

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. 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 18 units of apartment accommodation. This includes 11 units which formed part of the approved application application reference 2016/0745/P (Camden and listed building consent 2016/1128/L), and 7 additional units in the reminder of the building at ground and first floor levels. For completeness, this report covers the energy assessment of all 18 units.

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 methodology used to determine the CO₂ 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 CO₂ emissions by 46.2% 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 CO_2 emissions by 46.2% when compared to the existing baseline building. This meets the London Plan CO_2 reduction target of 35% set out for all major developments.





Conclusion

The graph below provides a summary of the regulated CO_2 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_2 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 ₂ per annum)		
	Regulated	Total	
Existing building baseline	141.2	165.5	
After energy demand reduction	76.0	100.3	
After CHP	76.0	100.3	
After renewable technologies	76.0	100.3	





$\mathrm{CO}_{_2}$ Savings Breakdown from each stage of the energy hierarchy

	Regulated Carbon Dioxide Savings		
	Tonnes CO ₂ / year	% over baseline	
Savings from energy demand reduction	65.2	46.2%	
Savings from CHP	0.0	0.0%	
Savings from renewable energy	0.0	0.0%	
Cumulative savings	65.2	46.2%	





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. 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 18 units of apartment accommodation. This includes 11 units which formed part of the approved application application reference 2016/0745/P (Camden and listed building consent 2016/1128/L), and 7 additional units in the reminder of the building at ground and first floor levels. For completeness, this report covers the energy assessment of all 18 units.

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,
- 2. 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 CO₂ 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 Uvalue, 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).

	Baseline Building			Lean		
	Energy (kWh/year)	CO ₂ emissions (kgCO ₂ /year)	CO ₂ (kgCO ₂ / m ²)	Energy (kWh/year)	CO ₂ emissions (kgCO ₂ /year)	CO ₂ (kgCO ₂ / m ²)
Hot Water	41,020	13,820	10.0	37,290	9,140	7.0
Space Heating	361,740	122,300	90.0	260,080	63,770	46.0
Cooling	0	0	0	0	0	0
Auxiliary	0	0	0	0	0	0
Lighting	10,150	5,270	4.0	5,970	3,100	2.0
Equipment (not incl. in Part L)	46,850	24,320	18.0	46,850	24,320	18.0
Total Part L	412,910	141,390	102.0	303,340	76,010	55.0
Total (incl. Equip)	459,760	165,710	120.0	350,190	100,330	73.0

Breakdown of Energy Consumption and CO₂ Emissions

CO₂ 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_2 emission over the existing building.

CO₂ Emissions Breakdown at Lean stage

	Carbon Dioxide emissions (tonnes CO ₂ per annum)					
	Regulated Unregulated Total					
Baseline building	141.2	24.3	165.5			
After energy demand reduction (Lean)	76.0	24.3	100.3			

	Carbon dioxide savings (tonnes CO ₂ per annum)		Carbon dioxide savings (tonnes CO2 per annum)Carbon dioxide savin baseline (%)		e savings from ne (%)
	Regulated Total		Regulated	Total	
Savings from energy demand reduction	65.2	65.2	46.2%	39.4%	





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_2 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 $\rm CO_2$ emissions at the Clean Stage.

CO₂ Emissions Breakdown at Clean stage

	Carbon Dioxide emissions (tonnes CO ₂ per annum)				
	Regulated Unregulated To				
Baseline building	141.2	24.3	165.5		
After energy demand reduction (Lean)	76.0	24.3	100.3		
After CHP (Clean)	76.0 24.3 100.3				

	Carbon dioxide savings (tonnes CO, per annum)		Carbon dioxide savings fror baseline (%)		
	Regulated	Total	Regulated	Total	
Savings from energy demand reduction	65.2	65.2	46.2%	39.4%	
Savings from clean technologies	0.0	0.0	0.0%	0.0%	



An example of a CHP engine (courtesy of Baxi)



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 Thermal	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		



CO₂ 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 CO₂ savings for this development. The savings achieved through sustainable design measures alone are significant.

The figures below show a CO₂ reduction in regulated emissions exceeding the required 35% when compared to the building with its existing fabric and systems.

CO₂ Emissions Breakdown

	Carbon Dioxide emissions (tonnes CO ₂ per annum)				
	Regulated	Unregulated	Total		
Baseline building	141.2	24.3	165.5		
After energy demand reduction (Lean)	76.0	24.3	100.3		
After CHP (Clean)	76.0	24.3	100.3		
After renewable technologies (Green)	76.0	24.3	100.3		

CO₂ Savings Breakdown at all stages for the energy hierarchy

	Carbon dioxide savings (tonnes CO ₂ per annum)		Carbon dioxid baseli	le savings over ne (%)
	Regulated Total		Regulated	Total
Savings from energy demand reduction	65.2	65.2	46.2%	39.4%
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	65.2	65.2	46.2%	39.4%



Conclusion

In line with the London Plan's three step energy hierarchy, the regulated CO_2 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 CO₂ 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_2 emissions by 46.2% 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.

36 Lancaster Grove

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, groundsource 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_2 emissions by 46.2% when compared to the existing baseline building. This meets the London Plan CO_2 reduction target of 35% set out for all major developments.





CO₂ Emissions Breakdown at all stages for the energy hierarchy

	Carbon Dioxide emissions (tonnes CO ₂ per annum)								
	Regulated	Unregulated	Total						
Baseline building	141.2	24.3	165.5						
After energy demand reduction (Lean)	76.0	24.3	100.3						
After district heating system (Clean)	76.0	24.3	100.3						
After renewable technologies (Green)	76.0	24.3	100.3						

CO₂ Savings Breakdown at all stages for the energy hierarchy

	Carbon diox (tonnes CO ₂	kide savings per annum)	Carbon dioxid baseli	e savings over ne (%)
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	65.2	65.2	46.2%	39.4%
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	65.2	65.2	46.2%	39.4%





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_2 emissions of the existing building.



					User D	etails:						
Assessor Name: Software Name:	Str	oma FS/	AP 201	2 P	roperty	Stroma Softwa Address	a Num are Vei : Unit 1	ber: rsion:		Versio	on: 1.0.3.15	
Address :	, lo	ndon, NV	/3 4PB									
1. Overall dwelling d	imension	IS:										
_					Area	a(m²)	I	Av. Hei	ight(m)	-	Volume(m ³)	-
Basement						33	(1a) x	2	.25	(2a) =	74.25	(3a)
Ground floor						19	(1b) x	1	.65	(2b) =	31.35	(3b)
Total floor area TFA =	= (1a)+(1l	b)+(1c)+(1d)+(1e)+(1r	ı)	52	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	105.6	(5)
2. Ventilation rate:												-
		main	Se	econdar	у	other		total			m ³ per hour	
Number of chimneys	ſ		ייייייי ר ד ר] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	L L	0	」 ヿ + ┌	0	」 ヿ + ┌	0	」 に ヿ = Г	0	x2	20 =	0	_] _(6b)
Number of intermitten	L t fans	0		0		•			× ^	10 =	20	$\int_{(72)}^{(22)}$
Number of passive ve	nto							2		10 -	20	$\int (7a)$
Number of flueless re								0		10 -	0	
Number of fideless ga	is mes						L	0	^-	Air ch	o nanges per hou	וג (_{יכ)}
Infiltration due to chim	neys, flu	ies and fa	ans = (6a	a)+(6b)+(7	a) +(7b)+(7c) =		20	· ·	÷ (5) =	0.19	(8)
If a pressurisation test h	as been ca	rried out or	is intende	d, procee	d to (17), d	otherwise o	continue fr	om (9) to ((16)			
Additional infiltration	า า	ening (ns)						[(9)-	-11x0.1 =	0	(9)
Structural infiltration	n: 0.25 fo	r steel or	timber f	frame or	0.35 fo	r masonr	rv constr	uction	[(0)	11000 -	0	(10)
if both types of wall a	re present,	use the val	ue corres	ponding to	the great	er wall are	a (after], ,
deducting areas of op	enings); if	equal user (optor 0.2	0.35 (unsoal	od) or 0	1 (soald	d) else	ontor 0					
If no draught lobby	enter 0 (0.2 15 else e	onter 0		i (Seale	u), eise					0	$\int_{(12)}^{(12)}$
Percentage of wind	ows and	doors dra	auaht st	ripped							0	$\int_{(14)}^{(13)}$
Window infiltration						0.25 - [0.2	2 x (14) ÷ 1	00] =		·	0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability val	ue, q50,	expresse	d in cub	ic metre	s per ho	our per so	quare m	etre of e	nvelope	area	20	(17)
If based on air perme	ability va	lue, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = ((16)				1.19	(18)
Air permeability value a	oplies if a p	ressurisatio	n test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed		r	٦
Number of sides shell Shelter factor	ered					(20) = 1 -	[0.075 x (1	9)] =			1	(19)
Infiltration rate incorpo	orating sh	nelter fact	or			(21) = (18)) x (20) =	/1			1 1	$\int_{(21)}^{(20)}$
Infiltration rate modifie	ed for mo	onthly win	d speed								1.1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind	l speed fi	rom Table	97								ı	
(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 F	actor (2	2a)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			
Adjuste	ed infiltra	ation rat	e (allowi	ing for sł	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			
Calcula	ate effec	tive air	change	rate for t	he appli	cable ca	se								(220)
lf ovh	eust air he		using Ann	endiv N (2	3h) - (23a	a) v Emv (e	auation (N	(15)) other	rwise (23h) - (23a)					(23a)
If bala	anced with	beat rec		$\frac{1}{2}$		for in-use f	actor (from	n Table <i>1</i> b) –	<i>(</i> 200)				0	(230)
a) If		d moob			with ho	of rocov			$(2)^{-1}$	2b)m i ('	22h) v [/	1 (22a)	· 1001	0	(23C)
(24a)m =								0	$\frac{1}{1} = \frac{2}{1}$			$\frac{1-(230)}{0}$	- 100j		(24a)
(2 la)	halance	d mech	anical ve		without	heat rec		1)/) (24h	$\int_{-\infty}^{-\infty} (2^{\prime})$	$1 \frac{1}{2}$	23h)	Ů	J		(,
(24b)m=											230)	0	1		(24b)
(2-10)III-			tract vor					n from c		Ů	Ů	Ů	J		()
c) ii	if (22b)m	0.5×0.5	(23b). 1	then (24)	c) = (23b)	b): other	ventilatic vise (24	c) = (22b)	m + 0	.5 × (23b))				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	n or wh	lole hous	e positiv	ve input '	ventilatio	n from l	loft				J		
i	if (22b)m	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)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			(24d <mark>)</mark>
Effe	ctive air	change	rate - er	nter (24a) or (24	o) or (24	c) or (24	d) in boy	x (25)						
(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)
2 1 10	at losses	and he		naramet	ar.										
3. He	ai 10330.	s anu ne	zai 1033 i	varancu											
S. FIE		Gros	SS 1055	Openin	gs	Net Ar	ea	U-valu	ue	AXU		k-value)	A X k	(
ELEN		Gros area	ss (m²)	Openin m	gs J ²	Net Ar A ,r	ea n²	U-valu W/m2	ue 2K	A X U (W/ł	<)	k-value kJ/m²·l	e K	A X k kJ/K	(
Doors	IENT Type 1	Gros area	ss (m²)	Openin r	gs ₁ 2	Net Ar A ,r 7.3	ea m² x	U-valu W/m2	ue 2K =	A X U (W/ł 10.22	<)	k-value kJ/m²·l	e K	A X k kJ/K	(26)
Doors	IENT Type 1 Type 2	Gros area	ss (m²)	Openin r	gs _{J2}	Net Ar A ,r 7.3	ea m ² x	U-valu W/m2 1.4	ue 2K = =	A X U (W/I 10.22 6.02	<)	k-value kJ/m²·I	e K	A X k kJ/K	(26) (26)
3. He ELEN Doors Doors Windov	AENT Type 1 Type 2 ws Type	Gros area	ss (m ²)	Openin m	gs ₂	Net Ar A ,r 7.3 4.3 1.6	ea n ² x x x x ¹	U-valu W/m2 1.4 1.4 /[1/(2.1)+	2K 2K = = 0.04] =	A X U (W/I 10.22 6.02 3.1	<)	k-value kJ/m²·I	e K	A X k kJ/K	(26) (26) (27)
S. He ELEN Doors Doors Windov Windov	IENT Type 1 Type 2 ws Type ws Type	Gros area	ss (m ²)	Openin r	gs ₁₂	Net Ar A ,r 7.3 4.3 1.6 1.97	ea n ² x x x x ¹ x ¹	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+	ue 2K = = 0.04] = 0.04] =	A X U (W/I 10.22 6.02 3.1 3.82	<)	k-value kJ/m²·I	e K	A X k kJ/K	(26) (26) (27) (27)
S. He ELEN Doors Doors Window Window Floor	Type 1 Type 2 ws Type ws Type	Gros area	(m ²)	Openin m	gs ₁ 2	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3	ea n ² x x x x ¹ x ¹ x ¹	U-valu W/m2 1.4 (1/(2.1)+ /[1/(2.1)+ (1/(2.1)+	ue 2K = = • 0.04] = • 0.04] = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546		k-value kJ/m²·I	×	A X k kJ/K	(26) (26) (27) (27) (28)
S. He ELEN Doors Doors Windov Floor Walls	IENT Type 1 Type 2 ws Type ws Type Type1	Grosarea	4	Openin m 15.1	gs ₁ 2 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23	ea n ² x x x x ¹ x ¹ x ¹ x ²	U-valu W/m2 1.4 (1/(2.1)+ /[1/(2.1)+ 0.22 0.28	ue 2K = = 0.04] = 0.04] = = =	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98	<)	k-value kJ/m²+l		A X k kJ/K	(26) (26) (27) (27) (28) (29)
Doors Doors Windov Windov Floor Walls	Type 1 Type 2 ws Type ws Type Type1 Type2	Gros area 1 2 29. 44.	4 1	Openin m 15.1	gs ₁ 2 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1	ea n ² x x x x ¹ x ¹ x ¹ x ² x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28	ue 2K = = 0.04] = 0.04] = = = = = =	A X U (W/) 10.22 6.02 3.1 3.82 7.546 3.98 12.35		k-value kJ/m²+l		A X k kJ/K	 (26) (27) (27) (28) (29) (29)
S. He ELEN Doors Doors Windov Floor Walls ⁻ Roof	AENT Type 1 Type 2 ws Type ws Type Type1 Type2	Gros area 1 2 29. 44.	4 1	Openin m 15.1' 0 0 0	gs ,2 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19	ea n ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.16	ue 2K = = = 0.04] = = = = = = = = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		k-value kJ/m²·l		A X k kJ/K	 (26) (27) (27) (27) (28) (29) (29) (30)
S. He ELEN Doors Doors Windov Floor Walls ⁻ Roof Total a	IENT Type 1 Type 2 ws Type ws Type Type1 Type2 area of e	Gros area 1 2 29. 44. 19. 19. 19.	4 1 , m ²	Openin m 15.1 0 0 0	gs ₁ 2 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8	ea n ² x x x x ¹ x ¹ x ¹ x ² x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.16	ue 2K = = = 0.04] = = 0.04] = = = = = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		k-value kJ/m²+l		A X k kJ/K	 (26) (27) (27) (28) (29) (29) (30) (31)
S. He ELEN Doors Doors Windov Windov Floor Walls ⁻ Roof Total a Party v	A E NT Type 1 Type 2 ws Type ws Type Type1 Type2 area of el wall	Grosarea	4 1 , m ²	Openin 15.1 0 0	7	Net Ar A,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9	ea n ² x x x x ¹ x ¹ x ¹ x ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 (1/(2.1)+ /[1/(2.1)+ (1/(2.1)+ 0.22 0.28 0.28 0.28 0.16	ue 2K = = 0.04] = = 0.04] = = = = = = = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		k-value kJ/m²-I		A X k kJ/K	 (26) (26) (27) (27) (28) (29) (29) (30) (31) (32)
S. ree ELEN Doors Doors Windou Floor Walls ⁻ Roof Total a Party v * for win	ALENT Type 1 Type 2 ws Type ws Type Type1 Type2 area of e wall dows and le the area	Gros area 1 2 29. 44. 19 lements roof wind	4 1 , m ² ows, use 6 sides of it	Openin m 15.1 0 0 effective wi	gs ⁷ ndow U-va ¹ / ₂	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul titions	ea n ² x x x ¹ x ¹ x ¹ x ² x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ (1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.16	ue	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] a	K)	k-value kJ/m²+l		A X k kJ/K	 (26) (27) (27) (28) (29) (29) (30) (31) (32)
S. ree ELEN Doors Doors Windov Floor Walls ⁻ Roof Total a Party v * for win ** includ Fabric	Area of e wall dows and heat los	Gros area 1 2 2 9. 44. 19 19 19 19 19 19 19 19 19 19 19 19 19	4 1 , m ² ows, use e sides of ir = S (A x	Openin m 15.1 0 0 effective wi nternal wal	gs j ² 7 ndow U-va Is and par	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 14.9 alue calculations	ea n ² x x x ¹ x ¹ x ¹ x ² x ³ x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 [1/(2.1)+ /[1/(2.1)+ [0.22 0.28 0.28 0.28 0.28 0.16 0.16 (26)(30)	$\begin{array}{c} ue \\ 2K \\ = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ = \\ = \\ 0.04] = \\ = \\ 0.04]$	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 12.35 3.04	<)	k-value kJ/m²-I		A X k kJ/K	 (26) (27) (27) (28) (29) (30) (31) (32)
S. ree ELEN Doors Doors Windov Windov Floor Walls ⁻ Roof Total a Party v * for win ** includ Fabric Heat c	Area of e wall dows and heat los apacity (Gros area Grosarea122 $29.44.19lementsroof windas on boths, W/KCm = St$	4 1 , m ² ows, use e sides of ir = S (A x (A x k)	Openin m 15.1 0 0 effective winternal wall U)	gs j2 7 ndow U-va Is and par	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculations	ea n ² x x x ¹ x ¹ x ¹ x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.28 0.16	$\begin{array}{c} ue \\ 2K \\ = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ = \\ = \\ = \\ 0 \\ = \\ 0 \\ 0.04] = \\ = \\ 0 \\ 0.04] = \\ = \\ 0 \\ 0.04] = \\ = \\ 0 \\ 0.04] = \\ = \\ 0 \\ 0.04] = \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] a	() () </td <td>k-value kJ/m²-I</td> <td></td> <td>A X k kJ/K</td> <td> (26) (27) (27) (28) (29) (29) (30) (31) (32) (33) (34) </td>	k-value kJ/m²-I		A X k kJ/K	 (26) (27) (27) (28) (29) (29) (30) (31) (32) (33) (34)
S. He B. S. He ELEN Doors Uindou Windou Floor Walls ⁻ Roof Total a Party v * for win ** includ Fabric Heat c Therm	ALENT Type 1 Type 2 ws Type ws Type ws Type Type1 Type2 area of e wall dows and le the area heat los apacity (al mass	Gros area Grosarea129. $44.19lementsroof windas on boths, W/KCm = Scparame$	$\frac{4}{1}$ $\frac{4}{1}$ $\frac{1}{2}$ $\frac{4}{2}$ $\frac{1}{2}$ $\frac{1}$	Openin r 15.1° 0 15.1° 0 0 0 0 0 0 0 0	gs ⁷ ⁷ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ² ² ² ³ ⁴ ⁴ ⁴ ⁵ ⁶ ⁶ ⁷ ⁷ ⁷ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculations	ea n ² x x x ¹ x ¹ x ¹ x ² x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ (1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.28 0.16	$\begin{bmatrix} ue\\2K \\ - & = \\ - & 0.04] = \\ - & 0.04] = \\ - & = $	A X U (WV/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 12.35 3.04 0 12.35 3.04	<pre>K)</pre>	k-value kJ/m²-l			 (26) (27) (27) (28) (29) (29) (30) (31) (32) (33) (34) (35)
S. He S.	ALENT Type 1 Type 2 ws Type ws Type ws Type Type1 Type2 area of e wall dows and le the area heat los apacity (al mass ign assess used instea	Gros area Grosarea129.44.19191919191919191919191919	$\frac{4}{1}$ $\frac{4}{2}$ $\frac{4}{3}$ $\frac{1}{3}$ $\frac{1}$	Openin m $ \begin{array}{c} 15.1\\ \hline 0\\ \hline $	gs 2 7 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul titions	ea n ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ (1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.28 0.16 0.16	$\frac{ue}{2K} = \frac{1}{2}$ $= \frac{1}$	A X U (WV/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 12.35 3.04 0 12.35 3.04	<pre>K)</pre>	k-value kJ/m²-I		A X k kJ/K	 (26) (27) (27) (28) (29) (29) (30) (31) (32) (33) (34) (35)

if details	s of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			70.07	(37)
Ventila	ation hea	at loss ca	alculated	monthly	Y	r	1		(38)m	= 0.33 × (25)m x (5)	1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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 t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	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		
				/			-		(40)	Average =	Sum(39)1	12 /12=	112.01	(39)
(40)m-	2 20		1LP), VV/	2.16	2.14	2.05	2.05	2.03	(40)m	= (39)m -	2 18	2 21	1	
(40)11-	2.23	2.21	2.20	2.10	2.14	2.00	2.00	2.05	2.00		Sum(40).	2.21 /12-	2 15	(40)
Numb	er of day	s in mo	nth (Tab	le 1a)					,	-verage -	Sum(40)1	12 / 12-	2.15	
	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	ater heat	ing ene	rgy requ	irement:								kWh/y	ear:	
Δεειιο		inancy	N									75	1	(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.0)013 x (TFA -13.	9)	15	J	(42)
if TF	A £ 13.9	9, N = 1											,	
Annua	I averag	e hot wa	ater usag	ge in litre usage by :	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36 a water us	se target o	75	.74		(43)
not mor	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	ld)		a water at	io larger e				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach m <mark>onth</mark>	Vd,m = fa	ctor from	Table 1c x	(43)					1	
(44)m=	<mark>8</mark> 3.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		
			r							Total = Su	m(44) ₁₁₂ =	=	908.89	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
lf inctor	tanoous w	ratar haati	na ot point	fuso (no	hot wata	r storago)	ontor 0 in	hoves (16) to (61)	Total = Su	m(45) ₁₁₂ =	=	1191.69	(45)
ii iiistai						siorage),							1	(40)
(46)m= Water	18.53 storage	16.21 loss:	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(46)
Storag	je volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If com	, munity h	eating a	ind no ta	ink in dw	velling, e	nter 110) litres in	(47)					1	
Other	vise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:											_	
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b								0		(49)
Energ	y lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10]	(50)
b) If n Hot w	nanufact	urer's de	eclared (cylinder l com Tabl	oss fact	or is not h/litre/da	known:					02	1	(51)
If com	munity h	eating s	ee secti	on 4.3	0 2 (100	1,1110,00	xy)				0.	.02		(31)
Volum	e factor	from Ta	ble 2a	-							1.	.03]	(52)
Temp	erature f	actor fro	m Table	2b							0	.6]	(53)
Energ	y 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 cal	culated	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 cylind	er 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 Append	lix 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)
Prima	y circuit	loss (ar	nual) fro	om Table	93	-				-		0		(58)
Prima	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le 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 ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	n
(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 D	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (<u>3)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter							-	-			
(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 w	ater heate	r (annual)₁	12	1842.53	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	n + (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	<mark>5</mark> 9.69	52.7 <mark>4</mark>	55.69	50.33	49.63	44.77	43.41	47.07	46.81	52.17	54.65	58.4		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	ts				•		_				
	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)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	28.32	25.16	20.46	15.49	11.58	9.77	10.56	13.73	18.43	23.4	27.31	29.11		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	152.43	154.01	150.02	141.54	130.83	120.76	114.03	112.45	116.44	124.92	135.63	145.7		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)), also se	e Table	5	_	-		
(69)m=	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75		(69)
Pumps	s and fa	ns gains	(Table \$	5a)									_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	vaporatic	on (nega	tive valu	es) (Tab	ole 5)							-	
(71)m=				1		00.00	60.06	-60.06	-60.06	-69.96	-69.96	-69.96		(71)
· · ·	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-09.90	-03.30	-03.30	00.00		00.00		(, , ,
Water	-69.96 heating	-69.96 gains (T	-69.96 able 5)	-69.96	-69.96	-69.96	-09.90	-03.30	-03.30	00.00		00.00	l	(, , ,
Water (72)m=	-69.96 heating 80.23	-69.96 gains (T 78.48	-69.96 able 5) 74.85	-69.96 69.91	-69.96 66.7	62.19	58.35	63.27	65.01	70.12	75.9	78.49]	(72)
Water (72)m= Total	-69.96 heating 80.23	-69.96 gains (T 78.48 gains =	-69.96 able 5) 74.85	-69.96 69.91	-69.96 66.7	-69.96 62.19 (66)	58.35)m + (67)m	63.27 n + (68)m -	65.01 + (69)m +	70.12 (70)m + (7	75.9 1)m + (72)	78.49]	(72)
Water (72)m= Total i (73)m=	-69.96 heating 80.23 internal 310.22	-69.96 gains (T 78.48 gains = 306.88	-69.96 Table 5) 74.85 294.56	-69.96 69.91 276.17	-69.96 66.7 258.34	62.19 (66) 241.95	58.35)m + (67)m 232.18	63.27 n + (68)m - 238.68	65.01 + (69)m + 249.11	70.12 (70)m + (7 267.68	75.9 1)m + (72) 288.07	78.49 m 302.54]	(72)

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

Orienta	ation:	Access F Table 6d	actor	•	Area m²	nrea Flu m² Ta			x ble 6a		Т	g_ able 6b		FF Table 60	5		Gains (W)	
North	0.9x	0.77		x	1.9	7	x	1	0.63	×		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		1 =	14.76	(74)
North	0.9x	0.77		x	1.9	7	x	3	4.53	×		0.76	×	0.7		1 =	25.08	(74)
North	0.9x	0.77		x	1.9	7	x	5	5.46	İ x		0.76	×	0.7		j =	40.28	(74)
North	0.9x	0.77		x	1.9	7	x	7	4.72	×		0.76	x	0.7		1 =	54.27	(74)
North	0.9x	0.77		x	1.9	7	x	7	9.99	×		0.76	×	0.7] =	58.09	(74)
North	0.9x	0.77		x	1.9	7	x	7	4.68	×		0.76	x	0.7] =	54.24	(74)
North	0.9x	0.77		x	1.9	7	x	5	9.25	×		0.76	x	0.7] =	43.03	(74)
North	0.9x	0.77		x	1.9	7	x	4	1.52	×		0.76	×	0.7] =	30.15	(74)
North	0.9x	0.77		x	1.9	7	x	2	4.19	×		0.76	×	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	×		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	x		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	3	х	1'	14.87	x		0.76	x	0.7			67.76	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	3	х	1	10.55	İ 🗴		0.76	x	0.7] =	<mark>6</mark> 5.21	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	х	10	08.01	x		0.76	x	0.7] =	63.71	(78)
South	0.9x	0.77		x	1.0	6	x	10	04.89	x		0.76	×	0.7] =	61.88	(78)
South	0.9x	0.77		x	1.0	3	x	10	01.89	×		0.76	x	0.7] =	60.1	(78)
South	0.9x	0.77		x	1.0	6	х	8	2.59	×		0.76	×	0.7] =	48.72	(78)
South	0.9x	0.77		x	1.0	6	x	5	5.42	×		0.76	×	0.7] =	32.69	(78)
South	0.9x	0.77		x	1.0	3	x	4	40.4	×		0.76	x	0.7] =	23.83	(78)
Solar g	ains ir	n watts, ca		ted	for eac	n mont	h . I	100.0	117.05	(83)n	n = S	um(74)m .	(82)m	40.00	20	207	l	(83)
Total o	oo.o ains –	internal a	02.0	olar	(84)m -	(73)m	$\frac{2}{1}$	123.3 (83)m	watts	102	4.91	90.25	00.20	42.22	30).27		(00)
(84)m=	345.52	366.81	377.	18	381.48	380.37	7 3	365.26	350.13	343	3.59	339.37	333.9	6 330.29	9 33	32.8		(84)
					(1										-			(-)
7. Me	an inte	ernal temp	oeratu	ire (a p	neating	seaso the liv	n) vina	aroa f	rom Tok		Th	1 (%C)					04	
Litilion		e during n	neaun aine f	y p or li			/iliy m (c			Je s	, 111	I (C)					21	(03)
Ullise	lan	Feb		ar I		May	/			Δ	ua	Sen	00		/ r	Dec		
(86)m=	1	1	1		1	1		0.98	0.93	0.	94	0.99	1	1		1		(86)
N/1						- T 4 /			0 4	7 :		. 0)						
Wean	Intern	al temper		in I 7	IVING are	ea 11 (20 67	20.86	/ IN	1 abl	e 9C)	20.1	3 10 77	10	12		(87)
(07)11-	19.59	19.49	13.	'	20.05	20.55	<u> </u>	20.07	20.00		.04	20.09	20.10	19.77		J.42		(01)
Temp	eratur	e during h		g p	eriods ir	rest o	t dv		trom Ta	able	9, TI	h2 (°C)	40.0	40.04	1.1		l	(00)
(88)m=	19.86	19.87	19.8	07	19.92	19.93		19.98	19.98	19	.99	19.96	19.9	19.91	19	9.89		(00)
Utilisa	ation fa	ctor for g	ains f	or r	est of d	welling	, h2	2,m (se	e Table	9a)							I	(0-1)
(89)m=	1	1	1		1	0.99		0.96	0.85	0.	87	0.98	1	1		1		(89)

