				2705 52	2227.00		(97)
` '						<u> </u>	703.52	1205.2	l .	2705.53	3337.08		(97)
Space heatin (98)m= 2139.51				862.78	0	0.02	0	0 0	1099.68	r -	2151.23		
(66)111= [2166.61	1011.00	1727.00	1272.01	002.70					l	) = Sum(9	<u> </u>	12690.34	(98)
Space heatin	a roquir	omont in	k\\/\b/m2	2/voor			. 0.10	. poi youi	(	<i>)</i> •••••(•			(99)
·	• .										Ĺ	160.64	(99)
9b. Energy rec			The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	Ĭ									
This part is use Fraction of spa							<b>.</b>	•		unity scr	neme.	0	(301)
Fraction of spa												1	(302)
							-// for	CUID and	45 65	- 11 11 1			(302)
The community so includes boilers, h									up to rour	otner neat	sources; tr	ie iaπer	
Fraction of hea	at from C	Commun	ity boiler	s								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem		[	1	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				[	1.05	(306)
Space heating											L	kWh/yea	<del>r</del>
Annual space	_	requiren	nent									12690.34	_
Space heat fro	m Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	= [	13324.86	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/sur	plemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =	Ī	0	(309)
Water heating											L		_
Annual water h		equirem	ent								ſ	2102.07	7
If DHW from c	ommuni	ty schem	ne:								L		_
Water heat fro								(64) x (30	03a) x (30	5) x (306) :	=	2207.17	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	155.32	(313)
Cooling System	m Energ	y Efficie	ncy Ratio	0							[	0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											-		_
mechanical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put 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)				398.03	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		nissions   CO2/year	
CO2 from other sources of space and water heating (not CI Efficiency of heat source 1 (%)	HP) using two fuels repeat (363) to	(366) for the second	d fuel	90	(367a)
CO2 associated with heat source 1 [(30	07b)+(310b)] x 100 ÷ (367b) x	0	= [	3727.69	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [	80.61	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	= [	3808.3	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instan	taneous heater (312) x	0.22	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			3808.3	(376)
CO2 associated with electricity for pumps and fans within d	welling (331)) x	0.52	= [	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	206.58	(379)
Total CO2, kg/year sum of (376)(382) =				4014.88	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				50.82	(384)
El rating (section 14)				56.53	(385)

User Details:	
Assessor Name: Stroma Number: Software Name: Stroma FSAP 2012 Software Version: Version:	1.0.3.4
Property Address: Unit 11	
Address: , london  1. Overall dwelling dimensions:	
Š	Volume(m³)
Basement 51 (1a) x 1.9 (2a) =	96.9 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ [4]	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	96.9 (5)
2. Ventilation rate:	
	m³ per hour
Number of chimneys $0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	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	0 (7c)
Airahan	and hour
	nges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 1 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	0.21 (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 construction	0 (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	0 (12)
If no draught lobby, enter 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) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	10 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$	0.71 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	
Number of sides sheltered	1 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.65 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed 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	

0.83	0.82	0.8	0.72	0.7	0.62	0.62	0.6	0.65	0.7	0.74	0.77		
alculate effec		_	rate for t	he appli	cable ca	se	!	!	!	!	!	<b>-</b>	
If mechanical If exhaust air he			andiv N (2	3h) - (23a	a) × Emy (e	aguation (1	VSV) othe	nvica (23h	) = (23a)			0	(2
If balanced with									) = (23a)			0	(2
		-	-	_					Ola \	005) [	4 (00-	0	(2
a) If balance	a mecn	anicai ve	ntilation	with ne	at recove	ery (MV)	1R) (248	$\frac{a)m = (2a)}{a}$	2b)m + ( 0	23b) × [	$\frac{1 - (230)}{0}$	) ÷ 100] ]	(2
												_	(2
b) If balance	o mech	anicai ve	niliation 0	without	neat rec	overy (r	0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (22)$	20)m + (.   0	230)	0	1	(2
												_	(2
c) If whole h if (22b)n				•	•				5 × (23h	n)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
d) If natural	ventilatio	n or wh	ole hous	e nositiv	ve input	L ventilatio	n from I	L loft	<u> </u>	<u> </u>	<u> </u>	J	
if (22b)n					•				0.5]				
4d)m= 0.85	0.83	0.82	0.76	0.75	0.69	0.69	0.68	0.71	0.75	0.77	0.79		(2
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	x (25)	-	-	-	_	
5)m= 0.85	0.83	0.82	0.76	0.75	0.69	0.69	0.68	0.71	0.75	0.77	0.79		(2
3. Heat losse	s and he	at loss i	naramet	or.									
LEMENT	Gros		Openin		Net Ar	ea	U-val	IIE	AXU		k-valu	e	ΑΧk
	area		m		A ,r		W/m2		(W/I	K)	kJ/m².		kJ/K
oo <mark>rs</mark>					1.9	х	1.4	= [	2.66				(2
/in <mark>dows</mark> Type	1				1.67	x1	/[1/( 4.8 )+	0.04] =	6.72	П			(2
indows Type	2				0.84	x1.	/[1/( 4.8 )+	0.04] =	3.38	П			(2
/alls Type1	45.	3	2.51		42.79	) x	2.1		89.86	Ē [		$\neg$	(2
alls Type2	15.3	39	1.9	=	13.49	x	2.1	<b>=</b> i	28.33	Ħ i		7 F	(2
oof	31.5	9	0		31.9	x	0.28	<b>=</b>	8.93	F i		<b>=</b>	(3
otal area of e					92.59								^` (;
or windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2	(
include the area	as on both	sides of ir	nternal wal	ls and par	titions								
abric heat los	s, W/K	= S (A x	U)				(26)(30)	) + (32) =				139.	89 (3
eat capacity	Cm = S(	(A x k )						((28)	(30) + (32	2) + (32a).	(32e) =	0	(
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	) (3
or design assess an be used inste				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
hermal bridge				ısina Ar	nendiy l	<b>~</b>						14	· (3
details of therma	•	,			•	`						14	(
otal fabric he			()		,			(33) +	(36) =			153.	89 (3
entilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (	(25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 27.09	26.65	26.23	24.25	23.88	22.15	22.15	21.83	22.81	23.88	24.63	25.41		(3
	o officio	o+ \\//k			-	-	-	(39)m	= (37) + (37)	38)m	-	-	
eat transfer o	;oemciei	II, VV/T						(00)	(0.) . (				

eat lo	ss para	meter (F	HLP), W/	m²K		•	•		(40)m	= (39)m ÷	(4)			
-0)m=	3.55	3.54	3.53	3.49	3.49	3.45	3.45	3.45	3.46	3.49	3.5	3.52		_
umbe	or of day	re in mor	nth (Tabl	0 12)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	3.49	(4
umbe	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		(4
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssum	ied occu	pancy, N	N								1.	72		(4
if TF		9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.				·
		•	iter usac	e in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		75	.04		(4
educe	the annua	ıl average		usage by	5% if the a	lwelling is	designed t	to achieve		se target o				`
or more				- '				۸۰۰۵	Con	Oct	Nov	Doo		
ot wate	Jan er usage ir	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		
4)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		
											m(44) <sub>112</sub> =		900.48	(-
nergy (			used - cal					Tm / 3600	kWh/mor					
5)m=	122.41	107.06	110.48	96.32	92.42	<b>7</b> 9.75	73.9	84.8	85.81	100.01	109.17	118.55		<b>—</b> ,
instant	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) <sub>112</sub> =		1180.67	(
6)m=	18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(
	storage													
		,						within sa	ime ves	sel		160		(
	•	_	nd no ta hot wate		-			(47) mbi boil	ers) ente	er 'O' in <i>(</i>	<i>4</i> 7)			
	storage		not wate	7 (tillo 11)	1014405 1	notantai	10000 00	THOI DOIL	010) 0110	51 O III (	71)			
) If m	anufact	urer's de	eclared le	oss facto	or is kno	wn (kWh	n/day):					0		(
empe	erature fa	actor fro	m Table	2b								0		(
			storage	-		:_		(48) x (49)	=		1	10		(
			eclared of factor fr	-							0.	02		(
		_	ee sectio		`		,							
		from Tal		01								03		(
•			m Table								0	.6		(
٠,		m water 54) in (5	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		03		(
	` ,	, ,	culated f	or each	month			((56)m = (	55) <b>v</b> (41):	m	1.	03		(
	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
s)m= cylinde												m Appendi	хH	,
7)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
<i>*</i>								I		<u> </u>	<u> </u>	0		(
	•	•	nual) fro culated f			59)m = (	(58) ÷ 36	65 × (41)	m			•		(
	•				,	•	. ,	, ,		. (1				
	dified by	factor fr	om Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r tnermo	stat)			

Combi loss	calculated	Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0 0	0	0	0 1)111 =	00) + 3	05 x (41)	0	T 0	0	0	0	1	(61)		
												J (59)m + (61)m	(0.)		