Mean	internal	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 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)
									f	LA = Livin	g area ÷ (4	4) =	0.66	(91)
Mean	internal	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × 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	adjustr	nent to tl	ne mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(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. Spa	ace hea	ting requ	uirement											
Set T	i to the r ilisation	nean int	ernal ter	nperatur	re obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Αυα	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1. 1.	may	ouri	001	, tug	000	000	1101	200		
(94)m=	1	1	1	1	0.99	0.97	0.9	0.92	0.98	1	1	1		(94)
Usefu	I gains,	hmGm	W = (94	4)m x (84	4)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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m·	– (96)m]				
(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	e heating	g require	ement fo	r each m		/Vh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m	1007 10		
(90)11=	1046.03	003.00	039.34	596.99	400.19	0	0	Toto		010.02	107.92	1027.10	6002.05	(08)
								TOta	i per year	(күүп/уса) = 3um(9	0)15,912 =	0092.03	
Space	e heating	g require	ement in	kvvh/m ²	/year								117.15	(99)
9b. En	ergy req	uiremer	nts – Co	nmu <mark>nity</mark>	heating	scheme								
This pa Fractio	art is use on of spa	ed for sp ace heat	ace hea from se	iting, spa condarw	ace cooli /supplen	ng or wa pentary l	ater heat heating (ting prov Table 1	/ided by 1) '0' if n	a comm one	unity scł	neme.	0	(301)
Fractio			fina	contact y/					1) 0 111	one		l	0	
Fractio	n of spa	ice neat	from co	mmunity	system	1 – (30	1) =					l	1	(302)
The con	nmunity sc boilers, h	heme mag eat pumps	y obtain he s. aeotherr	eat from se mal and wa	everal sour Aste heat f	rces. The p rom powe	procedure r stations	allows for See Apper	CHP and ı ndix C.	up to four	other heat	sources; th	ne latter	
Fractio	n of hea	at from C	Commun	ity boiler	S	em perio	otationio	0001.000					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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unitv hea	atina svs	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	itv heatii	na svste	m	5-7-			[1.1	(306)
Space	heating	3	(-,		,	5 -)					l	kWh/ve	ar
Annua	l space l	heating	requiren	nent								[6092.05	
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	7036.32	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	e 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) =		0	(309)
Water	heating	I										•		
Annua	l water h	neating r	equirem	ent								[1842.53	
If DHW	/ from co	ommunit	ty schem	ne:								•		

Water heat from Community boilers	(64) x (303a) x (3	805) x (306) =	2128.12	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e)	+ (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) ÷ (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) + (330b)	+ (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	
	-	-	-	
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 (3	66) for the second fue	el 65	(367a)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)If there is CHP usingCO2 associated with heat source 1[(307b)+(g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x	66) for the second fue	el 65 = 3045.42	(367a) (367)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution	g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x	66) for the second fue 0 = 0.52 =	65 = 3045.42 = 47.56	(367a) (367) (372)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution [Total CO2 associated with community systems (y two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372)	66) for the second fue 0 0.52	 65 3045.42 47.56 3092.98 	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution [Total CO2 associated with space heating (secondary) (y two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x	 66) for the second fue 0 0.52 = 0 = 	el 65 = 3045.42 = 47.56 = 3092.98 = 0	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)CO2 associated with heat source 1Electrical energy for heat distributionTotal CO2 associated with community systemsCO2 associated with space heating (secondary)CO2 associated with water from immersion heater or instantane	y two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x (309) x (312) x	0 = 0.52 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0.22 =	 65 3045.42 47.56 3092.98 0 0 	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)CO2 associated with heat source 1Electrical energy for heat distributionTotal CO2 associated with community systemsCO2 associated with space heating (secondary)CO2 associated with water from immersion heater or instantaneTotal CO2 associated with space and water heating	y two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x (309) x (373) + (374) + (375) =	0 = 0.52 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0.22 =	 65 3045.42 47.56 3092.98 0 0 3092.98 	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)CO2 associated with heat source 1Electrical energy for heat distributionTotal CO2 associated with community systemsCO2 associated with space heating (secondary)CO2 associated with water from immersion heater or instantaneTotal CO2 associated with space and water heatingCO2 associated with electricity for pumps and fans within dwelling	y two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x (309) x (373) + (374) + (375) = ng (331)) x	0 = 0.52 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0.52 = 0 = 0.52 =	 65 3045.42 47.56 3092.98 0 3092.98 0 3092.98 0 	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)If there is CHP usingCO2 associated with heat source 1Electrical energy for heat distributionTotal CO2 associated with community systemsCO2 associated with space heating (secondary)CO2 associated with water from immersion heater or instantaneTotal CO2 associated with space and water heatingCO2 associated with electricity for pumps and fans within dwellingCO2 associated with electricity for lighting	a two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x (309) x (373) + (374) + (375) = (373) + (374) + (375) = (332))) x	0 = 0.52 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0.52 = 0.52 = 0.52 = 0.52 =	 65 3045.42 47.56 3092.98 0 3092.98 0 3092.98 0 259.61 	(367a) (367) (372) (373) (374) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)If there is CHP usingCO2 associated with heat source 1Electrical energy for heat distributionTotal CO2 associated with community systemsCO2 associated with space heating (secondary)CO2 associated with water from immersion heater or instantaneTotal CO2 associated with space and water heatingCO2 associated with electricity for pumps and fans within dwellingCO2 associated with electricity for lightingCO2 associated with electricity for lightingCO2 associated with electricity for lighting	$\begin{array}{c} \text{(310b)]} \times 100 \div (367b) \times \\ (310b)] \times 100 \div (367b) \times \\ (313) \times \\ (363) \dots (366) + (368) \dots (372) \\ (309) \times \\ \text{ous heater} (312) \times \\ (373) + (374) + (375) = \\ \text{ng} (331)) \times \\ (332))) \times \end{array}$	0 = 0.52 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0.52 = 0.52 = 0.52 =	 65 3045.42 47.56 3092.98 0 3092.98 0 3092.98 0 259.61 3352.59 	(367a) (367) (372) (373) (374) (374) (375) (376) (378) (379) (383)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution [(307b)+(Total CO2 associated with community systems (CO2 associated with space heating (secondary) (CO2 associated with water from immersion heater or instantane (Total CO2 associated with space and water heating (CO2 associated with electricity for pumps and fans within dwelling (CO2 associated with electricity for lighting (Electricity for lighting (CO3 associated with electricity for lighting (CO4 associated with electricity for lighting ($\begin{array}{c} \text{(310b)]} \times 100 \div (367b) \times \\ (310b)] \times 100 \div (367b) \times \\ (313) \times \\ (363) \dots (366) + (368) \dots (372) \\ (309) \times \\ \text{ous heater} (312) \times \\ (373) + (374) + (375) = \\ \text{ng} (331)) \times \\ (332))) \times \end{array}$	0 = 0.52 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0.52 = 0.52 =	 65 3045.42 47.56 3092.98 0 3092.98 0 3092.98 0 259.61 3352.59 64.47 	(367a) (367) (372) (373) (374) (375) (376) (378) (378) (383) (384)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
A daha a a	London	Pr	operty <i>i</i>	Address:	Unit 2					
Address :	, London									
Basement	310113.		Area	a(m²) 55	(1a) x	Av. He	ight(m) .17	(2a) =	Volume(m³ 119.35) (3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1n)	55	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	119.35	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} 0 \\ \hline 0 \\ \end{array} $	econdary heating 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)
Number of intermittent fan	S				Γ	2	x ′	10 =	20	(7a)
Number of passive vents					Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	s, flues and fans = (en carried out or is intend e dwelling (ns) 25 for steel or timber sent, use the value corre is); if equal user 0.35	6a)+(6b)+(7 led, proceed frame or sponding to	a)+(7b)+(7 I to (17), c 0.35 for the greate	7c) = otherwise c masonr er wall area	ontinue fro y constr a (after	20 om (9) to (uction	(16) [(9)	÷ (5) = -1]x0.1 =	0.17 0 0 0 0	(8) (9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	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, q	50, expressed in cu	bic metres	s per ho	our per so $(18) = ($	quare m	etre of e	envelope	area	20	(17)
Air permeability value applies	y value, then $(10) = [($	17) - 20]+(0 as been don	e or a dec	se (10) = (meability	is heina u	sod		1.17	(18)
Number of sides sheltered					meability	s being u	300		2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0.99	(21)
Infiltration rate modified for	r monthly wind spee	d								_
Jan Feb M	<i>I</i> lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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								I	
(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		

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	elter an	d wind s	peed) =	(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		
Calcula	ate effe	ctive air	change	rate for t	he appli	cable ca	se							(220)
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a	i) x Fmv (e	equation (N	N5)), othe	rwise (23b	(23a) = (23a)			0	(23a)
lf bala	anced wit	h heat reco	overv: effi	ciency in %	allowing f	or in-use f	actor (from	n Table 4h) =	(200)			0	(230)
a) If	halance	d mech	anical v	entilation	with he	at recove	⊃rv (M\/I	-IR) (24:	′ a)m – (2'	2h)m + ((23h) ¥ [1 – (23c)	0 .∸ 100]	(200)
(24a)m=					0	0]	(24a)
b) If	balance	d mech	anical v	entilation	without	heat rec	coverv (N	///) (24h	1 = (2)	1 2h)m + ((23b)		I	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	unter unter unter unter unter un terretaria de la constana de la c	i ouse ex	ract ve	ntilation o	or positiv	re input v	ı ventilatio	n from o	utside			1	I	
i i	if (22b)r	n < 0.5 >	(23b),	then (24d	c) = (23b); other	wise (24	c) = (22	o) m + 0	.5 × (23	c)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilation	on or wh	nole hous	e positiv	/e input	ventilatio	on from	loft	•	-			
i	if (22b)r	n = 1, th	en (24d)m = (22t	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]	1	·	1	
(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		(24d)
Effe	ctive air	change	rate - e	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)				1	
(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		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros	s	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value	e	AXk
		area	(m ²)	m	2	A ,r	n²	W/m2	2K	(VV/	K)	kJ/m²·l	K	kJ/K
Doors	_					1.9	×	1.4	=	2.66				(26)
Windo		€1				9.03	x1,	/[1/(1.6)+	• 0.04] =	13.58				(27)
Windo	ws Type	e 2				1.82	x ^{1.}	/[1/(4.8)+	• 0 .04] =	7.33				(27)
Windo	ws Type	e 3				0.87	x1.	/[1/(4.8)+	0.04] =	3.5				(27)
Floor						55	x	0.93	=	51.15				(28)
Walls 7	Гуре1	28.	9	10.8	5	18.05	5 X	2.1	=	37.9				(29)
Walls 7	Гуре2	7.8	1	2.77		5.04	x	2.1	=	10.58				(29)
Total a	rea of e	elements	, m²			91.71								(31)
Party v	vall					27.9	x	0	=	0				(32)
Party v	vall					1.13	x	0	=	0				(32)
* for win ** includ	dows and le the are	l roof wind as on both	ows, use sides of i	effective wi nternal wal	ndow U-va Is and part	alue calcul titions	ated using	formula 1	/[(1/U-valu	ue)+0.04] a	as given in	n paragraph	n 3.2	
Fabric	heat lo	ss, W/K	= S (A x	: U)				(26)(30) + (32) =				126.7	1 (33)
Heat c	apacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	0	(34)
Therm	al mass	parame	ter (TM	P = Cm ÷	- TFA) in	n kJ/m²K			Indica	ative Value	e: High		450	(35)
For desi can be ι	gn asses ised inste	sments wh ad of a de	ere the de tailed calc	etails of the culation.	constructi	ion are noi	t known pr	ecisely the	e indicative	e values o	f TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) ca	Iculated u	using Ap	pendix I	<						14.4	(36)
if details	of therm	al bridging	are not ki	nown (36) =	= 0.15 x (3	1)								
Fotal fa	abric he	at loss							(33) +	- (36) =			141.1	1 (37)
Ventila	ition hea	at loss ca	alculate	d monthly	/			.	(38)m	$= 0.33 \times 10^{-10}$	(25)m x (5)	1	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(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 tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	- 38)m			
(39)m=	190.95	189.97	188.99	184.11	183.13	178.31	178.31	177.4	180.2	183.13	185.08	187.04		
Heat In	iss nara	meter (F		/m²K					(40)m	Average = - (39)m ÷	Sum(39) ₁	12 /12=	183.88	(39)
(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		
(-)	-					-	_			Average =	Sum(40)1	12 /12=	3.34	(40)
Numbe	er of day	vs in moi	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. Wa	ter heat	ting enei	rgy requi	irement:								kWh/ye	ar:	
Assum	ed occu	ipancy, l	N								1.	84		(42)
if TF.	A > 13.9 A £ 13.9	9, N = 1 9. N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	-A -13.9)2)] + 0.0	0013 x (IFA -13.	9)			
Annual	averag	e hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		77	.84		(43)
Reduce not more	the annua that 125	al average litres per l	hot water person per	usage by : r day (all w	5% if the a ater use, l	lwelling is not and co	designed t ld)	to achieve	a water us	se target o	f			
	Jan	Feb	, Mar	Apr	May	Jun	, jul	Aug	Sen	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		001	1100			
(44)m=	<mark>8</mark> 5.62	82.51	79.39	76.28	73.17	70.05	70.05	73.17	76.28	79.39	82.51	<mark>8</mark> 5.62		
										Total = Su	m(44) ₁₁₂ =	-	9 <mark>34.05</mark>	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x C	0Tm / 3600) kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	126.97	111.05	114.6	99.91	95. <mark>86</mark>	82.72	76.65	87.96	89.01	103.74	113.24	122.97	4004.00	
lf instant	aneous w	ater heatii	ng at point	t of use (no	o hot water	• storage),	enter 0 in	boxes (46) to (61)	1 otal = Su	m(45) 112 =	=	1224.68	(43)
(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:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		160		(47)
It comr Otherw	nunity n vise if no	eating a	ind no ta hot wate	ink in dw er (this in	/elling, e icludes i	nter 110 nstantar	eous co	(47) mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		. (,		,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear	or io not	known	(48) x (49)) =		1	10		(50)
Hot wa	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	known. iy)				0.	.02		(51)
If comr	nunity h	eating s	ee secti	on 4.3	,							-		
Volume	e factor	from Ta	ble 2a	Oh							1.	.03		(52)
i empe	rature t	actor fro	m I able	20					(50) (50)	0	.6		(53)
Energy	(50) or (m water (54) in (5	storage	, KVVN/Ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m	L			(00)
(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	er 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	хH	
(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	nnual) fro			0]	(58)						
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	a cylinde	r thermo	stat)		1	(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	J	(59)
Combi	loss ca	culated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m		-		-	_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	I
(62)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		(62)
Solar DH	-IW input o	calculated	using App	endix G o	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)				-	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter		-								_	
(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		_
								Outp	out from w	ater heate	r (annual)₁	12	1875.52	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	·]	
(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)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	ieating	
5. Int	ternal ga	ains (see	Table 8	5 and 5a):									
Metabo	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	9 <mark>1.87</mark>	91.87	91.87	91. <mark>87</mark>	91.87	91.87	91.87	91.87	91.87	9 <mark>1.87</mark>	91.87	91.87		(66)
Lightin	g gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso 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)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 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)
Cookir	ng gains	(calcula	Ited in A	ppendix	L, equat	tion L15	or L15a)), also se	ee 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	1	(69)
Pumps	and fai	ns gains	(Table !	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses	se.g. ev	aporatic	n (nega	tive valu	es) (Tab	le 5)							1	
(71)m=	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49]	(71)
Water	heating	gains (T	able 5)	ļ	I	1	I	ļ	ļ	I	ļ	I	1	
(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	1	(72)
Total i	nternal	gains =	!			(66)	l m + (67)m	י 1 + (68)m -	I + (69)m + (<u>.</u> (70)m + (7	1 1)m + (72)	l Im	1	
(73)m=	316.79	313.94	301.99	283.74	265.83	249.06	238.73	244.83	254.85	273.28	293.82	308.61]	(73)
6. <u>So</u>	lar gains	5:		I		1	1	I	I	1	I	1		
Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	e applicat	ole orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	X		g_		FF		Gains	

North	0.9x	0.77		x	1.8	2	x	2	20.32	x	0.85	x	0.7		=	15.25	(74)
North	0.9x	0.77		x	0.8	7	x	2	20.32	Īx	0.85	x	0.7		=	7.29	(74)
North	0.9x	0.77		x	1.8	2	x	3	34.53	x	0.85	×	0.7		=	25.91	(74)
North	0.9x	0.77		x	0.8	7	x	3	34.53	x	0.85	x	0.7		=	12.39	(74)
North	0.9x	0.77		x	1.8	2	x	5	55.46	Ī×	0.85	×	0.7		=	41.62	(74)
North	0.9x	0.77		x	0.8	7	x	5	55.46	x	0.85	x	0.7		=	19.9	(74)
North	0.9x	0.77		x	1.8	2	x	7	74.72	x	0.85	x	0.7		=	56.07	(74)
North	0.9x	0.77		x	0.8	7	x	7	74.72	x	0.85	x	0.7		=	26.8	(74)
North	0.9x	0.77		x	1.8	2	x	7	79.99	x	0.85	x	0.7		=	60.02	(74)
North	0.9x	0.77		x	0.8	7	x	7	79.99	x	0.85	x	0.7		=	28.69	(74)
North	0.9x	0.77		x	1.8	2	x	7	74.68	x	0.85	x	0.7		=	56.04	(74)
North	0.9x	0.77		x	0.8	7	x	7	74.68	x	0.85	x	0.7		=	26.79	(74)
North	0.9x	0.77		x	1.8	2	x	5	59.25	x	0.85	x	0.7		= [44.46	(74)
North	0.9x	0.77		x	0.8	7	x	5	59.25	x	0.85	x	0.7		=	21.25	(74)
North	0.9x	0.77		x	1.8	2	x	4	11.52	x	0.85	x	0.7		=	31.16	(74)
North	0.9x	0.77		x	0.8	7	x	4	11.52	x	0.85	x	0.7		= [14.89	(74)
North	0.9x	0.77		x	1.8	2	x	2	24.19	x	0.85	x	0.7		=	18.15	(74)
North	0.9x	0.77		x	0.8	7	x	2	24.19	х	0.85	x	0.7		=	8.68	(74)
North	0.9x	0.77		x	1.8	2	х	1	3.12] x	0.85	x	0.7		=	9.84	(74)
North	0.9x	0.77		x	0.8	7	х	1	3.12] ×	0.85	x	0.7		=	4.71	(74)
North	0.9x	0.77		x	1.8	2	x		8.86	x	0.85	x	0.7		=	6.65	(74)
North	0.9x	0.77		x	0.8	7	x		8.86	x	0.85	x	0.7		=	3.18	(74)
South	0.9x	0.77		x	9.0	3	x	4	46.75	x	0.76	x	0.7		=	155.64	(78)
South	0.9x	0.77		x	9.0	3	x	7	6.57	x	0.76	x	0.7		=	254.91	(78)
South	0.9x	0.77		x	9.0	3	x	g	97.53	x	0.76	x	0.7		=	324.7	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.23	x	0.76	X	0.7		=	366.99	(78)
South	0.9x	0.77		x	9.0	3	x	1	14.87	x	0.76	x	0.7		=	382.42	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.55	x	0.76	x	0.7		=	368.03	(78)
South	0.9x	0.77		x	9.0	3	x	1	08.01	x	0.76	x	0.7		=	359.59	(78)
South	0.9x	0.77		x	9.0	3	x	1	04.89	x	0.76	x	0.7		=	349.21	(78)
South	0.9x	0.77		x	9.0	3	x	1	01.89	x	0.76	x	0.7		=	339.19	(78)
South	0.9x	0.77		x	9.0	3	x	8	32.59	x	0.76	x	0.7		= [274.94	(78)
South	0.9x	0.77		x	9.0	3	x	5	55.42	x	0.76	x	0.7		= [184.49	(78)
South	0.9x	0.77		x	9.0	3	x		40.4	x	0.76	x	0.7		=	134.49	(78)
Solar	agine in	watte or		ьч	for each	n mont	h			(83)m	- Sum(74)m	(82)m					
(83)m=	167.44	277.44	363		428.51	465.3	4	56.75	442.42	414	.92 385.24	301.7	7 199.04	144.	32		(83)
Total	gains – i	internal a	nd so	lar	(84)m =	: (73)m	1) + (83)m	, watts	I			1				
(84)m=	484.23	591.39	665		712.24	731.13	3 7	05.81	681.14	659	.76 640.09	575.0	5 492.86	452.	93		(84)
7. M	ean inte	rnal temp	eratur	re (heating	seaso	n)										
Tem	Femperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)																
Utilis	ation fa	ctor for g	ains fo	or li	ving are	ea, h1,	m (s	ее Та	ble 9a)						•		_

Apr

May

Jun

Jul

Aug

Mar

Feb

Jan

Oct

Nov

Dec

Sep

(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	temper	ature in	living are	ea T1 (fo	ollow ste	ps 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)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	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)
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	0.95	0.85	0.64	0.69	0.9	0.98	1	1		(89)
Mean	internal	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(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	temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × 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	adjustn	nent to tl	ne mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(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. Spa	ace hea	ting requ	uirement											
Set T	i to the r	nean int	ernal ter	nperatui	re obtain	ied at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	lan	Eeb	Mar		May	lup		Δυσ	Son	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains hm	l. Vbi	Iviay	Jun		<u>Aug</u>	Jep	Oci	INOV	Dec		
(94)m=	1	0.99	0.99	0.98	0.95	0.88	0.75	0.78	0.92	0.98	1	1		(94)
Us <mark>efu</mark>	ll gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	<mark>48</mark> 2.98	588.26	<mark>6</mark> 58.13	696.95	695.46	621.84	511.73	516.37	589.56	564.37	490.53	452.03		(95)
Mo <mark>nt</mark> ł	nly avera	age exte	rnal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				()
(97)m=	2633.88	2543.64	2289.38	1874.09	1432.54	952.89	632.32	661.17	1031.77	1582.17	2130.94	2600.63		(97)
Space	e heating	g require	ement fo	r each n		/Vh/mon ⁻	th = 0.02	24 x [(97])m – (95)m] x (4′	1)m	1500 55		
(90)11=	1000.27	1314.02	1213.05	047.04	540.50	0	0	U Toto	0	101.24	1101.1	1096.00	0000 75	
-					.,			Tota	i per year	(күүп/уеаг) = Sum(9	0)15,912 =	9060.75	
Space	e heating	g require	ement in	kWh/m ²	/year								164.74	(99)
9b. En	ergy req	luiremer	nts – Cor	nmunity	heating	scheme	;							
This pa Fractio	art is use	ed for sp	ace hea	iting, spa	ace cooli /supplen	ing or wa	ater heat beating (ting prov Table 1 [.]	rided by a 1) '0' if p	a comm	unity sch	neme.	0	(301)
Fractio	n of spe		fina						1) 0 11 1	one		L	0	
Fractio	n or spa	ice neat	from co	mmunity	system	1 – (30	1) =					l	1	(302)
The con	nmunity so boilers, h	heme may eat pumps	y obtain he s. aeotherr	eat from se mal and wa	everal sour Aste heat f	rces. The p rom powe	procedure r stations	allows for See Appel	CHP and ι ndix C.	up to four o	other heat	sources; th	e latter	
Fractio	n of hea	at from C	Commun	ity boiler	'S	ioni pono		0007.pp0				[1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	Factor for control and charging method (Table 4c(3)) for community heating system 1.05													(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heati	ng syste	m				[1.1	(306)
Space	heating	9										L	kWh/year	
Annua	space	heating	requiren	nent								[9060.75	

Space heat from Community boilers	(98) x (304a) x (305) x (306) =	10465.17	(307a)
Efficiency of secondary/supplementary heating system in % (fi	rom Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary sys	stem (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1875.52	7
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)(307e) + (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) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fror	n 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)		428.94	(332)
12b. CO2 Emissions – Community heating scheme			
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%)	Energy kWh/year Emission factor kg CO2/kWh	Emissions kg CO2/year](367a)
CO2 associated with heat source 1 [(307b))+(310b)] x 100 ÷ (367b) x 0	= 4197.51	(367)
Electrical energy for heat distribution	[(313) x 0.52	= 65.56	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	= 4263.07	(373)
CO2 associated with space heating (secondary)	(309) x 0	= 0	(374)
CO2 associated with water from immersion heater or instantar	neous heater (312) x 0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =	4263.07	(376)
CO2 associated with electricity for pumps and fans within dwe	lling (331)) x 0.52	= 0	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	= 222.62	(379)
Total CO2, kg/year sum of (376)(382) =		4485.69	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		81.56	(384)
El rating (section 14)		43.08	(385)