(62)m= 177.6	<del>-i</del>	165.75	149.81	147.69	133.24	129.18	140.08		155.28	162.66	173.82	(39)111 + (01)111	(62)		
Solar DHW inp													(02)		
(add addition									CONTINU	non to wat	or ricating)				
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)		
Output from	water hea	ter	Į				<u> </u>					l			
(64)m= 177.6		165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82	]			
	Į	<u> </u>	<u> </u>			<u> </u>	Ou	tput from w	ter heate	r (annual)₁	l12	1831.51	(64)		
Heat gains f	rom water	heating.	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	-		
(65)m= 59.3		55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03	ĺ	(65)		
include (5	7)m in cal	culation	of (65)m	only if c	vlinder i	s in the	dwellin	or hot w	ater is f	rom com	munity h	ı neating			
5. Internal	•				-						,	<u> </u>			
Metabolic ga				,											
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]			
(66)m= 85.9	8 85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98		(66)		
Lighting gair	ns (calcula	ted in Ap	pendix	L, equ <mark>at</mark>	ion L9 o	r L9a), <mark>a</mark>	lso see	Table 5							
(67)m= 17.1	3 15.21	12.37	9.36	7	5.91	6.39	8.3	11.14	14.15	16.51	17.6		(67)		
Appliances	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5						
(68)m= 149.8	33 151.39	147.47	139.13	128.6	118.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)		
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5		•	•			
(69)m= 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)		
Pumps and	fans gains	(Table 5	 5a)								•				
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)		
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•	•	•		•		•			
(71)m= -68.7	8 -68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78		(71)		
Water heating	ng gains (1	Table 5)				•		•	•			•			
(72)m= 79.7	2 77.99	74.39	69.49	66.32	61.84	58.04	62.91	64.64	69.71	75.43	77.99		(72)		
Total intern	al gains =				(66	)m + (67)m	n + (68)m	ı + (69)m +	(70)m + (7	71)m + (72)	)m	•			
(73)m= 295.4	7 293.38	283.02	266.78	250.71	235.25	225.31	230.54	239.03	255.44	274.06	287.61		(73)		
6. Solar ga	ins:														
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applica		tion.				
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains			
_						DIE Ga	. –	Table 6b	_ '	able oc		(W)	,		
East 0.9		X	1.6	67	X .	19.64	x	0.85	X	0.7	=	13.52	(76)		
East 0.9		X	1.6	67	x ;	38.42	×	0.85	X	0.7	=	26.46	(76)		
East 0.9		X	1.6	67	×	63.27	×	0.85	x	0.7	=	43.57	(76)		
East 0.9		х	1.6	67	x 9	92.28	x	0.85	x	0.7	=	63.54	(76)		
East 0.9	<b>x</b> 1	х	1.6	I	x   1	13.09	X	0.85	X	0.7	=	77.88	(76)		

East							<b>-</b> 1		_				_
	0.9x	X	1.6	57	X	115.77	X	0.85	×	0.7	=	79.72	(76)
East	0.9x	X	1.6	67	X	110.22	X	0.85	X	0.7	=	75.9	(76)
East	0.9x	X	1.6	67	X	94.68	X	0.85	X	0.7	=	65.19	(76)
East	0.9x	X	1.6	67	X	73.59	X	0.85	X	0.7	=	50.67	(76)
East	0.9x	х	1.6	67	X	45.59	x	0.85	X	0.7	=	31.39	(76)
East	0.9x	X	1.6	67	X	24.49	X	0.85	X	0.7	=	16.86	(76)
East	0.9x	X	1.6	67	X	16.15	X	0.85	X	0.7	=	11.12	(76)
West	0.9x 0.7	77 ×	3.0	34	X	19.64	x	0.85	X	0.7	=	6.8	(80)
West	0.9x 0.7	77 ×	0.0	34	x	38.42	x	0.85	X	0.7	=	13.31	(80)
West	0.9x 0.7	77 ×	3.0	34	x	63.27	x	0.85	X	0.7	=	21.92	(80)
West	0.9x 0.7	77 ×	3.0	34	x	92.28	x	0.85	X	0.7	=	31.96	(80)
West	0.9x	7 ×	3.0	34	x	113.09	X	0.85	X	0.7	=	39.17	(80)
West	0.9x 0.7	77 ×	0.8	34	x	115.77	x	0.85	X	0.7	=	40.1	(80)
West	0.9x 0.7	7 ×	3.0	34	x	110.22	x	0.85	X	0.7	=	38.18	(80)
West	0.9x	7 ×	3.0	34	x	94.68	x	0.85	x	0.7	=	32.79	(80)
West	0.9x	77 ×	3.0	34	х	73.59	x	0.85	×	0.7	=	25.49	(80)
West	0.9x 0.7	77 ×	0.8	34	x	45.59	x	0.85	×	0.7	=	15.79	(80)
West	0.9x	7 ×	0.0	34	x	24.49	Х	0.85	Х	0.7	=	8.48	(80)
West	0.9x 0.7	7 ×	0.8	34	х	16.15	x	0.85	х	0.7		5.59	(80)
Solar ga	ains in watts,	calculated	d for eac	h month			(83)m	= Sum(74)m .	(82)m				
(83)m=	20.33 39.76	65.49	95.51	117.05	11	19.82 114.07	97.9	99 76.16	47.18	25.35	16.72		(83)
Total ga	ains – interna	and solar	r (84)m =	= (7 <mark>3)</mark> m	3) +	33)m , watts							
(84)m=	315.8 333.1	348.5	362.28	367.75	35	55.07 339.38	328		202 0	20004	00400		
7. Mea	an internal ter							.53 315.19	302.63	3 299.4	304.32		(84)
	an internal ter	nperature	(heating	seasor	1)			.53 315.19	302.6	3 299.4	304.32		(84)
	an internal ter erature durinç	•	`		<b>_</b>	area from Ta			302.6	3 299.4	304.32	21	(84)
Tempe		heating p	eriods ir	n the livi	ng a				302.6	3 299.4	304.32	21	
Tempe	erature during	heating p	eriods ir	n the livi	ng a		ble 9,		Oct		Dec	21	
Tempe	erature during	heating p	eriods ir	n the livi ea, h1,m	ng a	ee Table 9a)	ble 9,	Th1 (°C)				21	
Tempe Utilisat (86)m=	erature during tion factor for Jan Fet	heating pains for Mar	periods in living are Apr	n the livi ea, h1,m May	ng a	Jun Jul 0.99 0.97	ble 9,	Th1 (°C)  ug Sep  0.99	Oct	Nov	Dec	21	(85)
Tempe Utilisat (86)m=	erature during tion factor for Jan Feb 1 1	heating p gains for Mar 1 erature in	periods in living are Apr	n the livi ea, h1,m May	ng a	Jun Jul 0.99 0.97	ble 9,	Th1 (°C)  ug Sep  17 0.99  Table 9c)	Oct	Nov 1	Dec	21	(85)
Tempe Utilisat (86)m= Mean	tion factor for  Jan Fet  1 1  internal temp  18.59 18.71	pains for Mar 1 erature in 18.98	periods in living are Apr 1 living are	n the livi ea, h1,m May 1 ea T1 (fo	ng a	Dun Jul D.99 0.97 W steps 3 to 20.3 20.6	Au 0.9 7 in T 20.9	Th1 (°C)  ug Sep  17 0.99  Table 9c)  56 20.19	Oct	Nov 1	Dec 1	21	(85)
Tempe Utilisat (86)m= Mean	erature during tion factor for Jan Fet 1 1 internal temp	pains for Mar 1 erature in 18.98	periods in living are Apr 1 living are	n the livi ea, h1,m May 1 ea T1 (fo	ng and (see	Dun Jul D.99 0.97 W steps 3 to 20.3 20.6	Au 0.9 7 in T 20.9	Th1 (°C)  ug Sep  7 0.99  Table 9c)  56 20.19  9, Th2 (°C)	Oct	Nov 1	Dec 1	21	(85)
Tempe  Utilisat  (86)m=  Mean (87)m=  Tempe (88)m=	tion factor for  Jan Fet  1 1  internal temp  18.59 18.71  erature during  18.5 18.5	pains for Mar  1 erature in 18.98 heating pains for 18.51	living are Apr 1 living are 19.4 periods ir 18.52	n the livi ea, h1,m May 1 ea T1 (for 19.85 n rest of	ng a (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see	Dun Jul D.99 0.97  w steps 3 to 20.3 20.6  elling from Ta 8.54 18.54	Au 0.9 7 in T 20.9 able 9	Th1 (°C)  ug Sep  7 0.99  Table 9c)  56 20.19  9, Th2 (°C)	Oct 1 19.62	Nov 1	Dec 1 1 18.58	21	(85) (86) (87)