Assessor Name: Software Name: Strom FSAP 2012Strom A Bunder: Software Version:Version: Version:Version: I.0.3.15Address: Image: Im				User D	etails:									
Address : , london Address : , london Address : , london Basement 51 (la) × 2.17 (2a) = (la) × 2.17 (2a) = (la) × Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+((1n) 51 (d) (d) 2.17 (2a) = (la) × 2.17 (2a) (2a) × 2.17 (2a) (2a) × 2.17 (2b) (2a) × 2.17 (2b) (2a) × 2.17 (2b) (2b) × 2.10 (2b) × 2.10 (2b) ×	Assessor Name: Software Name:	Stroma FSAF	P 2012	roporti (Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15				
Autres: , (0)(0) Area(m²) (a) x (b) x (c) x		london	P	roperty <i>i</i>	Address:	Unit 3								
Area(m ²) Area(m ²) Av. Height(m) Volume(m ²) Basement 51 110, ar 2.17 (2a) 110,67 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 51 (4) (a) (a) (a) Dwelling volume (3a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	1 Overall dwelling dime	nsions:												
Total floor area TFA = (1a)+(1b)+(1c)+(1c)+(1c)+(1e)+(1n) 51 (4) Dwelling volume (3a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) 17	(2a) =	Volume(m³ 110.67) (3a)			
Detelling volume (3a)+(3b)+(3c)+(3d)+(2a)+((3n) = 10.67 (5) 2. Ventilation rate: main heating o ther total m ³ per hour Number of chimneys 0 + 0 = 0 x40 = 0 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 0 (6a) Number of intermittent fans 2 x10 = 0 7(a) 0 x40 = 0 0 7(a) Number of flueless gas fires 0 x10 = 0 7(b) 0 x40 = 0 0 7(b) Number of storeys in the dwalling (ns) x10 = 0 0 7(b) 0 x40 = 0 0 7(b) Number of storeys in the dwalling (ns) x10 = 0 0 (9) 4(b) 0 (9) (10) 0 (9) Structural infiltration 0.25 for statel or timber frame or 0.35 for masony construction 0 (11) 1 0 (12) 1 1 0 (12) If no draught lobby, enter 0.5, else enter 0 0 0 1 0 (12) 1 0 (13)	Total floor area TFA = (1a	a)+(1b)+(1c)+(1c	d)+(1e)+(1n)	51	(4)								
2. Ventilation rate: main heating 0 secondary heating 0 other total m³ per hour Number of chimneys 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 (6b) Number of open flues 0 + 0 = 0 x40 = 0 (6b) Number of intermittent fans. 2 x10 = 0 (7a) 0 x40 = 0 (7a) Number of bluess gas fires 0 x40 = 0 (7b) (7a) 0 x40 = 0 (7b) If a presurisation test has been carried out or is intentied, proceed to (17), attenties contrue form (01 to (16) 0 (10) 0 (10) 0 (10) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11) 0 (11)	Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	110.67	(5)			
main heating heatingsecondary heatingothertotalm² per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40$ $=$ 0 $(6a)$ Number of pon flues 0 $+$ 0 $=$ 0 $x20$ 0 $(6b)$ Number of intermittent flans 2 $x10$ $=$ 0 $x20$ 0 $(6b)$ Number of passive vents 0 $x10$ 0 0 720 Number of flueless gas fires 0 $x40$ 0 0 720 Number of storeys in the dwelling (ns) A 0 $x40$ 0 0 720 Additional infiltration 0.5 for steel or timber frame or 0.35 for masonry construction 0 110 0 110 t^{10} but hypes of wall are present, use the value corresponding to the greater wall area (after deducting rates of opening); if equal user 0.35 0 0 120 0 110 t^{10} but hypes of wall are present, use the value corresponding to the greater wall area (after deducting rates of quenting); if equal user 0.35 0 0 110 t^{10} but hypes of wall are present, use the value corresponding to the greater wall area (after deducting rates of quenting); if equal user 0.35 0 0 110 t^{11} but hypes of wall are present, use the value corresponding to the greater wall area (after deducting rates of quenting); if equal user 0.35 0 0 110 t^{11} but hypes of wall are present use on one or a degree are presentility is user and area (after dedu	2. Ventilation rate:													
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 changes per hour air changes per hour $x(5) =$ 0.18 (8) Inflitration due to chimneys, flues and fans = (6i)+(6b)+(7a)+(7b)= 20 $x(5) =$ 0.18 (8) Number of storeys in the dwelling (ns) $x(5) =$ 0.18 (9) (10) 0 (10) Addictional infitration 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) 0 (11) If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (12) 0 (14) Window infiltration rate (20) + (10) + (11) + (12) + (13) + (15) = 0 (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 20 (17) I based on air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0 (14) Air permeability value	Number of chimneys Number of open flues	main heating 0	secondar heating + 0 + 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)			
Number of passive vents0 $x 10 =$ 0(7b)Number of flueless gas fires0 $x 40 =$ 0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = $ 60 +(60)+(7a)+(7b)+(7c) =$ 20 $+(5) =$ 0.18(6)If a pressurisation test has been camed out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)Additional infiltration(9)0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionIf both types of wall are present, use the value corresponding to the greater wall are alfater deducting areas of openings); if equal use 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If a purpose 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0OIf or draught lobby, enter 0.05, else enter 0If the apresability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaNumber of sides shelteredNumber of sides shelteredIf permeability value, applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredIf permeability value, applies if a	Number of intermittent far	าร				Γ	2	x ′	10 =	20	(7a)			
Number of flueless gas fires0x 40 =0 c_{cc} Air changes per hourInfiltration due to chimneys, flues and fans = $(60)+(60)+(70)+(7c) =$ 20 $+(5) =$ 0.18(8)If a pressurisation test has been camed out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)Additional infiltration((9)-1):0.1 =00Additional infiltration(19)-1):0.1 =00000Additional infiltration(19)-1):0.1 =0000000Additional infiltration0.25 c for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If supended wooden floor, enter 0.2 (Lisealed), else enter 0000011/1000011/10000 <td c<="" td=""><td>Number of passive vents</td><td></td><td></td><td></td><td></td><td>Ē</td><td>0</td><td>x ′</td><td>10 =</td><td>0</td><td>(7b)</td></td>	<td>Number of passive vents</td> <td></td> <td></td> <td></td> <td></td> <td>Ē</td> <td>0</td> <td>x ′</td> <td>10 =</td> <td>0</td> <td>(7b)</td>	Number of passive vents					Ē	0	x ′	10 =	0	(7b)		
Air changes per hourInfiltration due to chimneys, flues and fans = $(66)+(6b)+(7a)+(7c) = 20 + (5) = 0.16$ (6)It a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (76)Number of storeys in the dwelling (ns)Additional infiltrationStructural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If on draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) + 100] =Infiltration rate(b) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)Air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredJonInfiltration rate incorporating shelter factor(21) = (18) × (20) =JanFebMarAprMayJunJunJunJunJunJunJunJunJunJunJunJunJun <t< td=""><td>Number of flueless gas fir</td><td>es</td><td></td><td></td><td></td><td>Ē</td><td>0</td><td>X 4</td><td>40 =</td><td>0</td><td>(7c)</td></t<>	Number of flueless gas fir	es				Ē	0	X 4	40 =	0	(7c)			
Infiltration due to chimneys, flues and fans = $(6)^{+}(6b)^{+}(7a)^{+}(7b)^{+}(7c)^{+} = 20 + (5)^{+} = 0.18$ (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (7c) Number of storeys in the dwelling (ns) Additional infiltration (19) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masony construction 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 Percentage of windows and doors draught stripped Window infiltration $25 - [0.2 \times (14) \pm 100] =$ Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) $\pm 20)^{+}(8)$, otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (22) = 1 - [0.075 \times (19)] = Infiltration rate incorporating shelter factor (21) = (18) $\times (20) =$ 3 (19) Shelter factor (22) m ± 1.18 (20) = 20 (21) Infiltration rate modified for monthly wind speed 3 (19) 3 (19) 3 (19) 3 (19) 3 (20) Infiltration rate modified for monthly wind speed 3 (21) = (18) $\times (20) =$ 3 (22) $= 1 - [0.075 \times (19)] =$ 3 (22) $= 2$ (21) Infiltration rate modified for monthly wind speed 3 (22) $= 1 - [0.075 \times (19)] =$ 3 (22) $= 0.92$ (21) Infiltration rate modified for monthly wind speed 3 (20) $= 1 - [0.075 \times (19)] =$ 3 (22) $= 0.92$ (21) Infiltration rate modified for monthly wind speed 3 (20) $= 0.92$ (21) Infiltration rate modified for monthly wind speed 3 (22) $= 1 - [0.075 \times (19)] =$ 3 (22) $= 1 - [0.075 \times (19)] =$ 3 (22) $= 1 - [0.075 \times (19)] =$ 3 (20) $= 0.92$ (2									Air ch	anges per ho	ur			
Additional infiltration[[9]-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area20(17)If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)1.18(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used3(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.78(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.92(21)Infiltration rate modified for monthly wind speed0(14)0.78(20)Infiltration rate modified for monthly wind speed3(19)0.78(20)Infiltration rate modified for monthly wind speed00.9210.92(21)Monthly average wind speed from Table 7(22)m =0.920.9211.081.121.18(22)m =1.231.11.080.950.9211.081.121.18 </td <td>Infilt<mark>ration</mark> due to chimney If a pressurisation test has be Number of storeys in th</td> <td colspan="13">Air channel c</td>	Infilt <mark>ration</mark> due to chimney If a pressurisation test has be Number of storeys in th	Air channel c												
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings): if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) \div 100] =Infiltration rate(B) $+$ (10) $+$ (11) $+$ (12) $+$ (13) $+$ (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area1f based on air permeability value, then (18) = [(17) $+$ 20]+(8), otherwise (18) = (16)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factorInfiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate modified for monthly wind speedJanFebMarAprMud Factor (22a)m = (22)m \div 4(22)m=1.121.251.231.11.080.950.951.1081.121.261.271.251.231.11.241.251.231.241.251.251.261.271.261.281.291.271.26 <td>Additional infiltration</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>[(9)</td> <td>-1]x0.1 =</td> <td>0</td> <td>(10)</td>	Additional infiltration							[(9)	-1]x0.1 =	0	(10)			
If subpended wooden noon, enter 0.2 (difference) of 0.1 (sealed), enserence of 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 rate $0.25 \cdot [0.2 \times (14) \pm 100] = 0$ (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 20 (17) If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 1.18 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered $(20) = 1 - [0.075 \times (19)] = 0.78$ (20) Infiltration rate modified for monthly wind speed <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Monthly average wind speed from Table 7 (22)m= <u>5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7</u> Wind Factor (22a)m = (22)m ÷ 4 (22a)m= <u>1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18</u>	Structural infiltration: 0. if both types of wall are pro- deducting areas of openin	25 for steel or tin esent, use the value gs); if equal user 0.3	mber frame or corresponding to 35	0.35 for the great	r masonr er wall area	y constr a <i>(after</i>	uction			0](11)			
In the dragen robust, once once of the or0Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJunAu4.34.44.34.34.44.34.44.34.34.44.34.44.34.44.44.54.7Wind F	If no draught lobby, ent	001, chief 0.2 (0	ter 0	i (Scale	,u), cisc					0	$- \frac{(12)}{(13)}$			
Uniform of the table of the table of	Percentage of windows	and doors drau	aht stripped							0	$= \frac{(10)}{(14)}$			
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 area20(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 1.18(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used1.18(18)Number of sides sheltered3(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78(20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.92(21)Infiltration rate modified for monthly wind speed $\overline{10} + 4$ $\overline{3} + 3$ $\overline{3} + 3$ $\overline{3} + 3$ Monthly average wind speed from Table 7 $(22)m = 5.1 + 5 + 4.9 + 4.4 + 4.3 + 3.8 + 3.8 + 3.7 + 4 + 4.3 + 4.5 + 4.7$ $\overline{1.22} + 1.23 + 1.1 + 1.08 + 0.95 + 0.92 + 1 + 1.08 + 1.12 + 1.18$	Window infiltration		9		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)			
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 20 (17)If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 1.18 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered3(20) = 1 - $[0.075 \times (19)] =$ One of sides sheltered3Shelter factor(20) = 1 - $[0.075 \times (19)] =$ One of sides sheltered3(19)Shelter factor(21) = $(18) \times (20) =$ One of sides shelteredJanFeb Mar Apr May Jun Jul Aug Sep Oct Nov DecMonthly average wind speed from Table 7(22)m= 5.1 54.44.33.83.74.44.33.83.744.33.83.744.33.83.744.33.83.74.44.33.8 <td colsp<="" td=""><td>Infiltration rate</td><td></td><td></td><td></td><td>(8) + (10) -</td><td>+ (11) + (1</td><td>2) + (13) -</td><td>+ (15) =</td><td></td><td>0</td><td>(16)</td></td>	<td>Infiltration rate</td> <td></td> <td></td> <td></td> <td>(8) + (10) -</td> <td>+ (11) + (1</td> <td>2) + (13) -</td> <td>+ (15) =</td> <td></td> <td>0</td> <td>(16)</td>	Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)		
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 1.18 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 3 (19) Number of sides sheltered 3 (19) Shelter factor (20) = 1 - [0.075 x (19)] = 0.78 (20) Infiltration rate incorporating shelter factor (21) = (18) x (20) = 0.92 (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 3.7 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 0.92 1 1.08 1.12 1.18	Air permeability value,	q50, expressed i	in cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	20	(17)			
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered3Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed0.92JanFebMarAprMayJunJunAugSepOctNovDecMonthly average wind speed from Table 7 $(22)m =$ 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.3 4.5 4.7	If based on air permeabili	ty value, then (1	$(17) \div 20] + (8)$	3), otherwi	se (18) = (16)				1.18	(18)			
Number of sides sheltered 3 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.92 (21) Infiltration rate modified for monthly wind speed $18) \times (20) =$ 0.92 (21) Infiltration rate modified for monthly wind speed 0.92 (21) Monthly average wind speed from Table 7 $(22)m =$ 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ $(22)m \div 4$ 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Air permeability value applies	s if a pressurisation t	test has been don	e or a deg	gree air pei	meability	is being u	sed			_			
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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 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Infiltration rate modified for	r monthly wind	sneed		(21) = (10)	x (20) -				0.92				
Image of the set of the		Mar Apr	May Jun	Jul	Αυσ	Sen	Oct	Nov	Dec					
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(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))m : 1			1	-			I	I				
	(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					

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-			_	
Calculate effective air dange rate for the applicable case If mechanical ventilation: If enchanical ventilation with (23b) = (23a) × Fm (equation (N5)), otherwise (23b) = (23a) If balanced with heat recovery, efficiency in % allowing for in-use factor (from Table 4h) = 0 (23a) If balanced mechanical ventilation with heat recovery, (MV-RP) (24a)m = (22b)m + (23b) × [1 – (23c) + 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<u> </u>	1.17	1.14	1.12	1.01	0.98	0.87	0.87	0.85	0.92	0.98	1.03	1.08	ĺ	
$ \begin{array}{c} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	Calcula If me	ate ette echanica	ctive air al ventila	cnange	rate for t	ne appli	cable ca	se						0	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = a) If balanced mechanical ventilation with heat recovery (MV/RF) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m $0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 $	lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	rwise (23b) = (23a)				(23b)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) + 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					(23c)
$ \begin{array}{c cl} \hline cl \\ cl \\ cl \\ cl \\ cl \\ cl \\ cl \\ cl$	a) If	balance	ed mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22)	2b)m + (23b) x [[,]	1 – (23c)	÷ 100]	(200)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
$ \begin{array}{c classical conditions of the set of th$	b) If	balance	d mecha	anical ve	entilation	without	heat rec	covery (N	и VV) (24b)m = (22	1 2b)m + (2	23b)		1	
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) (24c)m -0 0 0 0 0 0 0 0 0 0	, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
$ \begin{array}{c} \text{if } (22b)\text{m} < 0.5 \times (23b), \text{ then } (24c) = (23b); \text{ otherwise } (24c) = (22b) \text{ m} + 0.5 \times (23b) \\ (24c)\text{m} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & $	c) If	whole h	ouse ex	tract ver	ntilation c	or positiv	ve input v	ventilatio	on from c	outside				1	
$ \begin{array}{c} (24c)n & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & $	i	f (22b)n	n < 0.5 ×	(23b), t	hen (24o	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))		_	
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + f(22b)m ² x 0.5] (24d)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.86 0.92 0.98 1.03 1.08 (24d) Effective air change rate - enter (24a) or (24d) or (24d) in box (25) (25)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (25)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (26)m = 1.17 1.14 1.12 1.01 0.98 0.88 0.88 0.88 0.88 0.92 0.98 1.03 1.08 (25) (27) 1.14 1.15 0.04] = 1.15 0.04 (27) 1.14 1.15 0.04 (27) 1.14 1.15 0.04 (27) 1.14 1.15 0.04 (27) 1.14 1.15 0.04 (27) 1.14 1.15 0.04 (27) 1.14 1.15 0.04 (27) 1.15 0.15 0.05 (27) 1.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15	(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	ĺ	(24c)
$\begin{array}{c} \text{if } (226)\text{m} = 1, \text{ then } (224)\text{m} = (225)\text{m} \text{ otherwise } (224)\text{m} = 0.5 + [(225)\text{m} \times 0.5] \\ (24)\text{m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.88 & 0.88 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline \text{Effective air change rate - enter (24a) or (24b) or (24c) or (24c) or (24d) in box (25) \\ \hline \text{(25)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.82 & 0.98 & 1.03 & 1.08 \\ \hline \text{(25)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline \text{(25)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline \text{(25)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.82 & 0.98 & 1.03 & 1.08 \\ \hline \text{(25)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.82 & 0.98 & 1.03 & 1.08 \\ \hline \text{(25)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.82 & 0.98 & 1.03 & 1.08 \\ \hline \text{(26)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.82 & 0.98 & 1.03 & 1.08 \\ \hline \text{(26)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline \text{(27)m} = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.$	d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft					
$ \begin{array}{c} [240]m = 1.17 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.88 & 0.88 & 0.92 & 0.92 & 1.03 & 1.08 & (243) \\ \hline \text{Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) \\ \hline \text{C} \end{tabular} \end$	(0,4,1)	f (22b)n	n = 1, th	en (24d)	m = (22k)	o)m othe	erwise (2	.4d)m =	0.5 + [(2	2b)m² x	0.5]	1 4 99	4.00	1	(244)
$\begin{array}{c} \text{Lifective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)} \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (25)_{\text{ma}} & 1.47 & 1.14 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (26)_{\text{ma}} & 1.9 & 1.41 & 1.12 & 1.01 & 0.98 & 0.88 & 0.88 & 0.86 & 0.92 & 0.98 & 1.03 & 1.08 \\ \hline (26)_{\text{midows Type 1}} & 1.9 & 1.9 & 1.9 & 1.9 & 1.14 & 1.14 & 1.28 & 1.14 & 1.28$	(24d)m=	1.17	1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08	İ	(240)
L2 /r = L1/2 L1/2 <thl1 2<="" th=""> <thl1 2<="" th=""> <thl1 2<="" th=""></thl1></thl1></thl1>	Effec	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in boy	(25)	0.00	4.00	4.00	1	(25)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m?) Openings m² Net Area A, m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X k kJ/K Doors 19 x 1.4 = 2.66 (27) Windows Type 1 9.03 x/l1/(1.6.)+0.04) = 13.58 (27) Windows Type 2 51 x 0.99 = 50.49 (28) Walls Type1 16.1 9.03 7.11 x 2.1 = 14.33 (29) Walls Type2 16.1 4.79 11.31 x 2.1 = 23.75 (29) Total area of elements, m² 83.24 (31) (31) (32) * (31) Party wall 33.3 0 = 0 (32) * (34) Heat capacity Cm = S(A x k) (26)(30) + (32) = (17.05) (33) (34) (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 (36) (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1	(25)m=	1.17	1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08	J	(25)
ELEMENT Gross area (m ²) Openings m ² Net Area A,m ² U-value W/m2K A X k (W/K) K-value KJ/K A X k KJ/K Doors 1.9 A, m^2 W/m2K K-value (W/K) A X k KJ/K (26) Windows Type 1 1.9 A, m^2 W/m2K (W/m2K (27) Windows Type 2 1.14 = 2.66 (27) Floor 51 0.99 = 50.49 (28) Walls Type 1 16.14 9.03 7.11 2.1 = 14.93 (29) Walls Type 2 16.1 4.79 11.31 2.1 = 23.75 (29) Value area of elements, m ² 63.24 (31) (31) Party wall (33) 0 = 0 (32) * * for windows and root windows, use effective window U-value calculated using formula 1/f(1/U-value)+0.04] a given in paragraph 3.2 (31) Party wall 33.3 0 = 0 (32) * * include the areas on both sides of internal walls and partitions Table if (28) (33) (34) (35) (35) (36	3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
Doors 1.9 x 1.4 = 2.66 (26) Windows Type 1 9.03 x1111(1.6)+ 0.04) = 13.58 (27) Windows Type 2 51 x 0.99 = 50.49 (28) Walls Type 1 16.1 9.03 7.11 x 2.1 = 14.93 (29) Walls Type 2 16.1 4.79 11.31 x 2.1 = 23.75 (29) Total area of elements, m ² 83.24 (31) (32) (32) (32) (32) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 (31) * include the areas on both sides of internal walls and partitions (26)(30) + (32) = 117.05 (33) Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) = 117.05 (33) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 can be used instead of a detailed calculation. 12.8 (36) Thermal mass parameter (TMP = Cm ÷ TF	ELEN		Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r	rea m²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²·l) K	A X k kJ/K
Windows Type 1 9.03 x111/(1.6) + 0.04) = 13.58 (27) Windows Type 2 2.89 x111/(1.6) + 0.04) = 13.58 (27) Floor 51 x 0.99 = 50.49 (28) Walls Type 1 16.14 9.03 7.11 x 2.1 = 14.93 (29) Walls Type 2 16.1 4.79 11.31 x 2.1 = 23.75 (29) Total area of elements, m ² 83.24 (31) (32) (31) (32) (32) * include the areas on both sides of internal walls and partitions 5 (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) (28)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) (28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative Value: High 450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (36) (31) (32) + (32) (36) (37) Total fabric heat loss (1.5 x (31)) <t< td=""><td>Doo<mark>rs</mark></td><td></td><td></td><td></td><td></td><td></td><td>1.9</td><td>x</td><td>1.4</td><td>=</td><td>2.66</td><td></td><td></td><td></td><td>(26)</td></t<>	Doo <mark>rs</mark>						1.9	x	1.4	=	2.66				(26)
Windows Type 2 2.89 x1/1/1(4.8) + 0.04] = 11.64 (27) Floor 51 x 0.99 = 50.49 (28) Walls Type 1 16.14 9.03 7.11 x 2.1 = 14.93 (29) Walls Type 2 16.1 4.79 11.31 x 2.1 = 23.75 (29) Total area of elements, m ² 83.24 (31) (32) * (31) Party wall 33.3 x 0 = 0 (32) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) = 0 (34) 450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. 12.8 (36) If details of thermal bridging are not known (36) = 0.15 x (31) 133 + (36) = 129.85 (Win <mark>do</mark> v	ws Type	e 1				9.03	x1	/[1/(1.6)+	0.04] =	13.58				(27)
Floor 51 x 0.99 = 50.49 (28) Walls Type1 16.14 9.03 7.11 x 2.1 = 14.93 (29) Walls Type2 16.1 4.79 11.31 x 2.1 = 23.75 (29) Total area of elements, m ² 83.24 (31) (32) * (31) Party wall 33.3 x 0 = 0 (32) * for windows and roof windows, use effective window U-value calculated using formula 1/(1/U-value)+0.04] as given in paragraph 3.2 ** ** * include the areas on both sides of internal walls and paritions (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) (26)(30) + (32) = 0 (34) (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. 12.8 (36) Thermal bridges : S (L x Y) calculated using Appendix K (12) 12.8 (36) if details of thermal bridging are not known (36) = 0.15 x (31) (33) + (36) = 129.85 (37) Ventilation heat loss calcula	Windov	ws Type	2				2.89	x1	/[1/(4.8)+	0.04] =	11.64	F			(27)
Walls Type116.149.037.11x2.1=14.93(29)Walls Type216.14.7911.31x2.1=23.75(29)Total area of elements, m² 83.24 (31)Party wall 33.3 x0=0(32)* for windows and roof windows, use effective window U-value calculated using formula 1/(1/U-value)+0.04] as given in paragraph 3.2(31)** include the areas on both sides of internal walls and partitions(26)(30) + (32) =(32)Fabric heat loss, W/K = S (A x U)(26)(30) + (32) =(34)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =0Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²KIndicative Value: High450For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f(36)can be used instead of a detailed calculation.12.8(35)Thermal bridges : S (L x Y) calculated using Appendix K12.8(36)if details of themal bridging are not known (36) = 0.15 x (31)(38) m = 0.33 x (25) m x (5)(38)Ventilation heat loss calculated monthly(38) m = 0.33 x (25) m x (5)(38)(38)m= 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38)(38)m= 172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.91 161.41 165.78 167.44 169.12 <td>Floor</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>51</td> <td>×</td> <td>0.99</td> <td></td> <td>50.49</td> <td>F r</td> <td></td> <td></td> <td>(28)</td>	Floor						51	×	0.99		50.49	F r			(28)
Walls Type216.14.7911.31x2.1=23.75(29)Total area of elements, m2 33.3 x0=0(31)Party wall 33.3 x0=0(32)* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2(31)** include the areas on both sides of internal walls and partitions(26)(30) + (32) =(32)Fabric heat loss, W/K = S (A x U)(26)(30) + (32) =(33)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =0Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²KIndicative Value: High450For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f(36)can be used instead of a detailed calculation.12.8(36)Thermal bridges : S (L x Y) calculated using Appendix K12.8(36)if details of thermal bridging are not known (36) = 0.15 x (31)(33) + (36) =129.85(37)Ventilation heat loss calculated monthly(38)m = 0.33 x (25)m x (5)(38)m =(38)m =(37)(38)m= 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38)Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m =(37) + (38)m(39)m =(37) + (38)m(39)m = 172.46 171.62 170.79 166.61 165.78 161.91	Walls 7	Гуре1	16.1	4	9.03		7.11	x	2.1	=	14.93	i F		$\exists \vdash$	(29)
Total area of elements, m ² B3.24 (31) Party wall 33.3 x 0 = 0 (32) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 (32) * include the areas on both sides of internal walls and partitions (26)(30) + (32) = (17.05 (33) Heat capacity Cm = S(A x k) (26)(30) + (32) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative Value: High 450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (33) + (36) = 12.8 (36) if details of thermal bridges : S (L x Y) calculated using Appendix K (12.8 (36) (37) Ventilation heat loss calculated monthly (38) = 0.33 × (25) m × (5) (38) (39) = 0.33 × (25) m × (5) (38) (38)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 (38) (39)m= 172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.91 161.9	Walls 1	Гуре2	16.	1	4.79		11.31	x	2.1		23.75	F i		\dashv	(29)
Party wall 3.3.3 x 0 = 0 (32) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (117.05 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K Indicative Value: High (450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K (33) + (36) = (12.8 (36)) if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = $\frac{12.8 (36)}{42.61 41.77 40.94 36.76 35.93 32.06 32.06 31.34 33.55 35.93 37.6 39.27} (38)$ Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = $172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.19 163.4 165.78 167.44 169.12$	Total a	rea of e	lements	, m²			83.24			I					(31)
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative Value: High 450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 12.8 (36) if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 129.85 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = $\frac{1}{42.61}$ $\frac{1}{41.77}$ $\frac{1}{40.94}$ $\frac{1}{36.76}$ $\frac{1}{35.93}$ $\frac{3}{32.06}$ $\frac{3}{32.06}$ $\frac{3}{31.34}$ $\frac{3}{33.55}$ $\frac{1}{35.93}$ $\frac{3}{37.6}$ $\frac{3}{39.27}$ (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.19 161.41 165.78 167.44 169.12	Party v	vall					33.3	x	0		0				(32)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K Indicative Value: High 450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 12.8 (36) if details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 129.85 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m $42.61 41.77 40.94 36.76 35.93 32.06 32.06 31.34 33.55 35.93 37.6 39.27$ (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m $172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.19 163.4 165.78 167.44 169.12$	* for win	dows and	roof wind	ows, use e	effective wil	ndow U-va	alue calcul	ated using	formula 1	I /[(1/U-valu	ie)+0.04] a	as given in	paragraph	 ≀ 3.2	` `
Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 117.05 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: High 450 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (36) (37) Thermal bridges : S (L x Y) calculated using Appendix K 12.8 (36) if details of thermal bridging are not known (36) = 0.15 x (31) (33) + (36) = 129.85 (37) Total fabric heat loss (33) + (36) = 129.85 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38) (38)m= 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = (37) + (38)m (38)	** includ	e the area	as on both	sides of ir	nternal wall	ls and par	titions								
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) = 0 (34) Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K Indicative Value: High (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (36) ran be used instead of a detailed calculation. 12.8 Thermal bridges : S (L x Y) calculated using Appendix K 12.8 if details of thermal bridging are not known (36) = 0.15 x (31) 12.8 Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5) (38)m= 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m	Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				117.0	(33)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²KIndicative Value: High(35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1fcan be used instead of a detailed calculation.Thermal bridges : S (L x Y) calculated using Appendix K(33) + (36) =12.8(36)if details of thermal bridging are not known (36) = 0.15 x (31)Total fabric heat loss(38)m = 0.33 x (25)m x (5)Ventilation heat loss calculated monthly(38)m = 0.33 x (25)m x (5)(38)m =(38)m = 0.33 x (25)m x (5)(38)m = 0.33 x (25)m x (5)(38)m =(37) + (38)m(38)m = (37) + (38)m(39)m = (37) + (38)m(39)m = 172.46171.62170.79166.61165.78161.91161.91161.91161.91161.91161.91161.91161.91161.91161.91161.91161.91161.9112.8(36)(37) + (38)(38) m <td< td=""><td>Heat c</td><td>apacity</td><td>Cm = S(</td><td>(A x k)</td><td></td><td></td><td></td><td></td><td></td><td>((28)</td><td>(30) + (32</td><td>2) + (32a).</td><td>(32e) =</td><td>0</td><td>(34)</td></td<>	Heat c	apacity	Cm = S((A x k)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)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 Heat transfer coefficient, W/K (39)m = 172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.19 163.4 165.78 167.44 169.12	Therm	al mass	parame	ter (TM	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38) (39)m = $(172.46$ 171.62 170.79 166.61 165.78 161.91 161.91 161.19 163.4 165.78 167.44 169.12	For desi can be u	gn assess Ised inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
(33) + (36) = (33) + (36) = (33) + (36) = (33) + (36) = (33) + (36) = (37) (38) m = $0.33 \times (25)m \times (5)$ (38) m = $0.33 \times (25)m \times (5)$ (38) m = $0.33 \times (25)m \times (5)$ (38) m (38) m (38) m (39) m = (37) + (38) m (39) m = (37) + (38) m (39) m = (37) + (38) m (39) m = (37) + (38) m	Therma	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.8	(36)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) + (38)m	if details	of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)			(00)	(0.0)				
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec $(38)m =$ 42.61 41.77 40.94 36.76 35.93 32.06 31.34 33.55 35.93 37.6 39.27 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.19 163.4 165.78 167.44 169.12		abric ne	at loss		1					(33) +	(36) =	(05)		129.8	.5 (37)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	ventila	tion nea				/	lun	1.1	A	(38)m	= 0.33 × ((25)m x (5)		1	
Heat transfer coefficient, W/K (39)m = $(37) + (38)m$ (39)m = 172.46 171.62 170.79 166.61 165.78 161.91 161.91 161.19 163.4 165.78 167.44 169.12	(38)m-	Jan 42.61	11 77		Apr 36.76	1VIAY	Jun	JUI	Aug	32 55	35.02	1NOV	20.27		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 172.46 171.62 170.79 166.61 165.78 161.91 161.19 163.4 165.78 167.44 169.12	(30)11=	42.01	41.//	40.94	30.70	55.93	32.00	32.00	51.34	33.35	30.93	37.0	39.21	I	(50)
	Heat tr	anster o		$\frac{1}{170.70}$	100.01	105 70	101.01	101.01	101.10	(39)m	= (37) + (37) + (37)	38)m	100.10	1	
Average = $Sum(39)$, $m/12$ = 166.5 (39)	(29)11=	172.40	171.02	170.79	100.01	103.78	101.91	101.91	101.19	103.4	Average =	Sum(39)	12/12=	166 4	5 (39)

Heat lo	Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) 40)m= 3.38 3.37 3.35 3.27 3.25 3.17 3.16 3.2 3.25 3.28 3.32													
(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	r of day		nth (Tab	le 12)		1			,	Average =	Sum(40)1	12 /12=	3.26	(40)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Ĺ	-		_									_		
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.04 (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) [43] Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec														(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per I	r day for ea T	ach month I	Vd,m = fa I	ctor from T	Table 1c x	(43)					I	
(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	000.48	
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	f(see Ta)	ables 1b, 1	c, 1d)	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		-
lf instanta	aneous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	•	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	e volum	ie (litres)	includir	ng any so	olar or M	/WHRS	storage	within sa	ame ves	sel		160		(47)
If comm	nunity h	eating a	and no ta	ink in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:		<i>.</i>		(1) • (1)	(1)						I	
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/ye	ear	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	iy)				0.	02		(51)
If comm	hunity h	from To	ee secti	on 4.3									I	(50)
Tempe	rature f	Irom Ta	bie za m Table	2h							1.	03		(52)
Enorm								$(47) \times (51)$	x (52) x (5 2)	0	.0		(55)
Energy Enter (50) or ((54) in (5	501age	;, KVVII/ye	al			(47) X (31))	55) =	1.	03		(54)
Water s	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)ı	m	L'.	00		()
(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	r 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 Append	l lix 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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				-	
mod) ٦	ified by	factor fi	rom Tab	le H5 if t I	here is s	solar wat	er heati	ng and a	cylinde	r thermo	ostat)	-	I	
(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 hea	at req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 1	177.69	156.99	165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82		(62)
Solar DHW	V input o	calculated	using App	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add add	ditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output fr	rom w	ater heat	ter											
(64)m= 1	177.69	156.99	165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82		
								Outp	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat gair	ns fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	‹ [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
include	e (57)	m in calc	ulation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fi	rom com	munity h	eating	
5. Inter	rnal ga	ains (see	Table	5 and 5a):									
Metaboli	ic gain	s (Table	5). Wa	tts	/									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 8	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lighting	gains	(calculat	ted in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	22.71	20.17	16.4	12.42	9.28	7.84	8.47	11.01	14.77	18.76	21.89	23.34		(67)
Applianc	es da	ins (calc	ulated i	n Appeno	dix L. ea	uation L	13 or L1	3a), also	see Ta	ble 5	1			
(68)m= 1	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	(calcula	ted in A	ppendix	L equat	ion I 15	or I 15a)	also se	e 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 a	and fa	ns gains	(Table	5a)										
(70)m=	0		0		0	0	0	0	0	0	0	0		(70)
		anoratio	n (neas	tive valu	es) (Tab	l								
(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	l	(71)
	aating	(T	able 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)
	tornal	gaine –	1 1100		00.02	(66)	m + (67)m	+ (68)m -	+ (69)m + 1	(70)m + (7)	(1)m + (72)	m		()
(73)m = 3	301.05	298 33	287.05	269.83	252.99	237 17	227 39	233.25	242 66	260.05	279 44	293 35		(73)
6 Solar	r gaing	200.00	207.00	200.00	202.00	201.11	221.00	200.20	242.00	200.00	275.44	200.00		()
Solar gair	ns are o	alculated	using sola	ar flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	e applicat	ole orientat	ion.		
Orientati	ion: A	Access F	actor	Area		Flu	x		q		FF		Gains	
	٦	Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	×	2.8	39	x 1	0.63	x	0.85	☐ x [0.7	=	12.67	(74)
North	0.9x	0.77	×	2.8	39	x 2	20.32	x	0.85		0.7	=	24.22	(74)
North	0.9x	0.77	×	2.8	39	x 3	34.53	x	0.85	╡╷┝	0.7		41.15	(74)
North	0.9x [0.77	 ×	2.8	39	x .	5.46	×	0.85	╡╷╞	0.7	=	66.09] (74)
												1		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