Tempe  Utilisat  (86)m=  Mean i  (87)m=  Tempe (88)m=  Utilisat	tion factor for  Jan Fet  1 1  internal temp  18.59 18.71  erature during  18.5 18.5  tion factor for	gains for Mar 1 erature in 18.98 heating p 18.51 gains for	living are Apr 1 living are 19.4 periods ir 18.52 rest of d	n the livies, h1,m May 1 ea T1 (for 19.85 n rest of 18.53 welling,	ng a (see see see see see see see see see se	ee Table 9a) Jun Jul 0.99 0.97 w steps 3 to 20.3 20.6 elling from Ta 8.54 18.54 m (see Table	ble 9,  O.9  7 in T  20.9  able 9  18.9	Th1 (°C)  ug Sep  17 0.99  Table 9c)  56 20.19  9, Th2 (°C)  54 18.54	Oct 1 19.62 18.53	Nov 1 19.05	Dec 1 18.58 18.51	21	(85) (86) (87) (88)
Tempe  Utilisat  (86)m=  Mean i  (87)m=  Tempe (88)m=  Utilisat (89)m=	tion factor for  Jan Fet  1 1  internal temp  18.59 18.71  erature during  18.5 18.5  tion factor for	gains for Mar  1 erature in 18.98 heating p 18.51 gains for	living are Apr 1 living are 19.4 periods ir 18.52 rest of d	n the livies, h1,m May 1 ea T1 (for 19.85 n rest of 18.53 welling, 0.99	ng (se ) (c) (dw ) 1. h2,	Dun Jul D.99 0.97  w steps 3 to D.03 20.6  elling from Ta 8.54 18.54  m (see Table D.95 0.78	ble 9,  Au  0.9  7 in T  20.9  able 9  18.9  9a)  0.8	Th1 (°C)  ug Sep  17 0.99  Table 9c)  56 20.19  9, Th2 (°C)  54 18.54	Oct 1 19.62 18.53	Nov 1	Dec 1 1 18.58	21	(85) (86) (87)
Tempe  Utilisat  (86)m=  Mean i (87)m=  Tempe (88)m=  Utilisat (89)m=  Mean i	tion factor for  Jan Fet  1 1  internal temp  18.59 18.71  erature during  18.5 18.5  tion factor for  1 1  internal temp	pains for Mar 1 erature in 18.98 heating pains for 18.51 gains for 1 erature in	living are Apr 1 living are 19.4 periods ir 18.52 rest of deriods ir the rest	n the livies, h1,m May 1 ea T1 (for 19.85 n rest of 18.53 welling, 0.99 of dwell	ng a (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see ) (see	Dun Jul D.99 0.97  w steps 3 to D.93 20.6  elling from Ta 8.54 18.54  m (see Table D.95 0.78  T2 (follow steps)	Au 0.9 7 in T 20.9 able 9 9a) 0.8 eps 3	Th1 (°C)  ug Sep  17 0.99  Table 9c)  56 20.19  9, Th2 (°C)  54 18.54  10 7 in Table	Oct 1 19.62 18.53 1 e 9c)	Nov 1 19.05 18.52	Dec 1 18.58 18.51	21	(85) (86) (87) (88) (89)
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Tempe  Utilisat  (86)m=  Mean i  (87)m=  Tempe (88)m=  Utilisat (89)m=  Mean i  (90)m=  Mean i  (90)m=	tion factor for  Jan Fet  1 1  internal temp  18.59 18.71  erature during  18.5 18.5  tion factor for  1 1  internal temp  15.56 15.73	pains for Mar 1 erature in 18.98 heating pains for 18.51 gains for 1 erature in 16.14 erature (for 17.74	living are living are 1 living are 19.4 leriods ir 18.52 rest of de 1 the rest 16.75 or the wh	n the livies, h1,m May 1 ea T1 (for 19.85) n rest of 18.53 welling, 0.99 of dwell 17.41 cole dwell 18.79	ng a (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowed) (se collowe	ee Table 9a) Jun Jul 0.99 0.97 w steps 3 to 20.3 20.6 elling from Ta 8.54 18.54 m (see Table 0.95 0.78 T2 (follow ste 8.07 18.44 g) = fLA × T1 9.33 19.66	ble 9,  O.9  7 in T  20.9  18.9  9a)  0.8  eps 3  18.  + (1  19.0	Th1 (°C)  ug Sep  7 0.99  Table 9c)  66 20.19  9, Th2 (°C)  54 18.54  17.91  f  fLA) x T2  62 19.2	Oct 1 19.62 18.53 1 e 9c) 17.07 LA = Liv	Nov 1 19.05 18.52 16.24 //ing area ÷ (	Dec 1 18.58 18.51 1 1 15.56		(85) (86) (87) (88) (89) (90)

	1	1	·	1	ı	ı			1	ı	<del></del>	l	(22)
(93)m= 17.27	17.41	17.74	18.24	18.79	19.33	19.66	19.62	19.2	18.51	17.83	17.27		(93)
8. Space hea						44 -4	Table O	41	.t T: /	70)	-ll-		
Set Ti to the the utilisation					ied at st	ер 11 от	rable 9	o, so tna	it 11,m=(	76)m an	a re-caic	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, hm	1:										
(94)m= 1	1	1	1	0.99	0.97	0.91	0.93	0.98	1	1	1		(94)
Useful gains	, hmGm	, W = (9	4)m x (8	4)m		•						1	
(95)m= 315.47		347.72	360.66	363.73	343.72	309.53	304.95	309.39	301.33	298.92	304.05		(95)
Monthly ave	<del></del>	1	<del>i                                      </del>	r	r								(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 rat (97)m= 2347.74	2259.23		<del></del>		832.96	538.38	x [(93)m 566.18	- (96)m 900.41	1406.09	1915.15	2342.71		(97)
Space heatir	ļ	l	l	L		<u> </u>	ļ		l .	<u> </u>	2042.71		(0.)
(98)m= 1512.01	<del></del>			666.8	0	0	0	0	821.95	<del> </del>	1516.76		
. ,		<u> </u>	<u> </u>		<u> </u>		Tota	l per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	9162.85	(98)
Space heatir	na requir	ement in	kWh/m²	2/vear							′ . [	179.66	(99)
·	• ,				achama							170.00	
9b. Energy re This part is us			· ·	Ĭ			ting prov	ided by	a comm	unity sch	nomo		
Fraction of sp										unity 301	ieilie.	0	(301)
Fraction of sp	ace heat	from co	mmunity	svstem	1 - (30	1) =					ļ	1	(302)
The community s					,		allows for	CHP and	un to four	other heat	sources: th	he latter	`
inclu <mark>des boi</mark> lers, i									up to rour	Junor mode		70 Iditor	
Fraction of he	at from C	Commun	ity boiler	s								1	(303a)
Fraction of tot	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem		İ	1	(305)
Distribution lo	ss factor	(Table 1	12c) for (	commun	ity heati	ng syste	m				[	1.05	(306)
Space heatin	a										I	kWh/yea	 r
Annual space	_	requiren	nent									9162.85	
Space heat from	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	<b>-</b>	9620.99	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308)
Space heating	g require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water beatin	<b>a</b>										·		
Water heating Annual water	_	equirem	ent								ĺ	1831.51	$\neg$
If DHW from o	•	•									ı		
Water heat fro	om Comr	nunity b	oilers					(64) x (30	03a) x (30	5) x (306) :	=	1923.08	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	115.44	(313)
Cooling Syste	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	g (if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity for											•		_
mechanical ve	entilation	- baland	ced, extra	act or po	sitive in	put 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) + (330b) + (330g) =			0	(331)
Energy for lighting (calculated in Appendix L)				302.44	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factoring kg CO2/kWh		nissions CO2/year	
CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)  If there is CHP us	ing two fuels repeat (363) to	(366) for the secon	d fuel	90	(367a)
CO2 associated with heat source 1 [(307b	)+(310b)] x 100 ÷ (367b) x	0	=	2770.58	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	59.91	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	2830.49	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantant	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			2830.49	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	156.96	(379)
Total CO2, kg/year sum of (376)(382) =				2987.46	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				58.58	(384)
El rating (section 14)				58.16	(385)