North	0.9x	0.77		x	2.8	9	x	7	9.99	x	0.85	:	< [0.7		=	95.31	(74)
North	0.9x	0.77		x	2.8	9	x	7	4.68	X	0.85		< [0.7		= [88.99	(74)
North	0.9x	0.77		x	2.8	9	x	5	9.25	x	0.85	:	< [0.7		= [70.6	(74)
North	0.9x	0.77		x	2.8	9	x	4	1.52	x	0.85	2	< [0.7		= [49.47	(74)
North	0.9x	0.77		x	2.8	9	x	2	4.19] x	0.85		< [0.7		= [28.83	(74)
North	0.9x	0.77		x	2.8	9	x	1	3.12	x	0.85	;	< [0.7		= [15.63	(74)
North	0.9x	0.77		x	2.8	9	x		8.86	x	0.85		< [0.7		= [10.56	(74)
South	0.9x	0.77		x	9.0	3	x	4	6.75	x	0.76	;	< [0.7		= [155.64	(78)
South	0.9x	0.77		x	9.0	3	x	7	6.57	x	0.76	;	< [0.7		= [254.91	(78)
South	0.9x	0.77		x	9.0	3	x	9	7.53	x	0.76	:	< [0.7		= [324.7	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.23	x	0.76	:	< [0.7		= [366.99	(78)
South	0.9x	0.77		x	9.0	3	x	1	14.87	x	0.76	:	< [0.7		=	382.42	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.55	x	0.76		< [0.7		= [368.03	(78)
South	0.9x	0.77		x	9.0	3	x	1	08.01	x	0.76	;	< [0.7		= [359.59	(78)
South	0.9x	0.77		x	9.0	3	x	1	04.89	x	0.76	:	< [0.7		=	349.21	(78)
South	0.9x	0.77		x	9.0	3	x	1	01.89	x	0.76	:	< [0.7		= [339.19	(78)
South	0.9x	0.77		x	9.0	3	x	8	2.59	x	0.76	:	< [0.7		= [274.94	(78)
South	0.9x	0.77		x	9.0	3	x	5	5.42	х	0.76	2	ĸ	0.7		=	184.49	(78)
Sout <mark>h</mark>	0.9x	0.77		x	9.0	3	x		40.4	x	0.76	;	ĸ	0.7		= [134.49	(78)
Sola <mark>r</mark> (<mark>gain</mark> s in	watts, <mark>ca</mark>	lculate	ed	for eacl	n mont	:h			(83)m	n = Sum(74)	m(82)	m					
(83)m=	168.32	279.12	365.85	5	433.08	471.46	5 4	63.34	448.58	419	.81 388.6	67 <u>303</u>	.76	200.12	145	.05		(83)
Total g	gains – i	nternal ar	nd sol	ar	(84)m =	: (73)n	ו + (ד	83)m	, watts	r				_				
(84)m=	469.37	577.45	652.9		702.91	724.4	5 7	00.52	675.97	653	.06 631.3	3 563	.82	479.56	438	8.4		(84)
7. Me	ean inter	nal temp	eratur	e (heating	seasc	n)											
Temp	perature	during he	eating	pe	eriods ir	the liv	ving	area	from Tal	ole 9	, Th1 (°C)						21	(85)
Utilis	ation fac	tor for ga	ins fo	r li	ving are	ea, h1,	m (s	ee Ta	ble 9a)									
	Jan	Feb	Mai	·	Apr	May	/	Jun	Jul	A	ug Se	p C	ct	Nov	D	ec		
(86)m=	1	1	0.99		0.98	0.96		0.91	0.8	0.8	0.94	0.9	99	1	1			(86)
Mear	interna	l tempera	ature i	n li	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	18.82	19.02	19.34		19.79	20.23		20.63	20.84	20.	82 20.5	1 19.	93	19.31	18.8	82		(87)
Temp	oerature	during he	eating	pe	eriods ir	n rest o	of dv	velling	from Ta	able 9	9, Th2 (°C	;)						
(88)m=	19.31	19.32	19.33		19.37	19.37	·	19.41	19.41	19.	42 19.4	19.	37	19.36	19.3	34		(88)
Utilis	ation fac	tor for a	ins fo	r re	est of d	vellina	. h2	.m (se	e Table	9a)		-		-				
(89)m=	1	1	0.99	Т	0.98	0.94		0.82	0.61	0.6	6 0.89	0.9	98	1	1			(89)
Mear	interna	l tempera	aturo i	n ti	he rest	of dwe	lling	T2 (f	n Now ste		to 7 in Ta	ahle 9c	•)					
(90)m=	17.39	17.6	17.93	Т	18.4	18.83		19.23	19.37	19.	37 19.12	2 18.	55	17.92	17.4	41		(90)
. /								-	ļ			fLA =	Liv	ing area ÷ (4) =	-+	0.55	(91)
Mag	interne	Itomnorr	turo (for	thouch	010 dv		a) 4	Δ	. /4	fl A\ ¬	го				L		
(92)m-			18 71		19 17	19 61		y = 1	20.19	+ (1	- ILA) × 1	1∠ 9 10	32	18.7	18	19		(92)
(<u>S</u> =)=	1 .0.10	1 .0.00 L	.0.71	- 1		10.01	1 4			1 -0.	1 10.00	~ 1 '3	22	10.7	10.	·~ 1		()

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Spa	ace hea	ting requ	uirement											
Set Ti the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	nperatur using Ta	re obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(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)
Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m						-			
(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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m-	– (96)m]				
(97)m=	2394.85	2314.88	2085.85	1711.55	1310.84	875.22	581.23	607.94	946.16	1445.15	1941.59	2366.26		(97)
Space	e heatin	g require	ement fo	r each n	honth, k	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4′	1)m			
(98)m=	1433.55	1169.89	1071.95	739.1	467.5	0	0	0	0	664.77	1054.51	1435.04		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	8036.31	(98)
Space	e heating	g require	ement in	kWh/m²	/year								157.57	(99)
9b En	erav rea	wiremer	nts – Cor	nmunitv	heating	scheme						L		1
This pa	art is use	ed for sp	ace hea	ting, spa	ace cool	ng or wa	ater heat	ina prov	ided by	a comm	unitv sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	/supplen	nentary l	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)
The com	n munitv so	heme may	v obtain he	eat from se	everal sour	ces. The r	procedure	allows for	CHP and i	up to four a	other heat	sources: th	ne latter	1
includes	boilers, h	eat pumps	s, geothern	nal and wa	aste heat f	rom power	r stations.	See Apper	ndix C.	,				_
Fractio	<mark>n o</mark> f hea	at from C	Commun	<mark>ity bo</mark> iler	'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	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting sys	tem			1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m					1.1	(306)
Space	heating	9											kWh/year	
Annua	space	heating	requirem	nent								[8036.31]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (308	5) x (306) =	=	9281.94	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308
Space	heating	requirer	ment froi	m secon	dary/su	oplemen	tary syst	em	(98) x (30	01) x 100 ÷	+ (308) =		0	(309)
Water Annual	heating I water h	l neating r	equirem	ent								[1831.51	1
If DHW	from co	ommunit	y schem	ne:								ı r]
vvater	neat fro	m Comn		bilers				0.04	(64) x (30	J3a) x (30	5) X (306) =	=	2115.39	(310a)
		a for nea			-			0.01	× [(307a).	(307e) +	· (310a)(310e)] =	113.97	(313)
Cooling	y Syster	n ⊨nerg	y ⊨mciei	ncy Ratio	U 					(04.1)		ļ	0	(314)
Space	cooling	(If there	is a fixe	a cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electric mecha	city for p nical ve	oumps an ntilation	nd fans \ - balanc	within dw ed, extra	velling (1 act or po	⊺able 4f) sitive inj	: put from	outside				[0	(330a)
warm air heating system fans			(D	(330b)									
--	-----------------------------	-------------------------------	-------------------	--------------	--------									
pump for solar water heating			((330g)									
Total electricity for the above, kWh/year	=(330a) + (330b)) + (330g) =	(D	(331)									
Energy for lighting (calculated in Appendix L)			401	1.03	(332)									
12b. CO2 Emissions – Community heating scheme														
	Energy kWh/year	Emission factor kg CO2/kWh	Emissio kg CO2	ons /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 fu	el	65	(367a)									
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	= 37	87.42	(367)									
Electrical energy for heat distribution [(313) x	0.52	= 5	9.15	(372)									
Total CO2 associated with community systems (3	63)(366) + (368)(372)		= 38	46.57	(373)									
CO2 associated with space heating (secondary) (3	09) 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	673) + (374) + (375) =		38	46.57	(376)									
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	=	0	(378)									
CO2 associated with electricity for lighting (3	32))) x	0.52	= _2(08.13	(379)									
Total CO2, kg/year sum of (376)(382) =			40	54.71	(383)									
Dwelling CO2 Emission Rate (383) ÷ (4) =			7	79.5	(384)									
El rating (section 14)			4	5.56	(385)									

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
	london	PI	operty <i>i</i>	Address:	Unit 4					
1 Overall dwelling dimer	, ionuon									
Basement			Area	a (m²) 51	(1a) x	Av. He	ight(m) 18	(2a) =	Volume(m³ 111.18) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n)	51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	111.18	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	main s heating • 0 + 0 +	secondary heating 0 0	/ +] +	0 0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)
Number of intermittent fan	S					2	x ′	10 =	20	(7a)
Number of passive vents					Г	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 =	0	(7c)
					_			Air ch	anges per no	ur
Infiltration due to chimney If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	s, flues and fans = (en carried out or is intende e dwelling (ns) 25 for steel or timber sent, use the value corre as); if equal user 0.35	ded, proceed	a)+(7b)+(7 1 to (17), c 0.35 for the greate	(c) = htherwise c masonr er wall area	ontinue fro y constr a (after	20 om (9) to (uction	(16) [(9)	÷ (5) = -1]x0.1 =	0.18 0 0 0 0 0 0	(9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) 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 s	stripped		0.05 50.0		0.01			0	(14)
Window infiltration				0.25 - [0.2	X (14) ÷ 1	00] =	. (45)		0	(15)
Air permechility value	50 overessed in a	bio motro	o nor ho	(0) + (10)		2) + (13)		araa	0	(16)
If based on air permeabilit	(50, expressed in conversion of the second	$(17) \div 20]+(8)$), otherwis	ui pei so se (18) = (16)		invelope	alea	20	$= \binom{(17)}{(18)}$
Air permeability value applies	if a pressurisation test h	as been done	e or a deg	iree air pei	, meability	is being u	sed		1.10	
Number of sides sheltered									2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				1	(21)
Infiltration rate modified fo	r monthly wind spee	d							1	
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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 (22a)m = 1.27 1.25 1)m÷4	0.95	0.95	0.92	1	1.08	1 12	1 18	l	
			0.00	0.02	•		L 2			

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m	-	-	-	_	
~ ' '	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	ĺ	
Calcul If me	ate etter	<i>ctive air</i> al ventila	change	rate for t	ne appli	cable ca	Se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	wise (23b) = (23a)			0	(23b)
lf bala	anced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,				(23c)
a) If	balance	ed mech	, anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	m = (2)	2h)m + (23b) x [*	1 – (23c)	 _ ÷ 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	L Coverv (N	u MV) (24b)m = (22	1 2b)m + ()	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside				1	
, i	if (22b)n	n < 0.5 ×	(23b), t	then (24d	c) = (23b); otherv	wise (24	c) = (22b) m + 0.	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	-	-	-		
	if (22b)n	n = 1, th	en (24d)	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	I	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24 I	d) in boy	(25)				1	
(25)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN	/IENT	Gros	ss	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	÷	AXk
D		area	(m²)	m	12	A ,r	n²	VV/m2	ĸ	(VV/	K)	kJ/m ² ·I	۲.	kJ/K
Doors	-					1.9	X	1.4	=	2.66				(26)
Windo	ws Type	€1				9.03	x ¹	/[1/(1.6)+	0.04] =	13.58				(27)
Windo	ws Type	e 2				0.39	x ¹	/[1/(4.8)+	0.04] =	1.57	Ц.		_	(27)
Floor						51	×	0.97	= [49.47				(28)
Walls	Type1	39.	2	0.39		38.81	X	2.1	=	81.5				(29)
Walls	Type2	10.9	99	10.9	3	0.06	X	2.1	=	0.13				(29)
Total a	area of e	elements	, m²			101.1	9							(31)
Party v	wall					16.1	x	0	=	0				(32)
* for win	ndows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Eabric	he the area	as on both N/K		nternal wal TIN	is and pari	titions		(26) (30)	+ (32) =				1 40 04	(22)
Heat c	anacity	Cm - SI	- 0 (~ ^ ′A v k)	0)				()(00)	((28)	$(30) \pm (3)$	2) + (32a)	(32e) -	148.91	(34)
Therm	apacity	narame	(TAN) Iter (TMI	⊃ – Cm ≟	- TFΔ) ir	n k l/m²K			Indica	tive Value	· Hiah	(020) =	450	(34)
For desi	ian assess	sments wh	ere the de	etails of the	construct	ion are not	t known pi	reciselv the	indicative	e values of	TMP in Ta	able 1f	450	(33)
can be ı	used inste	ad of a de	tailed calc	ulation.				, , , , , , , , , , , , , , , , , , , ,						
Therm	al bridg	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						15.2	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)			(2.2)					
i otal fa	abric he	at loss	. 1	1					(33) +	(36) =	(O.F.) (1)		164.11	(37)
ventila	ation hea	at loss ca	aiculated	a monthly	/				(38)m	= 0.33 × (25)m x (5)		1	
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)M=	40.91	45.99	45.08	40.48	39.56	35	35	34.13	30.8	39.56	41.4	43.24	l	(30)
Heat tr	ransfer o	coefficier	nt, W/K	oc :	000	400	4.55	400	(39)m	= (37) + (38)m	0.00	1	
(39)m=	211.02	210.1	209.18	204.58	203.66	199.1	199.1	198.24	200.9	203.66	205.5 Sum(20)	207.34	204.27	(30)
									4	nvelaye =	Jun (38)1	12 / 14=	204.3/	(33)

Heat lo	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		
Numbo	r of dov		uth (Tab					1	,	Average =	Sum(40)1.	12 /12=	4.01	(40)
	lan	Feb	Mar		May	lun	6.1	Δυσ	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(, L					0.							0.		
4. Wat	ter heat	ting ener	gy requi	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, I 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					I	
(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		-
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	900.48	(44)
(45)m=	122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1180.67	(45)
(46)m=	18.36	16.06	16.57	14. <mark>45</mark>	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
Water s	storage	loss:												
Storage		ie (litres)		ig any so		IVVHRS	storage		ame ves	sei		160		(47)
Otherw	ise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:		(1)						(
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If ma	anufact	urer's de	eclared of factor fr	cylinder l	oss fact	or is not	known:							(54)
If comm	nunitv h	age ioss neating s	ee secti	on 4.3		1/11110/02	iy)				0.	02		(51)
Volume	factor	from Tal	ble 2a								1.	03		(52)
Tempe	rature f	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 s	storage	loss cal	culated f	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 cylinde	r 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 Append	lix 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	inual) fro	om Table	93							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m		_			
mod) ۲	lified by	factor fi	om Tab	le H5 if t I	here is s	solar wat	ter heati	ng and a	ı cylinde	r thermo	stat)	-	I	· ·
(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 ca	alculated	for eac	h month	(61)m =	(60) ÷ 3	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	for eac	ch month	(62)m =	• 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	IW input	calculated	using Ap	pendix G o	r Appendix	H (nega	tive quantity	/) (enter 'C	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applies	s, see Ap	pendix (G)			-	_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	vater hea	ter											
(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		
							-	Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	om water	heating	ı, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57))m in calo	ulation	of (65)m	only if c	ylinder	is in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic daii	ns (Table	5). Wa	tts	,									
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9 d	r L9a), a	lso see	Table 5					
(67)m=	2 <mark>3.08</mark>	20.5	16.67	12.62	9.44	7.97	8.61	11.19	15.02	19.07	22.26	23.72		(67)
Appliar	nces aa	ains (calc	ulated i	n Appen	dix L. ea	uation I	13 or L1	3a), also	see Ta	ble 5			I	
(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)
Cookin	a dains	s (calcula	ited in A	ppendix	L equat	ion 15	or L 15a	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 fa	ins gains	(Table	5a)				I						
(70)m=					0	0	0	0	0	0	0	0	l	(70)
		Vanoratio		l ative valu	L es) (Tab	le 5)	-				_		l	
(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	l	(71)
Water	heating		able 5)										l	. ,
(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	l	(72)
Total i	ntorna	Lasine –				(66	$h_{0}^{0} + (67)m_{0}^{0}$	1 + (68)m	+ (69)m +	(70)m + (7	(1)m + (72)	m	ł	. ,
(73)m-	301 43	298.67	287 32	270.04	253 14	237.3	227 53	233.43	242 91	260.36	279.8	293 73	I	(73)
6 Sol	ar gain	S.	207.02	210.01	200.11	20110	221.00	200.10	2 12:01	200.00	210.0	200.10		(- /
Solar g	ains are	calculated	using sol	ar flux from	Table 6a	and asso	ciated equa	itions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area	l	FI	, xu		q		FF		Gains	
		Table 6d		m²		Та	able 6a	Т	able 6b	Т	able 6c		(VV)	
North	0.9x	0.77)	0.3	39	x	10.63	x	0.85	☐ x [0.7	=	1.71	(74)
North	0.9x	0.77	,	. 0.:	39	x	20.32	i x 🗖	0.85	╡ <u> </u>	0.7		3.27	(74)
North	0.9x	0.77	,	0.;	39	x	34.53	x [0.85	=	0.7	=	5.55	(74)
North	0.9x	0.77	<u> </u>	0.:	39	x	55.46	;	0.85	╡╷╞	0.7		8.92	(74)
North	0.9x	0.77	,	. 0.:	39	x	74.72	i × 🗆	0.85	╡ × Г	0.7	=	12.02	(74)

North	0.9x	0.77		x	0.3	9	x	7	9.99	x	0.8	85) × [0.7		=	12.86	(74)
North	0.9x	0.77		x	0.3	9	x	7	4.68	x	3.0	85] × [0.7		= [12.01	(74)
North	0.9x	0.77		x	0.3	9	x	5	59.25	x	3.0	85	_ × [0.7		= [9.53	(74)
North	0.9x	0.77		x	0.3	9	×	4	1.52	x	3.0	85] × [0.7		= [6.68	(74)
North	0.9x	0.77		x	0.3	9	x	2	24.19	x	3.0	85	_ × [0.7		= [3.89	(74)
North	0.9x	0.77		x	0.3	9	x	1	3.12	x	3.0	85	_ × [0.7		= [2.11	(74)
North	0.9x	0.77		x	0.3	9	x	6	8.86	x	3.0	85	_ × [0.7		= [1.43	(74)
South	0.9x	0.77		x	9.0	3	x	4	6.75	x	0.7	76	×	0.7		= [155.64	(78)
South	0.9x	0.77		x	9.0	3	x	7	6.57	x	0.7	76	x	0.7		= [254.91	(78)
South	0.9x	0.77		x	9.0	3	x	g	97.53	x	0.7	76) × [0.7		=	324.7	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.23	x	0.7	76	_ × [0.7		=	366.99	(78)
South	0.9x	0.77		x	9.0	3	x	1	14.87	x	0.7	76	x	0.7		=	382.42	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.55	x	0.7	76] × [0.7		=	368.03	(78)
South	0.9x	0.77		x	9.0	3	x	1	08.01	x	0.7	76) × [0.7		=	359.59	(78)
South	0.9x	0.77		x	9.0	3	x	1	04.89	x	0.7	76) × [0.7		= [349.21	(78)
South	0.9x	0.77		x	9.0	3	x	1	01.89	x	0.7	76) × [0.7		=	339.19	(78)
South	0.9x	0.77		x	9.0	3	x	8	32.59	x	0.7	76	x	0.7		= [274.94	(78)
South	0.9x	0.77		x	9.0	3	×	5	5.42	x	0.7	76	×	0.7		=[184.49	(78)
South	0.9x	0.77		x	9.0	3	x		40.4] x	0.7	76	×	0.7		= [134.49	(78)
Solar (<mark>gain</mark> s in	watts, <mark>ca</mark>	alcula	ted	for eacl	n mon	th			(83)m	n = Sum(74)m	. <mark>(8</mark> 2)m					(22)
(83)m=	157.35	258.17	330.2	26	375.91	394.44	4 3	80.89	371.6	358	.74 34	5.87	278.83	186.6	135	5.92		(83)
Total	gains – I	nternal a		Diar	(84)m =	: (73)n	1 + (83)m	, watts	500	47 50	0.70	500.40	400.4	1 400	0.05		(0.4)
(84)m=	458.78	556.84	617.5	58	645.94	647.5	5 6	518.2	599.13	592	.17 58	58.78	539.19	466.4	429	9.65		(04)
7. Me	ean inter	rnal temp	eratu	ire (heating	seaso	on)									F		
Temp	perature	during h	eatin	g pe	eriods ir	the li	ving	area	from Tab	ole 9	, Th1 (°	°C)					21	(85)
Utilis	ation fac	ctor for g	ains f	or li	ving are	a, h1,	m (s	ee Ta	ible 9a)	. .				<u> </u>				
()	Jan	Feb	Ma	ar	Apr	Ma	/	Jun	Jul	A	ug S	Sep	Oct	Nov)ec		(00)
(86)m=	1	1	0.99	9	0.99	0.98		0.94	0.88	0.8	39 0	.96	0.99	1	,	1		(00)
Mear	n interna	l temper	ature	in li	iving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able 90	c)						()
(87)m=	18.41	18.6	18.9	5	19.43	19.92		20.4	20.7	20.	67 20	0.29	19.64	18.96	18	3.4		(87)
Temp	perature	during h	eatin	g pe	eriods ir	rest o	of dw	elling	from Ta	able 9	9, Th2 ((°C)			_			
(88)m=	18.93	18.94	18.9	5	18.99	19	1	9.05	19.05	19.	06 19	9.03	19	18.99	18.	.97		(88)
Utilis	ation fac	ctor for g	ains f	or r	est of d	welling	j, h2	,m (se	e Table	9a)								
(89)m=	1	0.99	0.99	9	0.98	0.96		0.87	0.68	0.7	71 0	.91	0.98	0.99	,	1		(89)
Mear	n interna	l temper	ature	in t	he rest	of dwe	elling	T2 (f	ollow ste	eps 3	to 7 in	Table	e 9c)					
(90)m=	16.71	16.91	17.2	6	17.77	18.26		18.75	18.98	18.	97 18	8.64	, 17.99	17.3	16	.73		(90)
	·								•	•		fL	A = Liv	ing area ÷	(4) =		0.47	(91)
Mear	n interna	l temper	ature	(for	the wh	ole dw	ellin	a) = fl	LA x T1	+ (1	– fLA) :	x T2				L		
(92)m=	17.51	17.71	18.0	6	18.55	19.04		19.53	19.79	19.	77 19	9.42	18.77	18.08	17.	.52		(92)
	L	1							1					1	-			

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter	mperatui using Ta	re obtain able 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor 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)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	< [(93)m-	– (96)m]				
(97)m=	2787.46	2691.51	2417.34	1975.04	1495.61	981.87	635.17	668.14	1068.9	1664.17	2256.73	2761.2		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	th = 0.02	4 x [(97)	m – (95)m] x (4	1)m			
(98)m=	1733.78	1437.04	1344.51	967.1	652.25	0	0	0	0	845.43	1291.15	1735.6		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	10006.86	(98)
Space	e heatin	g require	ement in	kWh/m ²	²/year								196.21	(99)
9b En	erav rea	uiremer	nts – Cor	mmunitv	heating	scheme						I		7
This pa	art is use	ed for sp	ace hea	iting spa	ace cooli	ng or wa	ater heat	ing prov	ided by a	a comm	unity sch	neme		
Fractic	on of spa	ace heat	from se	condary,	/supplen	nentary l	neating	Table 1	1) '0' if n	one			0	(301)
Fractic	on of spa	ace heat	from co	mmunity	v system	1 - (301	1) =						1	(302)
The con	nmunitv so	cheme ma	v obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four (other heat	sources: tl	ne latter	1
includes	boilers, h	eat pumps	s, geotherr	mal and wa	aste heat f	rom powei	r stations. S	See Apper	ndix C.					_
Fractic	on of hea	at from C	Commun	ity boiler	rs								1	(303a)
Fractic	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting syst	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for a	commun	ity heatir	ng syster	m					1.1	(306)
Space	heating	g											kWh/year	_
Annua	l space	heating	requirem	nent									10006.86	
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	11557.93	(307a)
Efficier	ncy of se	econdary	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment froi	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h	j neating r	equirem	ent									1831.51	1
lf DHW Water	/ from c heat fro	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30)3a) x (30	5) x (306) =	=	2115.39	(310a)
Electri	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(310e)] =	136.73	(313)
Coolin	g Syster	m Energ	y Efficiei	ncy Rati	0								0	(314)
Space	cooling	(if there	is a fixe	d coolin	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electri mecha	city for p nical ve	oumps aintilation	nd fans v - balanc	within dv ed, extra	velling (1 act or po	able 4f) 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)				407.66	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh	Emi kg C	ssions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	two fuels repeat (363) to (366) for the second fu	el	65	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	=	4543.75	(367)
Electrical energy for heat distribution [(313) x	0.52	=	70.96	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372)		=	4614.71	(373)
CO2 associated with space heating (secondary) (3	09) 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	73) + (374) + (375) =			4614.71	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	- [0	(378)
CO2 associated with electricity for lighting (3	32))) 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)

		ι	Jser De	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	2	5	Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
	landen	Pro	perty A	ddress:	Unit 5					
Address :	, london									
Basement	1510115.		Area	(m²) 28	(1a) x	Av. Hei	ight(m) .08	(2a) =	Volume(m ³ 522.24	') (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)	+(1n)	12	28	(4)	L				
Dwelling volume		~ /	L		(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	522.24	(5)
2. Ventilation rate:	-									
Number of chimneys Number of open flues	$\begin{array}{c} main & se \\ heating & he \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	condary eating 0	+ +	0 0] = [total 0 0	× 4	40 = 20 =	0 0	(6a) (6b)
Number of intermittent fan	s Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa Landa L					3	x 1	I0 = [30	(7a)
Number of passive vents	-						x 1	 0 = 0		
Number of passive vents					Ļ	0			0	(70)
number of flueless gas fire) ((ch) ((7c))	1 (7b) 1 (7c			0		Air ch	0 anges per ho	(7c)
Inflitration due to chimney	s, flues and fans = (ba)	(b) + (b) + (7a)	+(70)+(70)	c) = herwise c	ontinuo fr	30	(16)	÷ (5) =	0.06	(8)
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dwelling (ns) 25 for steel or timber fi	rame or 0	.35 for 1	masonr	y constru	uction	[(9)-	·1]x0.1 =	0 0 0	(9) (10) (11)
deducting areas of opening	gs); if equal user 0.35		ie greater	wall alea	a (allel					
If suspended wooden flo	oor, enter 0.2 (unseale	ed) or 0.1	(sealed	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 str	ipped		05 10 0		0.01			0	(14)
Window infiltration			0	.25 - [0.2	x (14) ÷ 1	[00] =	(45)		0	(15)
Inflitration rate	EQ averaged in subi	a matraa	oor hou	5) + (10) +	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
If based on air permeabilit	po, expressed in cubi	2 metres () ÷ 20]+(8).	otherwise	ir per so e (18) = (*	uare m 16)	elle ol e	nvelope	area	20	(17)
Air permeability value applies	if a pressurisation test has	been done o	or a degr	ee air per	meability i	s being us	sed	l	1.06	
Number of sides sheltered			-	·	-	-			2	(19)
Shelter factor			(2	20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	ng shelter factor		(2	21) = (18)	x (20) =			[0.9	(21)
Infiltration rate modified fo	r monthly wind speed									
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7						r			
(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	1					I			
(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 sł	nelter an	d wind s	peed) =	: (21a) x	(22a)m					
1.15	1.12	1.1	0.99	0.97	0.85	0.85	0.83	0.9	0.97	1.01	1.06		
Calculate effect	ctive air i	change i tion.	rate for t	he appli	cable ca	se			-	-	-	-	(00-)
If exhaust air be			andix N (2	3h) - (23a	a) v Emv (e	auation (N5)) othe	nwise (23h	(232)			0	(23a)
If balanced with	best reco		iency in %	(200) = (200)	$\frac{1}{2}$ or in-use f	actor (from	n Table 4h) –) – (23a)			0	(23D)
								n) —	0h)	00h) [/	1 (00 a)	0	(23c)
a) If balance							HR) (248 1	a)m = (2, 1)	20)m + (. 1	23D) × [*	1 - (23C)	i ÷ 100j 1	(24a)
(24a)m= 0	0	0			0	0					0	J	(24d)
b) If balance							VIV) (240 1	D)m = (22)	20)m + (/ 	230)		1	(24b)
(24b)m= 0	0	0		0		0			0	0	0	J	(240)
c) If whole h	ouse exit	tract ven	itilation (or positiv	ve input v	/entilatio	c) = (22)	b) $m \pm 0$	5 v (23h				
(24c)m = 0	0.5	0		(200) = (200)		0	$\frac{1}{1}$ 0			/) 0	0	1	(24c)
d) If natural	vontilatio					vontilati	on from		0	Ū	0]	(=)
if (22b)n	r = 1, the	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	22b)m ² x	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		(24d)
Effective air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	ld) in bo	x (25)				1	
(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	1	(25)
													_
				er.	Not Ar	00					k volu		
	area	(m²)	r	95 1 ²	A,r	n ²	W/m2	2K	(W/I	<)	kJ/m ² ·l	K	kJ/K
Doo <mark>rs Ty</mark> pe 1					2.8	x	1.4	=	3.92				(26)
Doo <mark>rs Ty</mark> pe 2					1.5	X	1.4		2.1	F			(26)
Windows Type	1				17.35		/[1/(4.8)+	- 0,04] =	69.87	F			(27)
Windows Type	2				2.48		/[1/(1.6)+	- 0.04] =	373	H			(27)
Windows Type	3				1.5		/[1/(4.8)+	- 0.041 –	6.04	\exists			(27)
Floor	•				1.0		0.70		101 12				(28)
	74.0		40.0		120		0.79		101.12	╡╏		\dashv	(20)
	74.2	.0	18.8	<u>></u>	55.41		2.1		116.36	╡╎		\dashv	(29)
	46.4	4	5.28		41.12	<u> </u>	0.28	=	11.51	╡╎		\dashv	(29)
vvalis Type3	71.1	6	1.5		69.66	5 X	2.1	=	146.29			\dashv	(29)
Walls Type4	5.34	4	0		5.34	X	0.3	=	1.6			$_$ $_$	(29)
Roof	17		0		17	x	0.1	=	1.7				(30)
Total area of e	lements	, m²			342.1	6							(31)
Party wall					22.1	x	0	=	0				(32)
* for windows and	roof winde	ows, use e sides of ir	effective wi	ndow U-va	alue calcul	ated using	g formula f	1/[(1/U-valu	ue)+0.04] a	ns given in	paragraph	1 3.2	
Fabric heat los	s. W/K =	= S (A x	U)	o ana pan			(26)(30) + (32) =				464 '	24 (33)
Heat capacity	Cm = S(Axk)	- /					((28).	(30) + (32	2) + (32a).	(32e) =		(34)
Thermal mass	parame	ter (TMF	² = Cm -	- TFA) ir	ו kJ/m²K			Indica	ative Value:	: High	. /	450	(35)
	•	`		,									· · /

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

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(36)

if detail	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)			(22)	(26) -				
Vontil	abitic he	al 1055	alaulataa	Imanthl					(33) +	(50) =	25)m v (5)		516.24	(37)
ventila					y May	lun	lul	Δυσ	(38)m	$= 0.33 \times ($	25)m x (5)	Dec	1	
(38)m=	197.5	193.63	189.76	170.4	166.62	149	149	145.73	155.79	166.62	174.27	182.01		(38)
Heat t	ransfer (L	nt W/K						(39)m	= (37) + (3	1 38)m		1	
(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	1	
					1	I				Average =	Sum(39)1		686.26	(39)
Heat I	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)		_	
(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		_
Numb	er of day	/s in mo	nth (Tab	le 1a)						Average =	Sum(40)1	12 /12=	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. W	ater hea	ting ene	rgy requ	irement:								kWh/y	ear:	
Accur		IDODOV	NI										1	(40)
if TF	FA > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	.9)	89	J	(42)
if TF	-A £ 13.	9, N = 1				·							_	
Annua	al averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36 a water us	se target o	10	2.83		(43)
not mor	e that 125	litres per	person pe	day (all w	ater use, l	hot and co	ld)		a water at	se larger o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	ter usage i	n litres per	r day for ea	ach m <mark>onth</mark>	Vd,m = fa	ctor from T	Table 1c x	(43)					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		
			<u> </u>							Total = Su	m(44) ₁₁₂ =	=	1 <mark>2</mark> 33.94	(44)
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	_	
(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		_
lf instar	tanoous	ator hooti	na ot point	of uso (n	hot wata	r storago)	ontor 0 in	boxos (16) to (61)	Total = Su	m(45) ₁₁₂ =	=	1617.89	(45)
						siorage),							1	(40)
(46)m= Water	25.16 storage	22.01	22.71	19.8	19	16.39	15.19	17.43	17.64	20.56	22.44	24.37	J	(46)
Storag	ge volum	e (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		160]	(47)
If com	- munity h	eating a	and no ta	ink in dw	velling, e	nter 110	litres in	(47)					1	
Other	wise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:											-	
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b								0		(49)
Energ	y lost fro	m water	storage	, kWh/y	ear			(48) x (49)) =		1	10		(50)
D) IT N Hot w	nanutaci ater stor	urer's de age loss	eclared (om Tabl	ioss fact le 2 (kW	or is not h/litre/da	KNOWN:				0	02	1	(51)
If com	munity h	leating s	ee secti	on 4.3	0 2 (101	n, na 0, ac	'y /				0.	.02	J	(01)
Volum	, ne factor	from Ta	ble 2a								1.	03]	(52)
Temp	erature f	actor fro	m Table	2b							0	.6]	(53)
Energ	y 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 cal	culated	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 cylind	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	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)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3					-		0		(58)
Prima	y circuit	loss cal	culated	for each	month ((59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	1
(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 D	HW input	calculated	using App	endix G o	r Appendix	(H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	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)₁	12	2268.73	(64)
Hea <mark>t g</mark>	lains fro	m water	heating	, kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)n	ı + (61)n	n] + 0.8 x	(<mark>46)m</mark> (+ (57)m	+ (59)m	1	
(65)m=	74.38	65.5 <mark>9</mark>	68.95	61.89	60.72	54.35	52.28	57.25	57.11	6 <mark>4.18</mark>	67.75	72.62		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	s (Table	<u>5), Wat</u>	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48		(66)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	45.52	40.43	32.88	24.89	18.61	15.71	16.97	22.06	29.61	37.6	43.88	46.78		(67)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m=	295.29	298.36	290.64	274.2	253.45	233.94	220.91	217.85	225.57	242.01	262.76	282.26		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a), also se	e Table	5			_	
(69)m=	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45		(69)
Pumps	s and fai	ns gains	(Table &	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatio	on (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58	-115.58		(71)
Water	heating	gains (T	able 5)										-	
(72)m=	99.98	97.6	92.67	85.96	81.61	75.48	70.27	76.95	79.32	86.26	94.1	97.61		(72)
													-	
Total	internal	gains =				(66))m + (67)n	n + (68)m -	+ (69)m +	(70)m + (7	(1)m + (72)	m		
Total i (73)m=	nternal 507.13	gains = 502.73	482.53	451.4	420.01	(66) 391.48)m + (67)m 374.5	1 + (68)m - 383.2	+ (69)m + 400.85	(70)m + (7 432.21	1)m + (72) 467.08	493		(73)

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

Orienta	ition:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.48	×	10.63) ×	0.76	×	0.7] =	9.72	(74)
North	0.9x	0.77	x	2.48	×	20.32	x	0.76	×	0.7	=	18.58	(74)
North	0.9×	0.77	x	2.48	×	34.53	x	0.76	×	0.7] =	31.57	(74)
North	0.9x	0.77	x	2.48	×	55.46	x	0.76	×	0.7] =	50.71	(74)
North	0.9x	0.77	x	2.48	×	74.72	x	0.76	×	0.7	=	68.31	(74)
North	0.9x	0.77	x	2.48	×	79.99	x	0.76	×	0.7] =	73.13	(74)
North	0.9x	0.77	x	2.48	×	74.68	x	0.76	×	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	×	41.52	x	0.76	×	0.7	j =	37.96	(74)
North	0.9x	0.77	x	2.48	x	24.19	x	0.76	x	0.7	1 =	22.12	(74)
North	0.9x	0.77	x	2.48	×	13.12	x	0.76	×	0.7	1 =	11.99	(74)
North	0.9x	0.77	x	2.48	×	8.86	x	0.76	×	0.7	1 =	8.1	(74)
South	0.9×	0.77	x	17.35	x	46.75	x	0.85	x	0.7	i =	334.46	(78)
South	0.9x	0.77	x	17.35	×	76.57	x	0.85	×	0.7	i =	547.77	(78)
South	0.9×	0.77	x	17.35	x	97.53	x	0.85	x	0.7	i =	697.76	(78)
South	0.9×	0.77	x	17.35	×	110.23	x	0.85	х	0.7	1	788.62	(78)
Sout <mark>h</mark>	0.9×	0.77	x	17.35	x	114.87	x	0.85	x	0.7	i -	821.79	(78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	110.55	i 🖌	0.85	x	0.7	i =	790.86	- (78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	108.01	x	0.85	x	0.7	1 =	772.72	(78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	104.89	x	0.85	x	0.7	=	750.42	– (78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	101.89	×	0.85	x	0.7	i =	728.89	 (78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	82.59	x	0.85	x	0.7	i =	590.82	(78)
South	0.9×	0.77	x	17.35	×	55.42	x	0.85	×	0.7	i =	396.45	(78)
South	0.9x	0.77	x	17.35	×	40.4	x	0.85	×	0.7] =	289.01	– (78)
West	0.9×	0.77	x	1.5	x	19.64	x	0.85	x	0.7	i =	12.15	(80)
West	0.9x	0.77	x	1.5	×	38.42	x	0.85	x	0.7	1 =	23.76	(80)
West	0.9x	0.77	x	1.5	×	63.27	x	0.85	×	0.7	1 =	39.13	(80)
West	0.9x	0.77	x	1.5	×	92.28	x	0.85	×	0.7	i =	57.08	(80)
West	0.9×	0.77	x	1.5	×	113.09	x	0.85	×	0.7	j =	69.95	(80)
West	0.9×	0.77	x	1.5	x	115.77	x	0.85	x	0.7	i =	71.6	(80)
West	0.9×	0.77	x	1.5	x	110.22	x	0.85	x	0.7	i =	68.17	(80)
West	0.9x	0.77	x	1.5	×	94.68	x	0.85	×	0.7	1 =	58.56	(80)
West	0.9x	0.77	x	1.5	×	73.59	x	0.85	×	0.7] =	45.52	(80)
West	0.9x	0.77	x	1.5	×	45.59	x	0.85	×	0.7	j =	28.2	(80)
West	0.9x	0.77	x	1.5	x	24.49	İ x	0.85	×	0.7	j =	15.15	(80)
West	0.9x	0.77	x	1.5	×	16.15	l x	0.85	×	0.7	i =	9.99	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m=	356.33	590.11	768.46	896.41	960.05	935.6	909.17	863.14	812.37	641.13	423.6	307.1	(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	⊦ (83)m	, watts						-
(84)m=	863.47	1092.84	1250.99	1347.8	1380.06	1327.07	1283.67	1246.35	1213.21	1073.34	890.68	800.1	(84)

7. Mean internal temperature (heating season)														
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	ble 9a)					I		
	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	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	r in Table	e 9c)					
(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	durina h	eating p	eriods ir	rest of	dwellina	from Ta	ble 9 Tl	n2 (°C)					
(88)m=	18.21	18.23	18.24	18.32	18.33	18.4	18.4	18.41	18.37	18.33	18.3	18.27		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling l	n2 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		(89)
Mean	interna	l I temper	ature in	the rest	of dwelli	na T2 (f	l ollow ste	une 3 to 7	T in Tahl	ـــــــــــــــــــــــــــــــــــــ				
(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		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.36	(91)
Maan	intorno	ltompor	oturo (fo	r tha wh	مام طيروا	ling) fl	ΔΤ4	, (1 fl	A) TO			l		
	16 27	16 49		17 51	18 12	18 74		+ (1 – 1L	A) X IZ	17.8	16.08	16.31		(92)
	adiustr	nent to t	he mear	internal	temper	ature fro	m Table	4e whe			10.00	10.01		(0-)
(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)
8. Spa	ace hea	ting regi	uirement											
Set Ti	i to the r	mean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(1	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										62.00
(94)m=	1	0.99	0.99	0.98	0.96	0.92	0.81	0.83	0.94	0.98	1	1		(94)
Usefu	Il gains,	hmGm	, W = (94	4)m x (84	4)m									(05)
(95)m=	860.91	1086.77	1238.76	1323.83	1330.27	1216.5	1035.48	1038.91	1142	1056.28	886.33	798.23		(95)
Montr	nly avera	age exte	rnal tem	perature		able 8	16.6	16.4	111	10.6	74	4.2		(06)
	4.3	4.9	0.5	0.9		14.0	[(20)m)	10.4	(06)m	10.6	7.1	4.2		(30)
(97)m-	8546 27	8226.8	7339.05	5013 0	4382 20	_111 , VV =	1653 59	1759 51	- (90)III 3021 12	4917.46	6823.00	8453 98		(97)
Space	heatin		ment fo	r each m	-1002.20	N/h/mont	h = 0.02	24 x [/97]	m = (95))ml v (4^{\prime})	1)m	0400.00		(0.)
(98)m=	5717.9	4798.1	4538.62	3304.85	2270.7	0	0.02		0	2872.72	4275.12	5695.88		
(/					-	-	-	Tota	l per vear	(kWh/vear) = Sum(9	8)1 59 12 =	33473.89	(98)
Snoo	a hoatin	a roquir	omont in	$kM/h/m^2$	woor					(,(-	- / 1	261 51	
Space	eneaun	y require			year							l	201.01	(33)
96. En	ergy rec	quiremer	nts – Cor	nmunity	heating	scheme								
Fractio	art is use In of spa	ed for sp ace heat	ace hea from se	ting, spa condary/	ace cooli /supplem	ng or wa nentary ł	ater heat heating (ing prov Table 1	ided by a 1) '0' if n	a commi one	unity scr	neme.	0	(301)
Fractio	n of spa	ace heat	from co	, mmunitv	system	- 1 – (301	1) =					l	1	(302)
The corr	nmunitv so	cheme ma	v obtain he	eat from se	everal sour	ces. The r	, procedure	allows for	CHP and i	up to four a	other heat	sources: fl	he latter	` ´
includes	boilers, h	eat pumps	s, geotherr	nal and wa	aste heat fi	rom power	r stations.	See Apper	ndix C.					

Fraction of heat from Community boilers

1 (303a)

Fraction of total space heat from Commur	nity boilers		(302) x (303a) =		1	(304a)
Factor for control and charging method (T	able 4c(3)) for community he	ating system			1.05	(305)
Distribution loss factor (Table 12c) for con	nmunity heating system				1.1	(306)
Space heating					kWh/year	,
Annual space heating requirement					33473.89	
Space heat from Community boilers		(98) x (304a) x (3	305) x (306) =		38662.34	(307a)
Efficiency of secondary/supplementary he	ating system in % (from Table	e 4a or Append	lix E)		0	(308
Space heating requirement from seconda	ry/supplementary system	(98) x (301) x 10	0 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				Γ	2268.73	1
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (3	305) x (306) =		2620.38	(310a)
Electricity used for heat distribution	0.01	1 × [(307a)(307e) + (310a)(310e)]	=	412.83	(313)
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling s	ystem, if not enter 0)	= (107) ÷ (314) =	:		0	(315)
Electricity for pumps and fans within dwell mechanical ventilation - balanced, extract	ing (Table 4f): 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) + (330b)) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix	(L)				803.82	(332)
12b. CO2 Emissions – Community heating	g scheme					1
	En kW	ergy /h/year	Emission factor kg CO2/kWh	or En kg	nissions CO2/year	
CO2 from other sources of space and wat Efficiency of heat source 1 (%)	er heating (not CHP) If there is CHP using two fuel	s repeat (363) to (3	366) for the second	fuel	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 sys	stems (363)(3	66) + (368)(372)		= [13932.82	(373)
CO2 associated with space heating (seco	ndary) (309) x		0	= [0	(374)
CO2 associated with water from immersio	n heater or instantaneous he	ater (312) x	0.22	= [0	(375)
Total CO2 associated with space and wat	er heating (373) + (3	374) + (375) =		[13932.82	(376)
CO2 associated with electricity for pumps	and fans within dwelling (33	1)) x	0.52	= [0	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= [417.18	_ (379)
Total CO2, kg/vear	um of (376)(382) =				14350.01	(383)
Dwelling CO2 Emission Rate	383) ÷ (4) =				112.11	(384)
El rating (section 14)					17.71	(385)

		L	Jser De	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	2	9	Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
		Pro	perty A	ddress:	Unit 6					
Address :										
1. Overall dwelling dimer	nsions:		-	(a)						
Bacamont			Area	(m²)	(10)	Av. He			Volume(m ³)	
	\ . / 4 L \ . / 4 - \ . / 4 - \ . / 4 -	. (4)	2	47	(ia) x	4.	.09	(2a) =	1010.23	(38)
Total floor area $IFA = (1a)$	l)+(1b)+(1c)+(1d)+(1e)	+(1n)	2	47	(4) (2-) : (25)) . (2 -) .	(2)		-
					(38)+(30)	1+(30)+(30)+(3e)+	.(31) =	1010.23	(5)
2. Ventilation rate:				. 4		4 - 4 - 1				
	heating he	condary eating	C	otner		total			m ³ per nou	,
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	× 2	20 =	0	(6b)
Number of intermittent fan	IS					4	x ^	10 =	40	(7a)
Number of passive vents					Г	0	x ^	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges <mark>per</mark> ho	ur
Infiltration due to chimney	s, flues and fans = (6a)+(6b)+(7a)+	+ <mark>(7</mark> b)+(7	(C) =		40		÷ (5) =	0.04	(8)
If a pressurisation test has be	en carried out or is intended	d, proceed to	o (17), oi	therwise c	ontinue fro	om (9) to (16)			
Additional infiltration	e dwelling (lis)						[(9)-	-11x0.1 =	0	(9)
Structural infiltration: 0.2	25 for steel or timber fr	ame or 0.	.35 for	masonr	v constr	uction	[(0)	1,100.1 -	0	$= \frac{1}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1}$
if both types of wall are pre	esent, use the value corresp	onding to th	e greate	er wall area	a (after			I		
deducting areas of opening	gs); if equal user 0.35	d) or 0.1		d) alaa	ontor O			I		
If suspended wooden in	001, enter 0.2 (unseale	u) 01 0. 1	(Sealed	u), eise					0	$ = \begin{bmatrix} (12) \\ - \\ (12) \end{bmatrix} $
Percentage of windows	and doors draught str	ipped							0	$\int_{(14)}^{(13)}$
Window infiltration		ippou	C	0.25 - [0.2	x (14) ÷ 1	00] =			0	$1^{(17)}_{(15)}$
Infiltration rate			((8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubi	c metres p	per hou	ur per so	quare m	etre of e	nvelope	area	20	– (17)
If based on air permeabilit	ty value, then (18) = [(17) ÷ 20]+(8),	otherwis	se (18) = (16)				1.04	(18)
Air permeability value applies	if a pressurisation test has	been done d	or a degi	ree air per	meability i	is being us	sed			_
Number of sides sheltered	b		((20) - 1 [0 075 v (1	0)] _			1	(19)
Sheller lactor	na choltor footor		((20) = 1 - [0.075 X (1	9)] =			0.92	(20)
Inititration rate incorporation	ng sneiter lactor		((21) = (10)	x (20) =			ļ	0.96	_(21)
	or monthly wind speed	luna	11	A	Can	Oct	Nev			
		Jun	Jui	Aug	Sep	001	INOV	Dec		
Monthly average wind spe		2.0	2.0	27	4	4.2	4.5	47		
	1.3 4.4 4.3	3.0	5.0	J.I	4	4.3	4.0	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		

Adjusted	infiltra	tion rate	e (allowi	ng for sh	nelter and	d wind s	peed) =	: (21a) x	(22a)m					
	1.23	1.2	1.18	1.06	1.03	0.91	0.91	0.89	0.96	1.03	1.08	1.13		
Calculate	e effect	tive air i Lvontilo	change i	rate for t	he applic	cable ca	se			-			- 	(22.0)
If exhaus	st air he	at pump i	using Appe	endix N (2	3b) = (23a) x Fmv (e	equation (N5)) othe	rwise (23h	(23a) = (23a)) (238)
If balanc	ed with	heat reco	overv: effic	iencv in %	allowing fo	or in-use fa	actor (fro	n Table 4h) =	<i>,)</i> = (200)) (23c)
a) If ha	lancer	d mecha	anical ve	ntilation	with her	at recove	⊳rv (M\/	HR) (24a	/ a)m = (2	2h)m + (23h) x [1 – (23c)	⊥ 1001	(200)
(24a)m=		0		0	0	0	0					0		(24a)
b) If ba	lanced	d mecha	ı anical ve	entilation	without	heat rec	overv (1 MV) (24b	m = (2)	1 2b)m + (;	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If wh	nole ho	ouse ext	tract ver	tilation o	positiv	e input v	/entilati	on from a	outside	I		I	1	
if (22b)m	< 0.5 ×	(23b), t	hen (240	c) = (23b); otherv	vise (24	-c) = (22k	o) m + 0	.5 × (23b))		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If na if (:	atural v 22b)m	entilation = 1, the	on or wh en (24d)	ole hous m = (22t	e positiv c)m othe	ve input v rwise (24	ventilati 4d)m =	on from l 0.5 + [(2	oft 2b)m² x	0.5]				
(24d)m=	1.23	1.2	1.18	1.06	1.03	0.92	0.92	0.9	0.96	1.03	1.08	1.13		(24d)
Effectiv	ve air d	change	rate - er	nter (24a) or (24b) or (24d	c) or (24	ld) in bo	x (25)	-	-	-	-	
(25)m=	1.23	1.2	1.18	1.06	1.03	0.92	0.92	0.9	0.96	1.03	1.08	1.13		(25)
3. Heat	losses	and he	eat loss r	paramete	er:									
3. Heat	losses NT	and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs 1 ²	Net Are A ,n	ea n²	U-valı W/m2	ue 2K	A X U (W/I	K)	k-value kJ/m²-l	e K	A X k kJ/K
3. Heat ELEME Doors Ty	Iosses NT /pe 1	and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs 1 ²	Net Are A ,n 13.1	ea n² X	U-valı W/m2	ue :K =	A X U (W/I 39.3	K)	k-value kJ/m²-l	e K	A X k kJ/K (26)
3. Heat ELEME Doors Ty Doors Ty	Iosses NT vpe 1 vpe 2	and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs 2	Net Arc A ,n 13.1 13.1	ea n² X	U-valu W/m2	ue :K = =	A X U (W/I 39.3 39.3	k)	k-value kJ/m²+l	÷ K	A X k kJ/K (26) (26)
3. Heat ELEME Doors Ty Doors Ty Doors Ty	iosses NT vpe 1 vpe 2 vpe 3	and he Gros area	eat loss ; ss (m²)	Daramete Openin m	er: gs 2	Net Ard A ,n 13.1 13.1 13.1	ea n² X X	U-valu W/m2 3 3 3	ue 2K = =	A X U (W/I 39.3 39.3 39.3	K)	k-value kJ/m²·l	e K	A X k kJ/K (26) (26) (26)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Doors Ty	iosses NT vpe 1 vpe 2 vpe 3 vpe 4	and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs ,2	Net Ard A ,n 13.1 13.1 13.1 2.5	ea n ² × × ×	U-valu W/m2 3 3 3 1.4	ue :K = = =	A X U (W/I 39.3 39.3 39.3 3.5	K)	k-value kJ/m²-l	⇒ ≺	A X k kJ/K (26) (26) (26) (26)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Doors Ty Windows	rpe 1 rpe 2 rpe 3 rpe 4 s Type	and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs ,2	Net Are A ,n 13.1 13.1 13.1 2.5 17.22	ea n ² × × × ×	U-valu W/m2 3 3 3 1.4 /[1/(4.8)+	ue K = = = = 0.04] =	A X U (W/I 39.3 39.3 39.3 39.3 3.5 69.34	K)	k-value kJ/m²·l	e K	A X k kJ/K (26) (26) (26) (26) (27)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows	vpe 1 vpe 2 vpe 3 vpe 4 s Type	and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs 2	Net Are A ,n 13.1 13.1 13.1 2.5 17.22 0.6	ea n ² × × × × ×	U-valu W/m2 3 3 1.4 /[1/(4.8)+	ue K = = = = 0.04] =	A X U (W/I 39.3 39.3 39.3 39.3 3.5 69.34 2.42	K)	k-value kJ/m²-l	e K	A X k kJ/K (26) (26) (26) (26) (27) (27)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Windows	vpe 1 vpe 2 vpe 3 vpe 4 s Type s Type s Type	and he Gros area 1 2 3	eat loss p ss (m²)	Openin M	er: gs ,2	Net Ard A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6	ea n ² × × × × × ×	U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+	ue !K = = = = 0.04] = 0.04] =	A X U (W/I 39.3 39.3 39.3 3.5 69.34 2.42 24.16	K)	k-value	€ K	A X k kJ/K (26) (26) (26) (26) (27) (27) (27)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Windows Windows	vpe 1 vpe 2 vpe 3 vpe 4 s Type s Type s Type	and he Gros area 1 2 3 102.	eat loss p ss (m ²)	Openin M	er: gs , ²	Net Ard A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6 39.48	ea n ² × × × × × × ×	U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+	ue K = = = 0.04] = 0.04] = 0.04] =	A X U (W/I 39.3 39.3 39.3 39.3 3.5 69.34 2.42 24.16 82.91	k)	k-value	×	A X k kJ/K (26) (26) (26) (26) (27) (27) (27) (27)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Windows Windows Walls Typ	vpe 1 vpe 2 vpe 3 vpe 3 vpe 4 s Type s Type s Type pe1 pe2	and he Gros area 1 2 3 <u>102.</u> 54.8	eat loss r ss (m ²)	Openin M 63.12	er: gs , ²	Net Are A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6 39.48 54.8	ea n ² × × × × × ×	U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+	ue K = = = 0.04] = 0.04] = 0.04] = = 0.04] = =	A X U (W/I 39.3 39.3 39.3 39.3 3.5 69.34 2.42 24.16 82.91 15.34		k-value	×	A X k kJ/K (26) (26) (26) (27) (27) (27) (27) (29)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Windows Walls Typ Walls Typ	vpe 1 vpe 1 vpe 2 vpe 3 vpe 4 s Type s Type s Type pe1 pe2 pe3	and he Gros area 1 2 3 102. 54.8 43.5	.6 56	0penin m 63.12 0 2.5	er: gs ,2	Net Are A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6 39.48 54.8 41.06		U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 2.1 0.28 2.1	ue K = = = = 0.04] = = 0.04] = = = = = = =	A X U (W/I 39.3 39.3 39.3 3.5 69.34 2.42 24.16 82.91 15.34 86.23		k-value kJ/m²-l		A X k kJ/K (26) (26) (26) (27) (27) (27) (27) (29) (29)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Walls Ty Walls Ty Walls Ty Walls Ty	vpe 1 vpe 1 vpe 2 vpe 3 vpe 4 s Type s Type s Type pe1 pe2 pe3 pe4	and he Gros area 1 2 3 102. 54.8 43.5 15.0	.6 .6 .6 .6 .5 .5	Openin m 63.12 0 2.5 0	er: gs ,2	Net Ard A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6 39.48 54.8 41.06		U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+	ue K = = = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = =	A X U (W/I 39.3 39.3 39.3 3.5 69.34 2.42 24.16 82.91 15.34 86.23 4.52		k-value kJ/m²-l		A X k kJ/K (26) (26) (26) (26) (27) (27) (27) (27) (27) (29) (29) (29)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Windows Walls Ty Walls Ty Walls Ty Walls Ty Roof	vpe 1 vpe 1 vpe 2 vpe 3 vpe 4 s Type s Type s Type pe1 pe2 pe3 pe4	and he Gros area 1 2 3 102. 43.5 43.5 15.0 85.2	6 6 8 6 1 1 1 1 1 1 1 1 1 1 1 1 1	0penin m 63.12 0 2.5 0 0	er: gs ,2 2	Net Ard A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6 39.48 54.8 41.06 15.05 85.21		U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+	ue K = = = = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	A X U (W/I 39.3 39.3 39.3 39.3 3.5 69.34 2.42 24.16 82.91 15.34 86.23 4.52 195.98		k-value kJ/m²-I		A X k kJ/K (26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (29)
3. Heat ELEME Doors Ty Doors Ty Doors Ty Windows Windows Windows Walls Typ Walls Typ Walls Typ Walls Typ Roof Total are	in osses in T in pe 1 in pe 2 in pe 3 in type is Type is Type is Type is Type pe 1 in pe 2 in pe 3 in pe 3 in pe 4 in a of ele	and he Gros area 1 2 3 102. 43.5 15.0 85.2 ements	.6 .6 .6 .6 .6 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7	0penin m 63.12 0 2.5 0 0	er: gs ,2 2	Net Are A ,n 13.1 13.1 13.1 2.5 17.22 0.6 6 39.48 54.8 41.06 15.05 85.21 301.22	ea n ² × × × × × × × × ×	U-valu W/m2 3 3 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 2.1 0.28 2.1 0.3 2.3	ue = = = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 39.3 39.3 39.3 39.3 3.5 69.34 2.42 24.16 82.91 15.34 86.23 4.52 195.98		k-value kJ/m²-I		A X k kJ/K (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (30) (31)

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	602.3	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: High	450	(35)
For design assessments where the details of the construction are not known pr can be used instead of a detailed calculation.	ecisely the indicative values of TMP in Table 1f		_

Thermal bridges : S (L x Y) calculated using Appendix K

if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)			(00)	(00)				
I otal fabric heat loss $(33) + (36) =$ Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$												648.7	(37)	
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		1	
(38)m-	Jan 408 74	Feb	Mar 302 71	Apr 352.64	May	305.8	305.8	Aug	Sep	OCt	NOV	276 68		(38)
(30)11=	400.74	400.73	592.71	552.04	544.05	303.0	303.0	290.57	320.03	344.03	300.00	370.00	J	(00)
Heat t	ransfer o		nt, W/K	4004.04	000.00	054.40	054.40	0.47.07	(39)m	= (37) + (37)	38)m	4005.00	1	
(39)m=	1057.44	1049.42	1041.41	1001.34	993.32	954.49	954.49	947.27	969.52	993.32	1009.35 Sum(20)	1025.38	000.72	(30)
Heat le	oss para	meter (H	HLP), W/	′m²K					ر (40)m	= (39)m ÷	Sum(39)₁. · (4)	12 / 12=	999.75	
(40)m=	4.28	4.25	4.22	4.05	4.02	3.86	3.86	3.84	3.93	4.02	4.09	4.15		
Numb	er of day	vs in mo	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	4.05	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
							•							
4. Wa	ater heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
A			NI										1	(10)
if TF	A > 13.9	ipancy, 1 9, N = 1	n + 1.76 x	[1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	<u>3.</u> .9)	06		(42)
if TF	A £ 13.9	9, N = 1	- 1			,			,		, 			
Annua	l averag	e hot wa	ater usac	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36	se target o	100	6.95		(43)
not mor	e that 125	litres per	person per	day (all w	ater use, l	hot and co	ld)		a water us	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ich m <mark>onth</mark>	Vd,m = fa	ctor from T	Table 1c x	(43)					J	
(44)m=	117.64	113.36	109.09	104.81	100.53	96.25	96.25	100.53	104.81	10 <mark>9.09</mark>	113.36	117.64		
			·							Total = Su	m(44) ₁₁₂ =	=	12 <mark>83.36</mark>	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	_	
(45)m=	174.46	152.58	157.45	137.27	131.71	113.66	105.32	120.86	122.3	142.53	155.58	168.95		_
lf instar	tanoous w	ator hoati	na at noint	of use (no	hot water	r storaga)	ontor () in	hoves (16) to (61)	Total = Su	m(45) ₁₁₂ =	=	1682.69	(45)
(10)					40.70	310/2gc),			10 (01)	04.00	00.04	05.04	1	(AC)
(46)m= Water	storage	22.89 loss:	23.62	20.59	19.76	17.05	15.8	18.13	18.35	21.38	23.34	25.34		(40)
Storag	je volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160]	(47)
If com	munity h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)					1	
Other	vise if no	o stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:					<i>.</i>						1	
a) If n _	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kvvr	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energ	y lost fro	m water	storage	, kWh/ye wlindor l	ear See fact	or is not	known:	(48) x (49)) =		1	10		(50)
Hot wa	ater stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02	1	(51)
If com	munity h	eating s	ee secti	on 4.3	·		• ·					-	1	
Volum	e factor	from Ta	ble 2a								1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energ	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03		(54)
Enter	(50) or (54) in (5	o5)								1.	03	J	(55)

Water	storage	loss cal	culated	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 cylind	er 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 Append	lix 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)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3	-						0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar 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 ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	229.74	202.51	212.73	190.76	186.99	167.15	160.6	176.14	175.8	197.81	209.08	224.23		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)	-	-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	229.74	202.51	212.73	190.76	186.99	167.15	160.6	176.14	175.8	197.81	209.08	224.23		_
								Outp	out from wa	ater heate	r (annual)₁	12	2333.53	(64)
Hea <mark>t g</mark>	jains fro	m water	heating	kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	ı + (61)n	n] + 0.8 >	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m=	76.62	67.54	70.96	63.65	62.4	55.8	53.63	58.8	58.68	66	69.74	74.79		(65)
inclu	ude (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in t <mark>he</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	neating	
5. In	ternal ga	ains (see	Table {	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	153.15	153.15	153.15	153.15	153.15	153.15	153.15	153.15	153.15	153.15	153.15	153.15		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	71.16	63.21	51.4	38.92	29.09	24.56	26.54						1	
Applia							20.54	34.49	46.3	58.78	68.61	73.14		(67)
(00)	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	^{34.49} 3a), alsc	46.3 see Ta	58.78 ble 5	68.61	73.14		(67)
(68)m=	nces ga 413.78	ins (calc 418.07	ulated ir 407.25	Append 384.21	dix L, eq 355.14	uation L 327.81	20.54 13 or L1 309.55	34.49 3a), alsc 305.26	46.3 see Ta 316.08	58.78 ble 5 339.11	68.61 368.19	73.14 395.52]	(67)
Cookir	nces ga 413.78 ng gains	ins (calc 418.07 (calcula	ulated ir 407.25 ited in A	Append 384.21 ppendix	dix L, eq 355.14 L, equat	uation L 327.81 tion L15	13 or L1 309.55 or L15a)	34.49 3a), alsc 305.26), also se	46.3 9 see Ta 316.08 9 Table	58.78 ble 5 339.11 5	68.61 368.19	73.14 395.52]	(67)
(68)m= Cookir (69)m=	nces ga 413.78 ng gains 38.32	ins (calc 418.07 (calcula 38.32	ulated ir 407.25 ted in A 38.32	Append 384.21 ppendix 38.32	dix L, eq 355.14 L, equat 38.32	uation L 327.81 tion L15 38.32	20.34 13 or L1 309.55 or L15a) 38.32	34.49 3a), also 305.26), also se 38.32	46.3 9 see Ta 316.08 ee Table 38.32	58.78 ble 5 339.11 5 38.32	68.61 368.19 38.32	73.14 395.52 38.32]]	(67) (68) (69)
Cookir (69)m= Pumps	nces ga 413.78 ng gains 38.32 s and fa	ins (calc 418.07 (calcula 38.32 ns gains	ulated ir 407.25 Ited in A 38.32 (Table \$	Append 384.21 ppendix 38.32 5a)	dix L, eq 355.14 L, equat 38.32	uation L 327.81 tion L15 38.32	26.34 13 or L1 309.55 or L15a) 38.32	34.49 3a), alsc 305.26), also se 38.32	46.3 9 see Ta 316.08 9e Table 38.32	58.78 ble 5 339.11 5 38.32	68.61 368.19 38.32	73.14 395.52 38.32]]	(67) (68) (69)
(68)m= Cookir (69)m= Pumps (70)m=	nces ga 413.78 ng gains 38.32 s and fa 0	ins (calc 418.07 (calcula 38.32 ns gains 0	ulated ir 407.25 ted in A 38.32 (Table 9	Append 384.21 ppendix 38.32 5a) 0	dix L, eq 355.14 L, equat 38.32	uation L 327.81 tion L15 38.32	26.34 13 or L1 309.55 or L15a) 38.32	34.49 3a), also 305.26), also se 38.32	46.3 9 see Ta 316.08 9 e Table 38.32 0	58.78 ble 5 339.11 5 38.32 0	68.61 368.19 38.32 0	73.14 395.52 38.32 0]]]	(67)(68)(69)(70)
(68)m= Cookir (69)m= Pumps (70)m= Losses	nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev	ins (calc 418.07 (calcula 38.32 ns gains 0 vaporatic	ulated ir 407.25 Ited in A 38.32 (Table 9 0 n (nega	Appendix 384.21 ppendix 38.32 5a) 0 tive valu	dix L, eq 355.14 L, equat 38.32 0 es) (Tab	uation L 327.81 tion L15 38.32 0 le 5)	26.34 13 or L1 309.55 or L15a) 38.32 0	34.49 3a), also 305.26), also se 38.32	46.3 9 see Ta 316.08 9 e Table 38.32 0	58.78 ble 5 339.11 5 38.32 0	68.61 368.19 38.32 0	73.14 395.52 38.32 0]]]	(67) (68) (69) (70)
(68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52	ins (calc 418.07 (calcula 38.32 ns gains 0 raporatic -122.52	ulated ir 407.25 ited in A 38.32 (Table 9 0 n (nega -122.52	Appendix 384.21 ppendix 38.32 5a) 0 tive valu -122.52	dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52	uation L 327.81 tion L15 38.32 0 le 5) -122.52	26.34 13 or L1 309.55 or L15a) 38.32 0	34.49 3a), also 305.26), also se 38.32 0	46.3 9 see Ta 316.08 9e Table 38.32 0 -122.52	58.78 ble 5 339.11 5 38.32 0 -122.52	68.61 368.19 38.32 0 -122.52	73.14 395.52 38.32 0 -122.52]]]]	 (67) (68) (69) (70) (71)
(69)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52 heating	ins (calc 418.07 (calcula 38.32 ns gains 0 raporatic -122.52 gains (T	ulated ir 407.25 ited in A 38.32 (Table 9 0 n (nega -122.52 āble 5)	Append 384.21 ppendix 38.32 5a) 0 tive valu -122.52	dix L, eq 355.14 L, equat 38.32 0 es) (Tab	uation L 327.81 tion L15 38.32 0 le 5) -122.52	26.34 13 or L1 309.55 or L15a) 38.32 0	34.49 3a), also 305.26), also se 38.32 0	46.3 9 see Ta 316.08 9 Table 38.32 0 -122.52	58.78 ble 5 339.11 5 38.32 0	68.61 368.19 38.32 0 -122.52	73.14 395.52 38.32 0 -122.52]]]]	(67)(68)(69)(70)(71)
(69)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52 heating 102.98	ins (calc 418.07 (calcula 38.32 ns gains 0 vaporatic -122.52 gains (T 100.51	ulated ir 407.25 ited in A 38.32 (Table 9 0 n (nega -122.52 Table 5) 95.38	Appendix 384.21 ppendix 38.32 5a) 0 tive valu -122.52 88.41	dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52 83.88	uation L 327.81 tion L15 38.32 0 le 5) -122.52 77.5	26.34 13 or L1 309.55 or L15a) 38.32 0 -122.52 72.08	34.49 3a), also 305.26), also se 38.32 0 -122.52 79.03	46.3 9 see Ta 316.08 9 e Table 38.32 0 -122.52 81.49	58.78 ble 5 339.11 5 38.32 0 -122.52 88.71	68.61 368.19 38.32 0 -122.52 96.86	73.14 395.52 38.32 0 -122.52 100.52]]]]	 (67) (68) (69) (70) (71) (72)
(69)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52 heating 102.98	ins (calc 418.07 (calcula 38.32 ns gains 0 -122.52 gains (T 100.51 gains =	ulated ir 407.25 tted in A 38.32 (Table 5 0 n (nega -122.52 Table 5) 95.38	Appendix 384.21 ppendix 38.32 5a) 0 tive valu -122.52 88.41	dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52 83.88	uation L 327.81 tion L15 38.32 0 le 5) -122.52 777.5 (66)	26.34 13 or L1 309.55 or L15a) 38.32 0 -122.52 72.08 m + (67)m	34.49 3a), also 305.26), also se 38.32 0 -122.52 79.03 n + (68)m +	46.3 9 see Ta 316.08 9 e Table 38.32 0 -122.52 81.49 + (69)m + (58.78 ble 5 339.11 5 38.32 0 -122.52 88.71 (70)m + (7	68.61 368.19 38.32 0 -122.52 96.86 1)m + (72)	73.14 395.52 38.32 0 -122.52 100.52 m]]]]	 (67) (68) (69) (70) (71) (72)
(69)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52 heating 102.98 internal 656.86	ins (calc 418.07 (calcula 38.32 ns gains 0 vaporatic -122.52 gains (T 100.51 gains = 650.73	ulated ir 407.25 ited in A 38.32 (Table 9 0 (Table 9 0 -122.52 able 5) 95.38 622.98	Appendix 384.21 ppendix 38.32 5a) 0 tive valu -122.52 88.41 580.48	dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52 83.88	uation L 327.81 tion L15 38.32 0 le 5) -122.52 777.5 (66) 498.82	26.34 13 or L1 309.55 or L15a) 38.32 0 -122.52 72.08 m + (67)m 477.12	34.49 3a), also 305.26), also se 38.32 0 -122.52 79.03 1 + (68)m + 487.72	46.3 9 see Ta 316.08 9 e Table 38.32 0 -122.52 81.49 + (69)m + (512.81	58.78 ble 5 339.11 5 38.32 0 -122.52 88.71 (70)m + (7 555.55	68.61 368.19 38.32 0 -122.52 96.86 1)m + (72) 602.61	73.14 395.52 38.32 0 -122.52 100.52 m 638.13]]]]]	 (67) (68) (69) (70) (71) (72) (73)

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	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.6	x	10.63	×	0.85	x	0.7] =	2.63	(74)
North	0.9x	0.77	x	0.6	x	20.32	x	0.85	x	0.7] =	5.03	(74)
North	0.9x	0.77	x	0.6	×	34.53	×	0.85	x	0.7] =	8.54	(74)
North	0.9x	0.77	x	0.6	×	55.46	×	0.85	x	0.7] =	13.72	(74)
North	0.9x	0.77	x	0.6	×	74.72	×	0.85	x	0.7] =	18.48	(74)
North	0.9x	0.77	x	0.6	×	79.99	×	0.85	x	0.7] =	19.79	(74)
North	0.9x	0.77	x	0.6	×	74.68	×	0.85	x	0.7] =	18.48	(74)
North	0.9x	0.77	x	0.6	x	59.25	x	0.85	x	0.7] =	14.66	(74)
North	0.9x	0.77	x	0.6	×	41.52	×	0.85	x	0.7	j =	10.27	(74)
North	0.9x	0.77	x	0.6	×	24.19	×	0.85	x	0.7] =	5.98	– (74)
North	0.9x	0.77	x	0.6	×	13.12	×	0.85	x	0.7	1 =	3.25	(74)
North	0.9x	0.77	x	0.6	x	8.86	×	0.85	x	0.7	1 =	2.19	– (74)
East	0.9×	· 1	x	17.22	x	19.64	x	0.85	x	0.7	i =	139.45	(76)
East	0.9x		x	17.22	x	38.42	×	0.85	x	0.7	i =	272.8	(76)
East	0.9×	(1	x	17.22	x	63.27	x	0.85	x	0.7	1 =	449.27	– (76)
East	0.9x	(1	x	17.22	×	92.28	x	0.85	х	0.7	i =	655.23	(76)
East	0.9×		x	17.22	x	113.09	x	0.85	x	0.7	i -	803	(76)
East	0.9×	(1	x	17.22	x	115.77	×	0.85	x	0.7] =	822.02	– (76)
East	0.9×	(1	x	17.22	x	110.22	x	0.85	x	0.7	1 =	782.59	– (76)
East	0.9×	(1	x	17.22	x	94.68	x	0.85	x	0.7	1 =	672.24	– (76)
East	0.9×	1	x	17.22	x	73.59	×	0.85	x	0.7	j =	522.51	╡ (76)
East	0.9×	. 1	x	17.22	x	45.59	x	0.85	x	0.7	1 =	323.7	– (76)
East	0.9×	(1	x	17.22	×	24.49	x	0.85	x	0.7	i =	173.88	(76)
East	0.9×	(1	x	17.22	x	16.15	x	0.85	x	0.7	j =	114.68	– (76)
West	0.9×	0.77	x	6	x	19.64	x	0.85	x	0.7	i =	48.59	(80)
West	0.9x	0.77	x	6	x	38.42	×	0.85	x	0.7	1 =	95.05	(80)
West	0.9x	0.77	x	6	x	63.27	×	0.85	x	0.7	1 =	156.54	(80)
West	0.9x	0.77	x	6	x	92.28	×	0.85	x	0.7	i =	228.3	(80)
West	0.9x	0.77	x	6	x	113.09	×	0.85	x	0.7	1 =	279.79	(80)
West	0.9×	0.77	x	6	x	115.77	x	0.85	x	0.7	1 =	286.42	(80)
West	0.9×	0.77	x	6	x	110.22	x	0.85	x	0.7	i =	272.68	(80)
West	0.9x	0.77	x	6	x	94.68	×	0.85	x	0.7	1 =	234.23	(80)
West	0.9x	0.77	x	6	×	73.59	×	0.85	x	0.7] =	182.06	(80)
West	0.9x	0.77	x	6	×	45.59	×	0.85	x	0.7	j =	112.79	(80)
West	0.9x	0.77	x	6	x	24.49	x	0.85	x	0.7	j =	60.59	(80)
West	0.9x	0.77	x	6	x	16.15	x	0.85	x	0.7	i =	39.96	– (80)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m			
(83)m=	190.67	372.88	614.35	897.25	1101.28	1128.22	1073.75	921.12	714.85	442.47	237.71	156.83	(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	⊦ (83)m	, watts						
(84)m=	847.54	1023.61	1237.32	1477.73	1638.33	1627.04	1550.87	1408.85	1227.66	998.03	840.32	794.96	(84)

7. Me	7. Mean internal temperature (heating season)													
Temp	Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)													
Utilisa	ation fac	tor for g	ains for	living are	a, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	1	1	0.99	0.97	0.98	1	1	1	1		(86)
Mean	interna	l temper	ature in	living ar	a T1 (fr	L Mow ste	ns 3 to 7	r in Table	- 9c)					
(87)m=	18.1	18.25	18.59	19.13	19.66	20.2	20.52	20.47	20.03	19.35	18.69	18.13		(87)
-							·							
1 emp	erature	auring n	18 89	eriods ir	18 99		19.07		12 (°C)	18 99	18.96	18.92		(88)
(00)11-	10.00	10.00	10.00	10.57	10.00	10.07	10.07	10.00	13.04	10.00	10.00	10.52		(00)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	1	1	1	1	0.99	0.97	0.89	0.93	0.99	1	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	16.35	16.51	16.87	17.46	18	18.59	18.89	18.86	18.4	17.7	17	16.43		(90)
									f	LA = Livin	g area ÷ (4	+) =	0.55	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) – fl	Δ 🗙 Τ1	+ (1 – fl	A) x T2			•		
(92)m=	17.3	17.46	17.81	18.37	18,91	19.47	19.78	19.74	19.29	18.6	17.92	17.36		(92)
Apply	adiustr	nent to t	he mear	internal	temper	ature fro	m Table	4e whe	re appro	poriate				
(93)m=	17.3	17.46	17.81	18.37	18.91	19.47	19.78	19.74	19.29	18.6	17.92	17.36		(93)
8. Spa	ace hea	tina real	Jirement											
Set Ti	i to the i	mean int	ernal ter	nperatu	e obtain	ed at ste	ep 11 of	Table 9	so tha	t Ti m=('	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a			T GDTO OI	, 00 ina	,	0)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	ation fac	tor for g	ains, hm	1										
(94)m=	1	1	1	1	0.99	0.98	0.94	0.96	0.99	1	1	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m	-								
(95)m=	847.32	1023.12	1235.97	1473.47	1624.68	1587.98	1453.96	1346.66	1216.3	996.54	840	794.81		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	13751.53	13185.49	11779.18	9483.44	7157.6	4644.93	3036.91	3162.42	5032.37	7948.12	10924.76	13494.1		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	9600.73	8173.11	7844.15	5767.18	4116.49	0	0	0	0	5171.97	7261.03	9448.27		
								Tota	l per year	(kWh/year) = Sum(98	B) _{15,912} =	57382.93	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								232.32	(99)
9b. En	erav rea	uiremer	nts – Cor	nmunitv	heating	scheme								
This pa	art is us	ed for sn	ace hea	ting spa	ace cooli	ing or wa	ater heat	ting prov	ided by :	a comm	unity sch	eme		
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	l) =						1	(302)
The com includes	he community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter 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 Communit	y boilers		(302) x (303a) =		1	(304a)
Factor for control and charging method (Tab	ole 4c(3)) for community he	ating system			1.05	(305)
Distribution loss factor (Table 12c) for comm	nunity heating system				1.1	(306)
Space heating Annual space heating requirement					kWh/year 57382.93]
Space heat from Community boilers		(98) x (304a) x (305) x (306) =		66277.28	(307a)
Efficiency of secondary/supplementary heat	ting system in % (from Tabl	e 4a or Append	lix E)		0	(308
Space heating requirement from secondary	/supplementary system	(98) x (301) x 10	0 ÷ (308) =		0	(309)
Water heating Annual water heating requirement					2333.53]
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =		2695.23	(310a)
Electricity used for heat distribution	0.0	1 × [(307a)(307e) + (310a)(310e)] =	689.73	(313)
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling sys	stem, if not enter 0)	= (107) ÷ (314) =	:		0	(315)
Electricity for pumps and fans within dwellin mechanical ventilation - balanced, extract o	g (Table 4f): <mark>r posi</mark> tive input from <mark>outsid</mark> e	9			0	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for th <mark>e above, kWh/year</mark>		=(330a) + (330b)) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L	_)				1256.76	(332)
12b. CO2 Emissions – Community heating s	scheme					-
	En kV	ergy /h/year	Emission fact kg CO2/kWh	tor En kg	nissions CO2/year	
CO2 from other sources of space and water Efficiency of heat source 1 (%)	r heating (not CHP) If there is CHP using two fue	ls repeat (363) to (:	366) for the second	d fuel	65	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0	= [22920.1	(367)
Electrical energy for heat distribution	[(313) x		0.52	= [357.97	(372)
Total CO2 associated with community syste	ems (363)(3	866) + (368)(372)		= [23278.06	(373)
CO2 associated with space heating (second	dary) (309) x		0	= [0	(374)
CO2 associated with water from immersion	heater or instantaneous he	ater (312) x	0.22	= [0	(375)
Total CO2 associated with space and water	• heating (373) + (3	374) + (375) =		[23278.06	(376)
CO2 associated with electricity for pumps a	nd fans within dwelling (33	1)) x	0.52	= [0	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= [652.26	(379)
Total CO2, kg/year sun	n of (376)(382) =				23930.32	(383)
Dwelling CO2 Emission Rate (38)	3) ÷ (4) =				96.88	(384)
El rating (section 14)					18.21	(385)

User Details:											
Assessor Name: Software Name:	Stroma FSAP 20	12 Dro		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	on: 1.0.3.15		
	london	PIC	openy <i>F</i>	Address:	Unit 7						
1 Overall dwelling dimen	, ionuon										
Basement			Area	1 (m²) 82	(1a) x	Av. He	ight(m) .05	(2a) =	Volume(m³ 250.1) (3a)	
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1n)		82	(4)						
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	250.1	(5)	
2. Ventilation rate:		_									
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} 0 \\ \hline 0 \\ \end{array} $	econdary heating 0	+	0 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)	
Number of intermittent fan	S				Г	2	x ´	10 =	20	(7a)	
Number of passive vents					Ē	0	x ^	10 =	0	(7b)	
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)	
								Air ch	ange <mark>s per</mark> ho	our	
Infiltration due to chimneys	s, flues and fans = (en carried out or is intend	6a)+(6b)+(7a) led, proceed i)+(7b)+(7 to (17), o	(c) = therwise c	ontinue fro	20 om (9) to ((16)	÷ (5) =	0.08	(8)	
Number of storeys in the Additional infiltration	e dwelling (ns)	frame or () 35 for	masonr	v constr	uction	[(9)	-1]x0.1 =	0	(9) (10)	
if both types of wall are pre deducting areas of opening	sent, use the value corre s); if equal user 0.35	sponding to ti	he greate	er wall area	a (after				0		
If suspended wooden flo	oor, enter 0.2 (unsea	led) 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 s	tripped		0 25 - [0 2	v(14) - 1	001 -			0	(14)	
				(8) + (10) -	~ (14) ÷ 1	2) + (13) -	+ (15) =		0	(15)	
Air permeability value	50 expressed in cu	bic metres	per ho	ur per so	uare m	etre of e	nvelope	area	20		
If based on air permeabilit	y value, then $(18) = [($	17) ÷ 20]+(8),	, otherwis	se(18) = (18)	16)		involopo	aioa	1.08		
Air permeability value applies	if a pressurisation test ha	is been done	or a deg	ree air per	meability i	s being u	sed				
Number of sides sheltered	l								2	(19)	
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			0.85	(20)	
Infiltration rate incorporatir	ng shelter factor		((21) = (18)	x (20) =				0.92	(21)	
Infiltration rate modified fo	r monthly wind spee	d T		i				i	1		
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind spe	ed from Table 7	· · · ·							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))m ÷ 4	· · ·					1		I		
(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			

Adjust	ed infiltra	tion rate	e (allowi	ng for sł	nelter ar	nd wind s	speed) =	= (21a) x	(22a)m						
	1.17	1.15	1.12	1.01	0.99	0.87	0.87	0.85	0.92	0.99	1.03	1.08]		
Calcul	ate effec	tive air (change i	ate for t	he appli	cable ca	ise					-	- 		
II Me	eustoirbo	i ventila		ndiv NL (2	(26) = (22)		oquation (NE)) othe	nuico (22h) - (220)				0	(23a)
li exn			using Appe	nuix in, (∠	.3D) = (238	a) × FIIIV (6		no)), otne) = (23a)				0	(23b)
		neat reco		ency in %		or in-use i			i) =					0	(23c)
a) If	balance	d mecha	anical ve	ntilation	with he	at recove	ery (MV	HR) (24a T	a)m = (22	2b)m + ()	23b) × [*	1 – (23c)) ÷ 100] 1		(0.1.5)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat red	covery (MV) (24t T	o)m = (22	2b)m + (2 1	23b)	<u> </u>	1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24b)
c) If	whole ho	ouse ex	tract ven	tilation of	or positiv	/e input v	ventilati	on from	outside	- (00)	、				
(2.4.)	if (22b)m	< 0.5 ×	(23b), t	nen (240	c) = (23t	b); other	wise (24	ic) = (22	b) m + 0.	.5 × (23b)		1		$(0.1 \circ)$
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24C)
d) If	natural v if (22b)m	entilation	on or whe en (24d)	ole hous m = (22l	se positi o)m othe	ve input erwise (2	ventilati 24d)m =	on from 0.5 + [(2	loft 22b)m ² x	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			(24d)
Effe	ctive air o	change	rate - en	ter (24a) or (24l	o) or (24	c) or (24	1d) in bo	x (25)						
(25)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			(25)
3 He	at losses	and he	at loss r	aramet	er.							_			
ELEN		Gros	65 (m²)	Openin	gs 2	Net Ar A .r	rea m²	U-val W/m2	ue	A X U (W/I	K)	k-value	e K	A) kJ	X k /K
Doors	Type 1					18	×	3		5.4					(26)
Doors	Type 2					1.0				2.24	Ħ				(26)
Windo	ws Type	1				5.56	X	I/[1/(4.8)+	0.04] =	22.39	Ħ				(27)
Windo	ws Type	2				4	x	I/[1/(4.8)+	0.04] =	16.11	5				(27)
Windo	ws Type	3				1.21	x	I/[1/(4.8)+	0.04] =	4.87	=				(27)
Floor						82	×	1.25	=	102.5	Ξ r				(28)
Walls ⁻	Type1	79.8	5	12.5	7	67.28	3 X	2.1		141.29			ה ה		 (29)
Walls ⁻		20.2	23	1.6		18.63	X	21		39 12	\dashv		; ۲		(29)
Roof	51	10.7	7			19.77	~ 7	23	-	45.47	= 1		≓ ¦		$ \boxed{(30)} $
Total a	area of el	ements	, m²			201.8	5	2.0		-017	L		J L		(31)
Party v	vall					16.8	x	0		0					(32)
Party v	vall					5.8	×	0		0	= i		۲ F		(32)
* for win	dows and	roof winde	ows, use e	ffective wi	ndow U-v	alue calcul	lated usin	g formula 1	1/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	L		
** inclua	le the area	s on both	sides of in	ternal wal	ls and par	titions									_
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30) + (32) =				37	9.39	(33)
Heat c	apacity (Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =		0	(34)
Therm	al mass	parame	ter (TMF	? = Cm -	- TFA) iı	ר kJ/m²K			Indica	tive Value	: High		4	50	(35)
For desi can be t	ign assessi ised instea	ments wh d of a dei	ere the dei tailed calcu	tails of the ılation.	construct	ion are no	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f			
Therm	al bridge	s : S (L	x Y) cale	culated	using Ap	pendix l	K						1:	8.4	(36)

if details of thermal bridging are not known $(36) = 0.15 \times (31)$

Total fa	abric hea	at loss							(33) +	(36) =			397.79	(37)
Ventila	tion hea	t loss ca	alculated	I monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	96.6	94.7	92.81	83.34	81.45	72.65	72.65	71.02	76.04	81.45	85.23	89.02		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	494.39	492.49	490.6	481.13	479.24	470.44	470.44	468.81	473.83	479.24	483.02	486.81		
Heat lo	ss para	meter (H	HLP). W/	′m²K					/ (40)m	Average = = (39)m ÷	Sum(39) _{1.} (4)	₁₂ /12=	480.87	(39)
(40)m=	6.03	6.01	5.98	5.87	5.84	5.74	5.74	5.72	5.78	5.84	5.89	5.94]	
	I			I					/	Average =	Sum(40)1.	₁₂ /12=	5.86	(40)
Numbe	r of day	s in mor	nth (Tab	le 1a)	Mov	lun	11	A	San	Oct	Nov	Dee	1	
(41)m-	Jan 31	28	1VIA1 31	Арі 30	1VIAY	30 30	31	Aug 31	30	31	30	21 21		(41)
(41)11=	51	20	51	30	31	30	51	51	30	51	30	51	J	(++)
4 304														
4. Wa	ter heat	ing ener	gy requi	rement:								kvvh/ye	ear:	
Assum	ed occu	pancy, I	N					.			2	.5]	(42)
if TF. if TF.	A > 13.9 A £ 13.9	9, N = 1 9 N = 1	+ 1.76 x	[1 - exp	(-0.0003	649 x (TF	-A -13.9)2)] + 0.0	013 x (1	FFA -13.	9)			
Annual	average	e hot wa	ater usa	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		93	.57		(43)
Reduce :	the annua	l average litres per r	hot water	usage by { day (all w	5% if the d	welling is o	designed t Id)	to achieve	a water us	e target o	f			
			berson per										1	
Hot wate	Jan Ir usage in	Feb litres per	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun ctor from T	JUI Fable 1c x	(43)	Sep	Oct	NOV	Dec	J	
(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	1	
(,	102.00	00.10	00.11	01.1	01.00	0	01.21	01.00	-	Fotal = Su	m(44) _{1,12} =	102.00	1122.82	(44)
Ener <mark>gy</mark> a	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x C	0Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 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		_
lf instant	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)	Fotal = Su	m(45) ₁₁₂ =	=	1472.19	(45)
(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:											J	
Storage	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ime vess	sel		160]	(47)
If comr	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Water of	vise it no	stored	hot wate	er (this in	ICIUDES I	nstantan	ieous co	mbi boile	ers) ente	er '0' in (47)			
a) If m	anufacti	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0	1	(48)
Tempe	rature 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 m	anufacti	urer's de	eclared o	ylinder l	oss fact	or is not	known:						1	
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	iy)				0.	02		(51)
Volume	e factor	from Tal	ee secli ble 2a	011 4.3							1	03	1	(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6	1	(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03	j	(54)
Enter	(50) or (54) in (5	5)								1.	03]	(55)

Water	storage	loss cal	culated	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 cylind	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	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)
Prima	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Prima	y circuit	loss cal	culated	for each	month ((59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	Ì
(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 D	HW input	calculated	using App	endix G o	r Appendix	cH (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(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		_
								Outp	out from w	ater heate	r (annual)₁	12	2123.03	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	<mark>6</mark> 9.36	61.2	64.41	57.94	56.93	51.07	49.25	53.77	53.59	60.07	63.27	67.76		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	e Table S	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	tts				•		_				
	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)
Lightir	g gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-			
(67)m=	35.93	31.91	25.95	19.65	14.69	12.4	13.4	17.42	23.38	29.68	34.64	36.93		(67)
Applia	nces ga	ins (calc	ulated in	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
(68)m=	223.57	225.89	220.04	207.6	191.89	177.12	167.26	164.94	170.78	183.23	198.94	213.71		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5		-		
(69)m=	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5		(69)
Pumps	s and fa	ns gains	(Table s	5a)					-				_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	ole 5)							_	
(71)m=	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	02.22	91.07	86 58	90.49	76.51	70.94	66.19	72.27	74.43	80.74	87.87	91.07		(72)
(/	93.23	01.01	00.00	00.40									1	
Total	internal	gains =	00.00	00.40		(66))m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72))m		
Total i (73)m=	93.23 internal 413.22	gains = 409.37	393.07	368.22	343.58	(66) 320.95)m + (67)m 307.35	n + (68)m - 315.12	+ (69)m + 329.08	(70)m + (7 354.15	1)m + (72) 381.95	m 402.21		(73)

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	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4	×	10.63	×	0.85	×	0.7] =	17.54	(74)
North	0.9x	0.77	x	4	x	20.32	x	0.85	×	0.7] =	33.52	(74)
North	0.9x	0.77	x	4	x	34.53	×	0.85	×	0.7] =	56.95	(74)
North	0.9x	0.77	x	4	x	55.46	×	0.85	×	0.7	=	91.48	(74)
North	0.9x	0.77	x	4	x	74.72	x	0.85	x	0.7] =	123.23	(74)
North	0.9x	0.77	x	4	x	79.99	×	0.85	×	0.7] =	131.92	(74)
North	0.9x	0.77	x	4	x	74.68	×	0.85	×	0.7	=	123.17	(74)
North	0.9x	0.77	x	4	x	59.25	x	0.85	×	0.7] =	97.72	(74)
North	0.9x	0.77	x	4	x	41.52	x	0.85	×	0.7	=	68.47	(74)
North	0.9x	0.77	x	4	x	24.19	×	0.85	×	0.7	=	39.9	(74)
North	0.9x	0.77	x	4	x	13.12	x	0.85	×	0.7	=	21.64	(74)
North	0.9x	0.77	x	4	x	8.86	×	0.85	×	0.7] =	14.62	(74)
East	0.9x	1	x	5.56	x	19.64	x	0.85	×	0.7] =	45.03	– (76)
East	0.9x	1	x	5.56	x	38.42	x	0.85	×	0.7	1 =	88.08	(76)
East	0.9x	1	x	5.56	x	63.27	x	0.85	x	0.7	j =	145.06	– (76)
East	0.9x	1	x	5.56	x	92.28	x	0.85	х	0.7	1 =	211.56	(76)
East	0.9x	1	x	5.56	x	113.09	x	0.85	x	0.7	i -	259.27	– (76)
East	0.9x	1	x	5.56	x	115.77	×	0.85	x	0.7] =	2 <mark>65.41</mark>	(76)
East	0.9x	1	x	5.56	x	110.22	x	0.85	x	0.7] =	252.68	– (76)
East	0.9x	1	x	5.56	x	94.68	x	0.85	x	0.7] =	217.05	(76)
East	0.9x	1	x	5.56	x	73.59	×	0.85	x	0.7] =	168.71	(76)
East	0.9x	1	x	5.56	x	45.59	x	0.85	x	0.7	=	104.52	(76)
East	0.9x	1	x	5.56	x	24.49	×	0.85	×	0.7] =	56.14	(76)
East	0.9x	1	x	5.56	x	16.15	×	0.85	×	0.7	=	37.03	(76)
West	0.9x	0.77	x	1.21	x	19.64	x	0.85	x	0.7] =	9.8	(80)
West	0.9x	0.77	x	1.21	x	38.42	×	0.85	×	0.7] =	19.17	(80)
West	0.9x	0.77	x	1.21	x	63.27	×	0.85	×	0.7] =	31.57	(80)
West	0.9x	0.77	x	1.21	x	92.28	x	0.85	x	0.7] =	46.04	(80)
West	0.9x	0.77	x	1.21	x	113.09	×	0.85	×	0.7] =	56.42	(80)
West	0.9x	0.77	x	1.21	x	115.77	x	0.85	x	0.7] =	57.76	(80)
West	0.9x	0.77	x	1.21	x	110.22	x	0.85	×	0.7	=	54.99	(80)
West	0.9x	0.77	x	1.21	x	94.68	×	0.85	×	0.7] =	47.24	(80)
West	0.9x	0.77	x	1.21	x	73.59	x	0.85	x	0.7] =	36.72	(80)
West	0.9x	0.77	x	1.21	x	45.59	x	0.85	x	0.7] =	22.75	(80)
West	0.9x	0.77	x	1.21	×	24.49	×	0.85	×	0.7] =	12.22	(80)
West	0.9x	0.77	x	1.21	x	16.15	x	0.85	x	0.7	=	8.06	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m=	72.36	140.77	233.58	349.08	438.93	455.1	430.84	362.01	273.9	167.16	90	59.71	(83)
Total g	Fotal gains – internal and solar (84)m = (73)m + (83)m , watts											-	
(84)m=	485.59	550.13	626.65	717.3	782.52	776.05	738.19	677.12	602.98	521.31	471.95	461.91	(84)

7. Me	an inter	nal temp	perature	(heating	season)								
Temperature during heating periods in the living area from Table 9, Th1 (°C)										21	(85)			
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)					Ľ		
	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 temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	r in Tabl	e 9c)					
(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)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Ti	h2 (°C)					
(88)m=	18	18	18.01	18.07	18.08	18.13	18.13	18.14	18.11	18.08	18.05	18.03		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(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 (fo	ollow ste	eps 3 to 3	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 (fc	or the wh	ole dwel	llina) = fl	_A x T1	+ (1 – fL	A) x T2			L		
(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)
vlqqA	adiustr	nent to t	he mear	internal		ature fro	m Table	4e, whe	ere appro	opriate	I			
(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	tina reau	uirement											
Set Ti	i to the i	mean int	ernal ter	nperatu	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	<mark>ilis</mark> ation	factor fo	or gains	using Ta	ble 9a					í í	,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	11										
(94)m=	1	1	0.99	0.99	0.97	0.94	0.87	0.9	0.97	0.99	1	1		(94)
Usefu	Il gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	484.46	548.29	623.05	708.92	762.04	728.53	640.12	606.56	583.86	516.89	470.39	460.99		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	5972.31	5738.37	5128.98	4176.77	3131.71	2019.47	1258.17	1324.54	2180.79	3487.6	4811.71	5934.28		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	4082.96	3487.73	3352.41	2496.85	1763.04	0	0	0	0	2210.21	3125.75	4072.12		
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	24591.08	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								299.89	(99)
9b. En	ergy rec	quiremer	nts – Coi	mmunity	heating	scheme						-		
This pa	art is us	ed for sp	ace hea	iting, spa	ace cooli	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	neme.		_
Fractio	n of spa	ace heat	from se	condary	/supplen	nentary h	neating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301) =					[1	(302)
The com	nmunity so	cheme mag	the community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter											

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 (3	03a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for com	munity heating system	L L	1.05] (305)
Distribution loss factor (Table 12c) for community heating sys	tem	L L	1.1	(306)
Space heating		L	kWh/year	J
Annual space heating requirement		[24591.08]
Space heat from Community boilers	(98) x (304a) x (305) x (306	٥) =	28402.69	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	[0	(308
Space heating requirement from secondary/supplementary s	ystem (98) x (301) x 100 ÷ (308) =	- [0	(309)
Water heating Annual water heating requirement		Γ	2123.03]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306	5) =	2452.1	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)	(310e)] =	308.55	(313)
Cooling System Energy Efficiency Ratio		Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not enter ()) = (107) ÷ (314) =	Ī	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fro	m outside		0	(330a)
warm air heating system fans		T T	0	(330b)
pump for solar water heating		Γ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g)	- ī	0	(331)
Energy for lighting (calculated in Appendix L)		Ī	634.57	(332)
12b. CO2 Emissions – Community heating scheme				-
	Energy Emission kWh/year kg CO2	on factor E /kWh k	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHI Efficiency of heat source 1 (%) If there is CHP u	P) sing two fuels repeat (363) to (366) for the	e second fuel	65	(367a)
CO2 associated with heat source 1 [(307	b)+(310b)] x 100 ÷ (367b) x 0	=	10253.29	(367)
Electrical energy for heat distribution	[(313) x 0.5	2 =	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 or instanta	neous heater (312) x 0.2	2 =	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 dw	elling (331)) x 0.5	2 =	0	(378)
CO2 associated with electricity for lighting	(332))) x 0.5	2 =	329.34	(379)
Total CO2, kg/year sum of (376)(382) =		[10742.76	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		[131.01	(384)
El rating (section 14)		[16.91	(385)

Assessor Name:Stroma FSAP 2012Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version: 1.0.3.15Property Address: Unit 8Address: Unit 8Address: iisAddress: Unit 8Address: Init 8Address: Init 8Address: Init 8Address: Init 8Address: Init 8Address: Init 8Adv. Height(m)Volume(m³)Basement70(1a) x3.5(2a) =245(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)70(4)Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =245(5)Colspan="2">Aventilation rate:Mumber of chimneysO+0+0=0(6a)Number of chimneys0+0+0=0(6a)Number of chimneys0+0+0=0(6a)Number of chimneys0+0+0=0(6a)
Property Address. On to 3Address :, london1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Basement70(1a) x3.5(2a) =245(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)70(4)Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 245(5)2. Ventilation rate:main heatingsecondary heatingothertotalm³ per hour heatingNumber of chimneys0+0=0x 40 =0(6a)Number of chimneys0+0+0=0x 40 =0(6a)
Address :, interview1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Basement 70 $(1a) \times 3.5$ $(2a) = 245$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 70 (4) 70 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 245$ (5) 2. Ventilation rate:main heatingsecondary heatingothertotalm³ per hour hourNumber of chimneys 0 $+$ 0 $=$ 0 $x 40 =$ 0 $(6a)$ Number of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $(6a)$
Area(m²)Av. Height(m)Volume(m³)Basement 70 $(1a) \times$ 3.5 $(2a) =$ 245 $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 70 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 245 (5) 2. Ventilation rate:Number of chimneys 0 $+$ 0 $=$ 0 $x 40 =$ 0 $(6a)$ Number of chimneys 0 $+$ 0 $=$ 0 $x 40 =$ 0 $(6a)$
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 245 (5) 2. Ventilation rate: Number of chimneys 0 + 0 + 0 = 0 x 40 = 0 (6a) Number of area floor
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 245$ (5)2. Ventilation rate:Number of chimneys 0 + 0 + $total$ m^3 per hourNumber of chimneys 0 + 0 + 0 = 0 $x 40 = 0$ (6a)Number of chimneys 0 + 0 + 0 = 0 $x 40 = 0$ (6a)
2. Ventilation rate: Number of chimneys $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
main heatingsecondary heatingothertotal m^3 per hourNumber of chimneys0+0=0 $x 40 =$ 0(6a)Number of energine(a)
Number of open flues $0 + 0 + 0 = 0$ (6b)
Number of intermittent fans 2 × 10 = 20 (7a)
Number of passive vents $0 x 10 = 0 (7b)$
Number of flueless gas fires
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)
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 0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)
Percentage of windows and doors draught stripped
Vindow infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0
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
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 1.08 (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)
Siletter factor $(20) = 1 - [0.075 \times (19)] = 0.92$ (20)
Infiltration rate modified for monthly wind speed $(21) = (10) \times (20) = 1$ (21)
lan Feb Mar Anr 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 Easter (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

Adjuste	ed infilti	ration rat	e (allow	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
<u> </u>	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		
Calcula If me	ate effe echanic	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	o) = (23a)			0	(23b)
If bala	anced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (from	n Table 4h) =	, , ,			0	(23c)
a) If	balance	ed mech	anical v	entilation	with hea	at recove	erv (MVI	HR) (24a	a)m = (2)	2b)m + ((23b) × [⁻	1 – (23c)	÷ 100]	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	ed mech	anical v	entilation	without	heat rec	covery (N	и ЛV) (24b)m = (22	1 2b)m + ((23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole ł	nouse ex	tract ve	ntilation of	or positiv	e input v	/entilatic	n from c	outside	<u>.</u>			1	
i	f (22b)r	m < 0.5 >	(23b),	then (24d	c) = (23b); other	vise (24	c) = (22k	o) m + 0	.5 × (23	b)		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilati	on or wh	nole hous	e positiv	e input	ventilatio	on from I	oft					
i	f (22b)r	m = 1, th	en (24d)m = (22t	o)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]		4.40	1	
(24d)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93		1.08	1.13	1.18	J	(240)
Effec	ctive air		rate - e	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)	4.00	4.40	4.40	1	(25)
(25)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93		1.08	1.13	1.18		(23)
3. He	at l <mark>osse</mark>	es and he	eat loss	paramete	er:									
ELEN	1ENT	Gros	SS (m2)	Openin	gs	Net Ar	ea	U-valu	ue	AXU		k-value	e l	A X k
Doors		area	(111-)	II.	-	A ,r		VV/III2		(r)	KJ/111-•1	n i i i i i i i i i i i i i i i i i i i	KJ/K (26)
Windo		0.1				1.9		<u> </u>	0.041	5.7				(20)
Windo						8.7		/[1/(4.0)+	0.04]	35.03				(27)
Windo	ws Typ					6.5		/[1/(4.0)+	0.04] =	26.17	4			(27)
	ws typ	83				2.2	X1/	/[1/(4.0)+	0.04] =	8.86	╡,			(27)
FIOOr						70	×	1.25	=	87.5			\dashv	(28)
walls		116	.5	19.3		97.2	×	2.1	=	204.12	2		\dashv	(29)
Roof		26.	7	0		26.7	x	2.3	=	61.41				(30)
Total a	rea of e	elements	, m²			213.2	2							(31)
Party v	vall					24.2	x	0	=	0				(32)
Party v	vall					8.6	x	0	=	0				(32)
* for win	dows and le the are	d roof wind as on both	ows, use sides of i	effective wi	ndow U-va Is and part	ilue calcul itions	ated using	formula 1	/[(1/U-valı	ue)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat lo	ss. W/K	= S (A x	: U)	o ana pan			(26)(30)) + (32) =				428	8 (33)
Heat c	apacity	Cm = S((Axk)	- /					((28).	(30) + (3	2) + (32a).	(32e) =	0	(34)
Therma	al mass	parame	ter (TM	P = Cm ÷	- TFA) in	⊨kJ/m²K			Indica	ative Value	: High		450) (35)
For desi	gn asses	sments wh	ere the de	etails of the	, constructi	on are no	t known pr	ecisely the	e indicative	e values o	f TMP in Ta	able 1f	100	
can be u	ised inste	ead of a de	tailed cald	culation.			_							
Therma	al bridg	es : S (L	x Y) ca	Iculated u	using Ap	pendix ł	<						84.8	3 (36)
it details	ot therm abric he	al bridging eat loss	are not ki	nown (36) =	= 0.15 x (3	1)			(33) +	- (36) =			E10	6 (37)
Ventila	tion he	at loss c	alculate	d monthly	/				(38)m	i = 0.33 × i	(25)m x (5))	<u> </u>	<u> </u>
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec]	
		1	1	1 1			I		I - I		1		1	

(38)m=	103.14	101.11	99.09	88.98	86.96	76.95	76.95	75.05	80.89	86.96	91	95.05		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	- 38)m			
(39)m=	616.73	614.71	612.69	602.58	600.56	590.54	590.54	588.65	594.49	600.56	604.6	608.64		
Heatle	ee nara	motor (F		/m2k					(40)m	Average =	Sum(39)1.	12 /12=	602.11	(39)
(40)m=	8.81	8.78	8.75	8.61	8.58	8.44	8.44	8.41	(40)m 8.49	= (39)m ÷	(4) 8.64	8.69		
(10)	0.01	0.10	0.10	0.01	0.00	0.11	0.11	0.11	0.10	Average =	Sum(40)1	12 /12=	8.6	(40)
Numbe	er of day	vs in moi	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. Wa	iter heat	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occupancy, N 2.25 (42) 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 TF	A £ 13.9	θ , N = 1	ator usar	no in litre	e nor da	ve hV ve	erade -	(25 v NI)	+ 36		07			(12)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t	(25 X N) to achieve	a water us	se target o	87 f	.55		(43)
not more	e that 125	litres per	person per	r day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	96.3	92.8	89.3	85. <mark>7</mark> 9	82.29	78.79	78.79	82.29	85.79	89.3	92.8	96.3		
Energy content of hot water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 kWh/month$ (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		
			r							Total = Su	m(45) ₁₁₂ =	=	1377.43	(45)
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	r 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)
Storag	storage e volum	IOSS:	includir	na anv so	olar or M	/WHRS	storane	within sa	ame ves	ما		160		(47)
If comr	nunity h	eating a	nd no ta	ing any so	vellina e	nter 110	litres in	(47)		501		160		(47)
Otherw Water	/ise if no storage	o stored loss:	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	v lost fro	m water	· storage	, kWh/y€	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared of force for the second second second second second second second second second second second second se	cylinder l	oss fact	or is not	known:							(54)
If comr	nunity h	leating s	ee secti	on 4.3			iy)				0.	.02		(51)
Volume	e factor	from Ta	ble 2a								1.	.03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	v lost fro	m water	· storage	e, kWh/y€	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	tor 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	S-11	(56)
it cylinde	er contains	s dedicate	a solar sto r	rage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5 I	u), else (5 1	/)m = (56) I	m where (I	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)

Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom lab	le H5 if t	here is s	solar wat	ter heatil	ng and a	cylinde	r thermo	stat)		I	(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 ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m	-	-	-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × 0	(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 DH	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		_
			-				-	Outp	out from w	ater heate	r (annual) ₁	12	2028.27	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	۲ ((46)m	+ (57)m	+ (59)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)
in <mark>clu</mark>	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	leating	
5. Int	ernai ga	ains (see	Table {	5 and 5 a):							_		
Metab	olic gain	s (Table	5) Wat	ts										
motor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	112.31	112.31	11 <mark>2.31</mark>	112.31	112.31	112.31	112.31	112.31	112.31	11 <mark>2.31</mark>	112.31	112.31		(66)
Lightin	g gains	(calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso see ⁻	Table 5				J	
(67)m=	29.9	26.56	21.6	16.35	12.22	10.32	11.15	14.49	19.45	2 <mark>4.7</mark>	28.83	30.73		(67)
Applia	nces da	ins (calc	ulated ir	Append	dix L. ea	uation L	13 or L1	3a), also	see Ta	ble 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)
Cookir	na aains	(calcula	ted in A	r Doendix	L. equat	ion L15	or L15a). also se	e Table	5	1	1	1	
(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		(69)
Pumps	and fai	ns gains	(Table !	1									1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(70)
Losses		anoratic	n (nega	tive valu	L es) (Tab	le 5)							4	
(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	ĺ	(71)
Water	L heating	nains (1	able 5)	ļ	ļ		ļ	ļ	ļ	ļ	<u> </u>	<u> </u>	ł	
(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	1	(72)
Total i	ntornal	asine -				(66)	m + (67)m	1 + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m	i	
(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	1	(73)
6So	lar gains	3	1 000.00			20110	1 21 0.00							(-)
Solar o	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	e applicat	ole orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	X		g_		FF		Gains	

North	0.0x	0.77	=		0.7	」] ^] _	0.05	╡ Û	0.7		123.07	
North	0.9x	0.77	<u> </u>		8.7	」 ^ 1		5.46] X 1	0.85		0.7	=	198.97	
North	0.9x	0.77			8.7	」× 」		4.72] X 1	0.85	_ [×]	0.7		268.03	
North	0.9x	0.77	×		8.7	」 ×		79.99] X 1	0.85	_ ×	0.7	=	286.93	(74)
North	0.9x	0.77	×	(8.7	¦ ×		74.68	X	0.85	×	0.7	=	267.89	(74)
North	0.9x	0.77	×		8.7	ļ ×	< <u>5</u>	59.25	X	0.85	×	0.7	=	212.54	(74)
North	0.9x	0.77	×		8.7	ļ×		1.52	X	0.85	×	0.7	=	148.93	(74)
North	0.9x	0.77	×	(8.7	ļ×	(2	24.19	X	0.85	×	0.7	=	86.78	(74)
North	0.9x	0.77	×		8.7	ļ×	۲ <u>ا</u>	3.12	x	0.85	×	0.7	=	47.06	(74)
North	0.9x	0.77	×	(8.7	_ ×	()	8.86	x	0.85	×	0.7	=	31.8	(74)
South	0.9x	0.77	×	(2.2	×	4	6.75	x	0.85	x	0.7	=	42.41	(78)
South	0.9x	0.77	×	(2.2	×	(7	6.57	x	0.85	x	0.7	=	69.46	(78)
South	0.9x	0.77	×	(2.2) ×	<u>د</u> ع	97.53	x	0.85	x	0.7	=	88.48	(78)
South	0.9x	0.77	×	(2.2	×	(1	10.23	x	0.85	x	0.7	=	100	(78)
South	0.9x	0.77	×	(2.2) ×	(1	14.87	x	0.85	x	0.7	=	104.2	(78)
South	0.9x	0.77	×	(2.2] ×	(1	10.55	x	0.85	x	0.7	=	100.28	(78)
South	0.9x	0.77	×	(2.2) ×	(1)	08.01	x	0.85	x	0.7	=	97.98	(78)
South	0.9x	0.77	×		2.2	×	(1	04.89	х	0.85	x	0.7	=	95.15	(78)
South	0.9x	0.77	×		2.2	×	(1	01.89	x	0.85	x	0.7	=	92.42	(78)
South	0.9x	0.77	×	Ì	2.2	×	4	32.59	×	0.85	x	0.7	=	74.92	(78)
South	0.9x	0.77	×	ł	2.2	Ī×	5	5.42	x	0.85	x	0.7	=	50.27	(78)
Sout <mark>h</mark>	0.9x	0.77	×	į	2.2	Ī,	،	40.4	x	0.85	x	0.7	=	36.65	(78)
West	0.9x	0.77	×	į	6.5	Ī ×	· 1	9.64	×	0.85	x	0.7	=	52.64	(80)
West	0.9x	0.77	×	į	6.5	Ī ×	(3	8.42	x	0.85	x	0.7	=	102.97	(80)
West	0.9x	0.77	×		6.5] >	(6	3.27	×	0.85	x	0.7	=	169.58	(80)
West	0.9x	0.77	×		6.5	Ī,	(2.28	x	0.85	x	0.7	=	247.33	(80)
West	0.9x	0.77	×	(6.5	Ī,	(1	13.09	x	0.85	x	0.7	=	303.11	(80)
West	0.9x	0.77	×		6.5	į,	(1	15.77	x	0.85	×	0.7	=	310.29	(80)
West	0.9x	0.77	×	(6.5	į,	(1	10.22	x	0.85	×	0.7	=	295.4	(80)
West	0.9x	0.77	×		6.5	į ,	<u></u>	94.68	x	0.85	×	0.7	=	253.75	(80)
West	0.9x	0.77	×	(6.5	į,	(7	3.59	x	0.85	×	0.7	=	197.23	(80)
West	0.9x	0.77	×	(6.5	i,	(4	5.59	x	0.85	×	0.7	=	122.19	(80)
West	0.9x	0.77	×	(6.5	i,	(2	24.49	x	0.85	×	0.7	=	65.64	(80)
West	0.9x	0.77	×	(6.5	i,	ـــــــــــــــــــــــــــــــــــــ	6.15	x	0.85	×	0.7	=	43.29	(80)
	L					1			1						
Solar	gains in	watts, ca	lculate	d :	for each mon	th			(83)m	n = Sum(74)m	(82)m	l			
(83)m=	133.2	245.33	381.93	Τ	546.29 675.3	4	697.5	661.27	561	.44 438.59	283.8	8 162.96	111.73]	(83)
Total o	gains – i	nternal a	nd sola	ır ((84)m = (73)r	n +	(83)m	, watts		•		•	•		
(84)m=	505.92	614.74	737.02		879.44 986.7	9	988.8	940.26	847	7.4 736.69	604.1	2 507.87	474.57]	(84)
7. Me	ean inter	rnal temp	erature	e (l	heating seaso	on)								-	
Temp	perature	during h	eating	ре	eriods in the li	vin	g area	from Tab	ole 9	, Th1 (°C)				21	(85)
Utilis	ation fac	ctor for ga	ains for	liv	ving area, h1,	,m ((see Ta	ble 9a)						L	
	Jan	Feb	Mar	Τ	Apr Ma	y	Jun	Jul	A	ug Sep	Oc	t Nov	Dec]	

(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 Tabl	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	durina h	eating p	periods ir	n rest of	dwelling	from Ta	able 9. T	h2 (°C)					
(88)m=	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	0.99	0.99	0.98	0.95	0.86	0.62	0.7	0.93	0.98	0.99	1		(89)
`´´			- 4	44- 0 11 0 0 0 0		L								
	14 49					ng 12 (li		20 3 10	17 26	16 9C)	15.28	14.47		(90)
(30)11-	14.43	14.7	15.2	10.95	10.72	17.40	17.05	17.04	17.20	fl A = l ivin	$a_{\text{rea}} \div (4$	(4, 4) =	0.91	(91)
Mean	interna	temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2	1				(22)
(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)
Apply	adjustn	nent to th	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate	47.05			(02)
(93)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		(93)
8. Spa	ace nea	ung requ		moorotuu	ra abtair		on 11 of		h aa tha	+Tim ('	76) m on		ulata	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a	ieu al si	epiror	Table 9	0, so ina	u 11,m=(70)m and	u re-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	ation fac	tor for g	ains, hm	n:				<u> </u>						
(94)m=	0.99	0.99	0.99	0.98	0.95	0.91	0.85	0.88	0.95	0.98	0.99	1		(94)
Us <mark>efu</mark>	<mark>l g</mark> ains,	hmGm ,	W = (9	4)m x (84	4)m									
(95)m=	<mark>50</mark> 3.35	609. <mark>98</mark>	<mark>72</mark> 7.44	857.98	940.63	902.61	803.57	747.04	700.58	594	504.26	472.49		(95)
Mo <mark>nt</mark> h	nly avera	age exte	rnal terr	nperature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	1 <mark>0.6</mark>	7.1	4.2		(96)
Heat	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	7370.53	7111.39	6410.78	5304.13	4085.3	2766.28	1870.17	1937.31	2942.15	4471.55	6015.4	7326.33		(97)
Space	e heatin	g require	ement fo	or each n	honth, k	Nh/mon ⁻	th = 0.02	24 x [(97)m – (95 I	5)m] x (4 ⁻	1)m			
(98)m=	5109.18	4368.95	4228.4	3201.23	2339.63	0	0	0	0	2884.9	3968.03	5099.26		
								Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	31199.58	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								445.71	(99)
9b. En	ergy rec	luiremer	nts – Coi	mmunity	heating	scheme)							
This pa	art is use	ed for sp	ace hea	ating, spa	ace cooli	ing or wa	ater heat	ting prov	vided by	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =					[1	(302)
The com	munity so	heme may	y obtain he	eat from se	everal sour	rces. The p	orocedure	allows for	CHP and u	up to four o	other heat	sources; th	ne latter	
includes	boilers, h	eat pumps	s, geotheri	mal and wa	aste heat f	rom powe	r stations.	See Appel	ndix C.			r		
Fractio	n of hea	at from C	Commun	ity boiler	S								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303a	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1.05	(305)
Distrib	ution los	s factor	(Table 1	12c) for (commun	itv heati	na svste	m				ו [(306)
	hactin					.,au	5,5,5							
Annual	space	J heating :	requiren	nent								I	31100.59	
, uniudi	opace	licating	Squiren	ion								l	51159.00	

Space heat from Community boilers	(98) x (304a) x	(98) x (304a) x (305) x (306) =								
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appen	dix E)	0	(308						
Space heating requirement from secondary/supplementary s	ystem (98) x (301) x 1	00 ÷ (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)(307	e) + (310a)(310e)] =	383.78	(313)						
Cooling System Energy Efficiency Ratio			0	(314)						
Space cooling (if there is a fixed cooling system, if not enter ()) = (107) ÷ (314)	=	0	(315)						
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fro	om outside		0	(330a)						
warm air heating system fans	0	(330b)								
pump for solar water heating			0	(330g)						
Total electricity for the above, kWh/year	0	(331)								
Energy for lighting (calculated in Appendix L)			528.07	(332)						
12b. CO2 Emissions – Community heating scheme				-						
CO2 from other sources of space and water heating (not CHI Efficiency of heat source 1 (%)	Energy kWh/year P) sing two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year](367a)						
CO2 associated with heat source 1 [(307	b)+(310b)] x 100 ÷ (367b) x	0 =	1 <mark>2753.3</mark> 6	(367)						
Electrical energy for heat distribution	[(313) x	0.52 =	199.18	(372)						
Total CO2 associated with community systems	(363)(366) + (368)(372	2) =	12952.54	(373)						
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)						
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22 =	0	(375)						
Total CO2 associated with space and water heating	(373) + (374) + (375) =		12952.54	(376)						
CO2 associated with electricity for pumps and fans within dw	elling (331)) x	0.52 =	0	(378)						
CO2 associated with electricity for lighting	(332))) x	0.52 =	274.07	(379)						
Total CO2, kg/year sum of (376)(382) =			13226.61	(383)						
Dwelling CO2 Emission Rate (383) ÷ (4) =			188.95	(384)						
El rating (section 14)			4.23	(385)						
			User D	etails:						
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Assessor Name: Software Name:	Stroma FSAP 20	12 Dr	on orthu	Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
Addrose J	london	PI	openy r	Address.	Unit 9					
1 Overall dwelling dimen	sions:									
Basement				a(m²) 124	(1a) x	Av. He	ight(m) .37	(2a) =	Volume(m³ 293.88) (3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1n) 1	124	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	293.88	(5)
2. Ventilation rate:	-									
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} 0 \\ \hline 0 \\ \end{array} $	beating 0 0	/ +] +	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	S				Γ	2	х ′	10 =	20	(7a)
Number of passive vents					Ē	0	x /	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the	s, flues and fans = (en carried out or is intend e dwelling (ns)	6a)+(6b)+(7a led, proceed	a)+(7b)+(7 to (17), c	7c) = otherwise c	ontinue fro	20 om (9) to ((16)	÷ (5) =	0.07	(8)
Additional infiltration							[(9)	-1]x0.1 =	0	(0)
Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	y constr	uction		-	0	(11)
if both types of wall are pre deducting areas of opening	sent, use the value corre is); if equal user 0.35	sponding to	the greate	er wall area	a (after					_
If suspended wooden flo	or, enter 0.2 (unsea	aled) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0	tuin n a d							0	(13)
Window infiltration	and doors draught s	stripped		0 25 - [0 2	x (14) ∸ 1	001 =			0	(14)
Infiltration rate				(8) + (10) -	F (11) + (1	2) + (13) ·	+ (15) =		0	(15)
Air permeability value, o	50. expressed in cu	bic metres	s per ho	ur per so	uare m	etre of e	envelope	area	20	-1(17)
If based on air permeabilit	y value, then $(18) = [($	17) ÷ 20]+(8), otherwis	se (18) = (16)				1.07	(18)
Air permeability value applies	if a pressurisation test ha	as been done	e or a deg	ıree air per	meability	is being u	sed			
Number of sides sheltered									1	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0.99	(21)
Infiltration rate modified fo	r monthly wind spee	d							I	
Jan Feb N	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7						i		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 $(22a)m = (22)$)m ÷ 4	· · · ·					1	1	I	
(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		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m	-	-		_	
~ ' '	1.26	1.23	1.21	1.09	1.06	0.94	0.94	0.91	0.99	1.06	1.11	1.16		
Calcula If me	ate etter	ctive air al ventila	change	rate for t	he appli	cable ca	ISE						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)), othei	rwise (23b) = (23a)			0	(23b)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,			0	(23c)
a) If	balance	ed mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	ı)m = (22	2b)m + ()	23b) x [⁻	1 – (23c)	÷ 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	covery (N	и ЛV) (24b)m = (22	1 2b)m + (2	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If	whole h	iouse ex	tract ver	tilation of	or positiv	ve input v	ventilatio	on from c	outside				1	
í	if (22b)n	n < 0.5 ×	(23b), t	hen (240	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft					
i	if (22b)n	n = 1, th	en (24d)	m = (22t	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(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		(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24)	c) or (24	d) in boy	(25)	4.00		4.40	1	(25)
(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		(25)
3. He	at l <mark>osse</mark>	s and he	at loss	oaramete	er:									
ELEN		Gros are <mark>a</mark>	ss (m²)	Openin m	gs 2	Net Ar A ,r	rea m²	U-valı W/m2	le K	A X U (W/I	K)	k-value kJ/m²·l	e K	A X k kJ/K
Doo <mark>rs</mark>						1.6	x	1.4	= [2.24				(26)
Win <mark>do</mark>	<mark>ws</mark> Type	ə1				5.49	x1.	/[1/(4.8)+	0.04] =	22.11				(27)
Windo	ws Type	e 2				4.7	x1.	/[1/(4.8)+	0.04] =	18.93	F			(27)
Walls 7	Type1	11.8	5	1.6		10.25	5 X	2.1		21.52	F r			(29)
Walls ⁻	Type2	122	2	10.19	ə	111.8	1 X	1.27	= [142.22			\dashv	(29)
Roof		68.	1	0		68.1	x	2.3		156.63			7 6	(30)
Total a	area of e	elements	, m²			201.9	5		I					(31)
Party v	wall					4.8	x	0	= [0				(32)
* for win	dows and le the area	l roof winde	ows, use e sides of ir	effective wi	ndow U-va	alue calcul	lated using	formula 1,	L /[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2]、 /
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				363.6	i5 (33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be u	ign asses: Jsed inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	K						30.4	(36)
if details	of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			394.0	15 <mark>(37)</mark>
Ventila	ation hea	at loss ca	alculated	monthly	/	i			(38)m	= 0.33 × (25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	122.16	119.76	117.37	105.39	103	91.2	91.2	88.99	95.82	103	107.79	112.58]	(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m	-		
(39)m=	516.21	513.81	511.42	499.44	497.04	485.25	485.25	483.03	489.86	497.04	501.83	506.62		
										Average =	Sum(39)1	12 /12=	498.9) (3 9)

Heat lo	ss para	meter (H	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		
					<u> </u>			ļ	,	Average =	Sum(40)1.	12 /12=	4.02	(40)
Numbe	r of day	/s in moi	nth (Tab		Mov	lun	1.1	<u> </u>	Son	Oct	Nov	Dee		
(41)m-	21	29	1VId1	20 20	1VIAY	20	21	Aug	30 30	21	20	21		(41)
(41)11=	51	20	51	- 50	51	- 30	51	51	30	51	- 50	51		(+1)
4. Wat	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 ×	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.	2. .9)	88		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person pe	ge in litre usage by r day (all w	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	102 f	2.54		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					I	
(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		-
Ener <mark>gy c</mark>	ontent of	hot water	used - ca	lculated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1230.5	(44)
(45)m=	1 <mark>6</mark> 7.27	146.3	150.97	131.62	126.29	108.98	100.98	115.88	117.26	13 <mark>6.66</mark>	149.18	161.99		_
lf instanta	aneous w	vater heati	ing at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1 <mark>6</mark> 13.38	(45)
(46)m=	25.09	21.94	22.64	19. <mark>7</mark> 4	18.94	16.35	15.15	17.38	17.59	20.5	22.38	24.3		(46)
Storage	storage	loss: le (litres)	Vincludir	ng any se	olar or M	/WHRS	storage	within sa	ame ves	sel		160		(47)
lf com	nunity h	neating a	and no ta	ank in dw	velling e	nter 110	litres in	(47)			L	100		(47)
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	e 2b								0		(49)
Energy	lost fro	m water	r storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If ma Hot wat	anufact	urer's de	eclared (cylinder l rom Tabl	OSS fact = 2 (k)/	or is not h/litre/da	known:				0	00	l	(51)
If comm	nunity h	neating s	see secti	on 4.3		n/ nti 0/ dc	xy)				0.	02		(01)
Volume	factor	from Ta	ble 2a								1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	r storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter ((50) or ((54) in (5	55)								1.	03		(55)
Water s	storage	loss cal	culated	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 cylinde	r contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	lculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	, cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for each	n month	(61)m =	(60) ÷	365 × (41)m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for e	ach month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	222.55	196.23	206.24	185.11	181.57	162.4	17 156.26	171.16	170.76	191.94	202.67	217.27		(62)
Solar DH	HW input	calculated	using App	pendix G o	r Appendix	H (ne	gative quantit	y) (enter '()' if no sola	r contribut	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHRS	and/or \	NWHRS	appli	es, see Ap	pendix	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	222.55	196.23	206.24	185.11	181.57	162.4	17 156.26	171.16	170.76	191.94	202.67	217.27		_
								Out	put from w	ater heate	r (annual)	112	2264.22	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [O.	85 × (45)m	n + (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	74.23	65.45	68.81	61.77	60.6	54.2	4 52.19	57.14	57	64.05	67.61	72.47		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinde	r is in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic dair	ns (Table	5). Wa	tts										
	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	143.88	143.88	143.88	143.88	143.88	143.8	38 143.88	143.88	143.88	143.88	143.88	143.88		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equati	ion LS) or L9a), a	also see	Table 5					
(67)m=	51.64	45.87	3 7.3	28.24	21.11	17.8	2 19.26	25.03	33.6	42.66	49.79	53.08		(67)
Applia	nces da	ins (calc	ulated in	n Appeno	dix L. eq	Jatior	L13 or L1	3a), also	see Ta	ble 5	•			
(68)m=	290.33	293.35	28 5.75	269.59	249.19	230.0)1 217.2	214.19	221.78	237.95	258.35	277.52		(68)
Cookin	a dains	s (calcula	ted in A	ppendix	L. equat	ion L	15 or L15a), also s	ee Table	5				
(69)m=	37.39	37.39	37.39	37.39	37.39	37.3	9 37.39	37.39	37.39	37.39	37.39	37.39		(69)
Pumps	and fa	ns gains	(Table	5a)								I		
(70)m=					0	0	0	0	0	0	0	0		(70)
			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)
Wator	heating		able 5)										I	
(72)m=	99 77	97.4	92 48	85 79	81 45	75.3	4 70 14	76.8	79 17	86.09	93.9	97 41]	(72)
Total i	ntornal		02.10	00.10	01110	10.0	(66)m + (67)n	1 + (68)m	+ (69)m +	(70)m + (7)	(1)m + (72)			(/
(73)m-	507.91	502 78	481.7	449 79	417.91	380 3	372 77	382.10	400.71	432.85	468.2	494 17	1	(73)
(70)III-	ar gain	s [.]	401.7	++0.10	417.51	000.0	572.11	002.10	400.71	402.00	400.2	434.17		()
Solar g	ains are	calculated	using sola	ar flux from	Table 6a a	and as	sociated equa	ations to c	onvert to th	ne applical	ole orienta	tion.		
Orienta	ation:	Access F	actor	Area		I	- Flux		a		FF		Gains	
		Table 6d		m²		-	Table 6a	٦	Table 6b	Т	able 6c		(VV)	
North	0.9x	0.77	x	5.4	19	x	10.63) x [0.85	ר × ר	0.7	=	24.07	(74)
North	0.9x	0.77	×	5.4	49	×	20.32	」	0.85	╡╷┝	0.7		46	(74)
North	0.9x	0.77	×	5.4	19	×	34.53	」] [0.85	╡╷┝	0.7		78.17](74)
North	0.9x	0.77	x	54	19	×	55.46	i . ⊢	0.85	╡╷┝	0.7		125.56](74)
North	0.9x	0.77	×	54	19	x F	74.72	i x ⊢	0.85	╡ _╸ ┟	0.7		169.14	_`´´](74)
	0.07	0.77	^	5.4	+9	^	14.12		0.85	^ L	0.7	_	109.14	(1-1)

North	0.9x	0.77	x	5.4	19	x	7	79.99	x	0.85	x	0.7] = [181.06	(74)
North	0.9x	0.77	x	5.4	19	x	7	74.68	X	0.85	x	0.7] = [169.05	(74)
North	0.9x	0.77	x	5.4	19	x	5	59.25	x	0.85	x	0.7] = [134.12	(74)
North	0.9x	0.77	x	5.4	49	x	4	11.52	x	0.85	x	0.7] = [93.98	(74)
North	0.9x	0.77	x	5.4	19	x	2	24.19	x	0.85	x	0.7] = [54.76	(74)
North	0.9x	0.77	×	5.4	19	x	1	3.12	x	0.85	x	0.7] = [29.69	(74)
North	0.9x	0.77	×	5.4	19	x		8.86	x	0.85	x	0.7] = [20.07	(74)
South	0.9x	0.77	×	4.	7	x	4	16.75	x	0.85	x	0.7] = [90.6	(78)
South	0.9x	0.77	x	4.	7	x	7	76.57	x	0.85	×	0.7] = [148.39	(78)
South	0.9x	0.77	x	4.	7	x	9	97.53	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	x	0.7] = [222.62	(78)
South	0.9x	0.77	x	4.	7	x	1	10.55	x	0.85	×	0.7] = [214.24	(78)
South	0.9x	0.77	x	4.	7	x	1	08.01	x	0.85	×	0.7] = [209.32	(78)
South	0.9x	0.77	x	4.	7	x	1	04.89	x	0.85	x	0.7] = [203.28	(78)
South	0.9x	0.77	x	4.	7	x	1	01.89	x	0.85	×	0.7] = [197.45	(78)
South	0.9x	0.77	×	4.	7	x	8	32.59	x	0.85	x	0.7] = [160.05	(78)
South	0.9x	0.77	x	4.	7	x	5	55.42	х	0.85	×	0.7] = [107.4	(78)
Sout <mark>h</mark>	0.9x	0.77	×	4.	7	x		40.4	x	0.85	×	0.7		= [78.29	(78)
Sola <mark>r (</mark>	<mark>gain</mark> s in	watts, <mark>cal</mark>	lculated	for eac	h mont	h			(83)m	n = Sum(74)m	n(82)r	n				
(83)m=	114.68	194.39	267.18	339.19	391.75		395.3	378.37	337	7.4 291.43	3 214.	81 137.0	9 98	3.36		(83)
Total g	gains – i	nternal ar	nd sola	r (84)m =	= (73)m I) + (83)m	, watts	1							
(84)m=	622.58	697.16	748.88	788.98	809.67		84.64	751.14	719	.59 692.14	4 647.	605.2	9 59	2.53		(84)
7. Me	ean inter	nal tempe	erature	(heating	seaso	n)										
Temp	perature	during he	eating p	eriods i	n the liv	ving	area	from Tal	ble 9	, Th1 (°C)					21	(85)
Utilis	ation fac	tor for ga	ins for	living ar	ea, h1,i	n (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	′	Jun	Jul	A	ug Sep	00	t Nov	/ [Dec		
(86)m=	1	1	1	1	1		0.99	0.98	0.9	0.99	1	1		1		(86)
Mear	interna	l tempera	iture in	living ar	ea T1 (follc	w ste	ps 3 to 7	7 in T	able 9c)						
(87)m=	18.22	18.37	18.68	19.15	19.66	2	20.17	20.5	20.	46 20.05	19.4	1 18.77	18	3.23		(87)
Temp	perature	during he	eating p	eriods i	n rest o	f dw	elling	from Ta	able 9	9, Th2 (°C))					
(88)m=	18.92	18.93	18.94	18.99	19	1	9.04	19.04	19.	05 19.02	19	18.98	3 18	3.96		(88)
Utilis	ation fac	tor for a	ins for	rest of d	wellina	. h2	.m (se	ee Table	9a)		•					
(89)m=	1	1	1	1	0.99	<u> </u>	0.97	0.9	0.9	0.99	1	1		1		(89)
Moor		l tempera	ituro in	the rest	of dwo	lling	T2 (f	I ollow sta		to 7 in Ta						
(90)m=	16.51	16.66	16.98	17.49	18		12 (1	18.86	18.	83 18.41	17.7	6 17.1	16	6.55		(90)
· /							-				fLA = L	iving area -	÷ (4) =		0.3	(91)
Maar	intorne	l tomas-	turo /f-	vr tha we		oll:~	a) f	۲۸۰۰ ۲۷	. /4	fl ۸ \ ┯	Э			L		` ´
			17 49	17 QQ			9) = T	LA X 11	+ (1	- ILA) × 1.	<u>۲</u>	5 176	17	7 06		(92)
102111-	1		11.43	1	I 10.0		+	1 .0.00	1 .9.	- 1 10. 7 1	1 10.2	~ I ''.0	1 ''			(54)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r tilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	1	1	0.99	0.97	0.92	0.94	0.98	1	1	1		(94)
Usefu	ıl gains,	hmGm ,	W = (94	4)m x (84	4)m									
(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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	_m , W =	=[(39)m >	< [(93)m∙	– (96)m]				
(97)m=	6571.1	6307.98	5622.35	4542.03	3380.85	2154.23	1337.63	1412.34	2354.41	3804.33	5270.14	6514.35		(97)
Space	e heatin	g require	ement fo	r each m	honth, k\	Wh/mont	th = 0.02	4 x [(97))m – (95)m] x (4′	1)m			
(98)m=	4426.05	3771.02	3626.95	2704.38	1918.59	0	0	0	0	2350.28	3359.2	4406.11		1
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	26562.59	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								214.21	(99)
9b. En	ergy rec	luiremer	nts – Cor	nmunity	heating	scheme						-		
This pa	art is use	ed for sp ace heat	ace hea from se	ting, spa	ace cooli /supplen	ng or wa	ater heat	ing prov Table 1′	ided by a 1) '0' if n	a c <mark>omm</mark>	unity sch	neme.	0	(301)
Freetie			from co			4 (204	1)		,	0110				
Fractic	on of spa	ace neat	from col	mmunity	system	1 – (30	1) =					[1	(302)
The con	nmunity so	cheme may	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and ι	up to four o	other heat	sources; th	ne latter	
Fractic	on of hea	at from C	commun	ity boiler	'S	ioni power	stations.	зее дррег	idix C.			[1	(303a)
Fractic	on of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting syst	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syster	n					1.1	(306)
Space	heating	9											kWh/year	_
Annua	l space	heating	requirem	nent									26562.59]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (308	5) x (306) =	- [30679.79	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	e 4a or A	ppendix	E)	[0	(308
Space	heating	requirer	ment froi	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 ÷	÷ (308) =	[0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								ſ	2264.22	1
If DHW	/ from co	ommunit	ty schem	ne: Dilers					(64) x (3(13a) x (304	5) x (306) -	ו _ [2615 17](310a)
Flectri		h for boo	numry DC	ution				0.01	(0-r) ∧ (00 × [(307-)	(3070) -	(310a)	- 310e)] - [2010.17](313)
Coolin					h			0.01	~ [(307a).	(3078) +	(J 10a)(<u> </u>	JJZ.95	(31 <i>3</i>)
Space				d cooling		, if not a	ontor 0		- (107) ·	(314) -] I	0	(315)
Space			is a lixe		y system		iner U)		$=(107) \div$	(314) =			U	(313)
Electric	city for p inical ve	oumps aintilation	nd fans v - balanc	within dw ed, extra	velling (1 act or po	able 4f) sitive inj	: 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)				911.99	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh	Emi kg (issions 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 fu	el	65	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0	=	11064.17	(367)
Electrical energy for heat distribution [(313) x	0.52	=	172.8	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372)		=	11236.97	(373)
CO2 associated with space heating (secondary) (3	309) 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) =			11236.97	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	= [0	(378)
CO2 associated with electricity for lighting (3	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 FSAP 201	2		Stroma Softwa	a Num Ire Ver	ber: sion:		Versio	n: 1.0.3.15	
		Pr	operty A	Address:	Unit 10					
Address :	, Iondon									
	1510115.		Area	ı(m²)		Av. He	ight(m)		Volume(m ³)
Basement				79	(1a) x	2	2.6	(2a) =	205.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)		79	(4)			-		_
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	205.4	(5)
2. Ventilation rate:										_
Number of chimneys	main si heating h	econdary neating 0	/ · · ·	0] = [total 0	×4	40 = 20 -	m ³ per hou	(6a)
Number of intermittent for		0] · L	0	」 └	0		-0 -	0	
Number of intermittent fan	S				Ļ	2	×	10 =	20	(7a)
Number of passive vents					Ļ	0	X 1	10 =	0	(7b)
Number of flueless gas fire	es la la la la la la la la la la la la la				L	0	X 2	Air ch	0 anges per ho	(7c) ur
Infiltration due to chimney If a pressurisation test has be Number of storeys in the	s, flues and fans = (6 en carried out or is intende e dwelling (ns)	a)+(6b)+(7a ed, proceed	a)+(7b)+(7 b) to (17), c	7c) = otherwise c	ontinue fre	20 om (9) to ((16)	÷ (5) =	0.1	(8)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	25 for steel or timber sent, use the value corres gs); if equal user 0.35	frame or ponding to	0.35 for the greate	masonr er wall area	y constr a (after	uction	[(9)-	·1]XU. 1 =	0](10)](11)
If no draught lobby enter	201, effici 0.2 (unsea)		i (Seale	u), eise					0	$ = \frac{(12)}{(13)} $
Percentage of windows	and doors draught st	ripped							0	
Window infiltration	j			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, c	150, expressed in cub	oic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	20	(17)
If based on air permeabilit	y value, then (18) = [(1	7) ÷ 20]+(8)), otherwis	se (18) = (16)				1.1	(18)
Air permeability value applies	if a pressurisation test ha	s been done	e or a deg	ree air per	meability	is being u	sed			
Shelter factor	l			(20) = 1 - [0.075 x (1	9)] =			0.92	-(19)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				1.02](21)
Infiltration rate modified fo	r monthly wind speed	ł								
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	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								I	
(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		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)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		
Calcul If m	ate etter	ctive air	change	rate for t	he appli	cable ca	se						0	(220)
lf exh	aust air h	eat pump i	usina App	endix N. (2	3b) = (23a	i) x Fmv (e	equation (I	N5)) . othei	rwise (23b) = (23a)			0	(23a)
If bala	anced with	heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, (,			0	(23c)
a) If	balance	d mech:	, anical ve	ntilation	with he	at recove	∍rv (MVI	HR) (24a	n)m = (2)	2h)m + (23h) x [1	l – (23c)	 ∸ 1001	(200)
(24a)m=				0	0	0			0			0		(24a)
b) If	balance	d mech:	I anical ve	Intilation	without	heat rec	L coverv (N	L MV) (24b	l = (2)	I 2b)m + (L 23b)			
(24b)m=	0	0		0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	ract ver	tilation o	or positiv	re input v	ı ventilatio	on from c	utside					
0)	if (22b)n	n < 0.5 ×	(23b), 1	hen (240	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	.5 × (23t))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft	•	•			
	if (22b)n	n = 1, the	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		r	1	
(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		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	(25)	i		i		
(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)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramete	er:									
	/ENT	Gros	s	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	e l	AXk
_		area	(m²)	m	2	A ,r	n²	W/m2	K	(VV/	K)	kJ/m ² ·l	<	kJ/K
Doors						1.6	×	1.4	=	2.24				(26)
Windo	ws Type	e 1				3.12	x1	/[1/(4.8)+	0.04] =	12.56				(27)
Windo	ws Type	e 2				3.66	x1	/[1/(4.8)+	0.04] =	14.74				(27)
Walls	Type1	89.2	2	6.78		82.42	<u>x</u>	1.27	=	104.83				(29)
Walls	Type2	26.6	63	1.6		25.03	3 X	2.1	=	52.56				(29)
Roof		46.	5	0		46.5	x	2.3	=	106.95				(30)
Total a	area of e	lements	, m²			162.3	3							(31)
Party v	wall					5.3	x	0	=	0				(32)
* for win	idows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
** incluc	le the area	as on both	sides of in	nternal wal	ls and part	titions		(00) (00)	(22)					
Fabric	heat los	SS, W/K =	= S (A x	U)				(26)(30)	(32) =	(0.0)			293.89	(33)
Heat c	apacity	Cm = S((A X K)			1 1/ 21/			((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
I nerm	al mass	parame		$P = Cm + \frac{1}{2}$	- IFA) Ir	i KJ/M²K			Indica	tive Value	: High	- h l = 15	450	(35)
ror desi can be ι	ign assess used inste	sments wn ad of a dei	ere the de tailed calc	talis of the ulation.	construct	on are not	t known pi	recisely the	e indicative	e values of	TMPINT	adie 11		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						24.8	(36)
if details	of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			318.69	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	87.72	86	84.28	75.68	73.96	65.41	65.41	63.77	68.8	73.96	77.4	80.84		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	406.41	404.69	402.97	394.37	392.65	384.1	384.1	382.46	387.49	392.65	396.09	399.53		
										Average =	Sum(39)1	12 /12=	393.96	(39)

Heat lo	ss para	imeter (H	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		
L	r of day		I			<u> </u>			,	Average =	Sum(40)1.	12 /12=	4.99	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
`´														
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	:[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	2. .9)	44		(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by r day (all w	es per da 5% if the a vater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	92 f	.24		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					L	
(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		— (1)
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1106.83	(44)
(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		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	•	1451.23	(45)
(46)m=	22.57	19.74	20.37	17.76	17.04	14.7	13.63	15.64	15.82	18.44	20.13	21.86		(46)
Storage	e volum	loss: le (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If comm	nunity h	eating a	and no ta	ink in dw	elling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/y∉ ≫dindorl	ear	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	e factor	from Ta	ble 2a	011 4.3							1	03		(52)
Temper	rature f	actor fro	m Table	2b							0	.6		(53)
Enerav	lost fro	m water	storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		03		(54)
Enter ((50) or ((54) in (5	55)	, ,						,	1.	03		(55)
Water s	storage	loss cal	culated	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 cylinde	r 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 Append	l lix 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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
mod) ר	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		I	
(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 ca	alculated	for ea	ch	month	(61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0]	(61)
Total h	eat rec	quired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)m =	0.85 ×	(45)m +	· (46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.74	181.52	191.0	7	171.88	168.87	15	51.52	146.11	159.51	158.97	178.2	187.68	200.99		(62)
Solar DI	-IW input	calculated	using A	ppe	ndix G o	r Appendix	н (negativ	ve quantity	enter '0	' if no sola	r contribu	ition to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S a	and/or \	NWHRS	ap	plies	, see Ap	pendix (G)	-			-	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter									•	_		-	
(64)m=	205.74	181.52	191.0	7	171.88	168.87	15	51.52	146.11	159.51	158.97	178.2	187.68	200.99		-
										Out	out from w	ater heat	er (annual)₁	12	2102.07	(64)
Heat g	ains fro	om water	heatir	ıg,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)n	n + (57)m	+ (59)m	<u>[</u>]	
(65)m=	68.64	60.56	63.76	6	57.37	56.38	5	50.6	48.81	53.27	53.08	59.48	62.63	67.06		(65)
inclu	ide (57)m in calo	culatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwelling	or hot w	ater is	from com	munity ł	neating	
5. Int	ternal g	jains (see	e Table	e 5	and 5a):										
Metab	olic gai	ns (Table	e 5), W	att	S	-	_				-	-		-	_	
	Jan	Feb	Ма	r	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	122.18	122.18	122.1	8	122.18	122.18	12	22.18	122.18	122.18	122.18	122.18	122.18	122.18		(66)
Ligh <mark>tin</mark>	<mark>g g</mark> ains	s (calcula	ted in	Ap	pendix	L, equat	ion	L9 oi	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m=	3 <mark>8.31</mark>	34.03	27.68	3	20.95	15.66	1	3.22	14.29	18.57	24.93	31.65	36.94	39.38		(67)
App <mark>lia</mark>	nces ga	ains (ca <mark>lc</mark>	ulated	lin	Append	dix L, eq	uat	ion L'	13 or L1	3a), also	o see Ta	ble <mark>5</mark>				
(68)m=	217.34	219.5 <mark>9</mark>	213.9	1	201.81	186.54	17	72.18	162.59	160.34	166.02	178.12	193.39	207.75		(68)
Cookir	ng gains	s (calcula	ated in	Ap	pendix	L, equat	ion	L15	or L15a)	, also se	ee Table	5			-	
(69)m=	35.22	35.22	35.22	2	35.22	35.22	3	5.22	35.22	35.22	35.22	35.22	35.22	35.22		(69)
Pumps	and fa	ans gains	(Table	e 5	a)											
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
Losses	s e.g. e	vaporatic	n (neg	gati	ve valu	es) (Tab	le :	5)				-			-	
(71)m=	-97.74	-97.74	-97.7	4	-97.74	-97.74	-9	97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74]	(71)
Water	heating	g gains (T	able 5	5)			-				-	•	•		-	
(72)m=	92.26	90.13	85.7		79.69	75.78	7	0.28	65.61	71.6	73.72	79.95	86.98	90.13]	(72)
Total i	nterna	l gains =						(66)	m + (67)m	+ (68)m ·	+ (69)m +	(70)m + (71)m + (72)	m	-	
(73)m=	407.56	403.4	386.9	4	362.1	337.64	3′	15.34	302.14	310.16	324.33	349.38	376.97	396.92]	(73)
6. So	lar gain	is:	•								•				-	
Solar g	ains are	calculated	using so	olar	flux from	Table 6a	and	associ	ated equa	tions to co	onvert to th	ne applica	ble orientat	ion.		
Orienta	ation:	Access F	actor		Area			Flu	X	-	g	-	FF		Gains	
		l able 6d			m²			lat	ole 6a	I	able 6b		able 6c		(VV)	_
North	0.9x	0.77		x	3.6	66	x	1	0.63	x	0.85	x	0.7	=	16.05	(74)
North	0.9x	0.77		x	3.6	66	x	2	0.32	x	0.85	×	0.7	=	30.67	(74)
North	0.9x	0.77		x	3.6	66	x	3	4.53	x	0.85	x [0.7	=	52.11	(74)
North	0.9x	0.77		x	3.6	66	x	5	5.46	x	0.85	x	0.7	=	83.7	(74)
North	0.9x	0.77		x	3.6	66	x	7	4.72	x	0.85	x	0.7	=	112.76	(74)

North	0.9x	0.77		x	3.66) ×	ĸ	79.99	x	0.85	x	0.7	=	120.71	(74)
North	0.9x	0.77		x	3.66	Ī ×	ĸ	74.68	×	0.85	×	0.7	=	112.7	(74)
North	0.9x	0.77	:	x	3.66	_ } ×	×	59.25	x	0.85	x	0.7	=	89.41	(74)
North	0.9x	0.77		x	3.66	_ ×	ĸ	41.52	x	0.85	x	0.7	=	62.65	(74)
North	0.9x	0.77	:	x	3.66	_ _	×	24.19	x	0.85	×	0.7	=	36.51	(74)
North	0.9x	0.77	:	x	3.66	_ _ ×	×	13.12	x	0.85	×	0.7	=	19.8	(74)
North	0.9x	0.77	:	x	3.66	_ _ ×	×	8.86	x	0.85	×	0.7	=	13.38	(74)
South	0.9x	0.77	:	x	3.12	_ } ×	×	46.75	x	0.85	x	0.7	=	60.15	(78)
South	0.9x	0.77	:	x	3.12	_ _ ×	×	76.57	x	0.85	×	0.7	=	98.5	(78)
South	0.9x	0.77		x	3.12	_ ×	ĸ	97.53	x	0.85	×	0.7	=	125.48	(78)
South	0.9x	0.77	:	x	3.12	_ _	×	110.23	x	0.85	×	0.7	=	141.81	(78)
South	0.9x	0.77	:	x	3.12	_ _ ×	×	114.87	x	0.85	×	0.7	=	147.78	(78)
South	0.9x	0.77		x	3.12] ×	×	110.55	x	0.85	x	0.7	=	142.22	(78)
South	0.9x	0.77		x	3.12	Ī ×	ĸ	108.01	×	0.85	×	0.7	=	138.96	(78)
South	0.9x	0.77		x	3.12	Ī ×	ĸ	104.89	x	0.85	×	0.7	=	134.95	(78)
South	0.9x	0.77	:	x	3.12] ×	×	101.89	x	0.85	x	0.7	=	131.07	(78)
South	0.9x	0.77	:	x	3.12	_ _ ×	×	82.59	x	0.85	×	0.7	=	106.25	(78)
South	0.9x	0.77		x	3.12	×	ĸ	55.42	x	0.85	x	0.7	=	71.29	(78)
South	0.9x	0.77		x	3.12	×	x	40.4	x	0.85	x	0.7		51.97	(78)
Solar g	<mark>gain</mark> s in	watts, <mark>ca</mark>	lculate	d	for each mon	th			(83)m	n = Sum(74)m	<mark>(8</mark> 2)m				
(83)m=	76.19	129.17	177.59		225.52 260.5	4	26	62.93 251.65	224	.36 193.73	142.7	5 91.09	65.35		(83)
Total (gains – i	nternal a	nd sola	ar	(84)m = (73)r	n +	- (8	33)m , watts	1			_	i		
(84)m=	483.76	532.57	564.53		587.62 598.1	7	57	78.27 553.8	534	.52 518.06	492.1	3 468.06	462.27		(84)
7. Me	ean inter	nal temp	erature	Э (heating seas	on)									
Temp	perature	during h	eating	pe	eriods in the I	ivin	g	area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilis	ation fac	tor for ga	ains fo	r li	ving area, h1	,m ((se	ee Table 9a)						1	
	Jan	Feb	Mar		Apr Ma	y		Jun Jul	A	ug Sep	Oct	t Nov	Dec	-	
(86)m=	1	1	1		1 0.99		(0.98 0.97	0.9	0.99	1	1	1		(86)
Mear	n interna	l tempera	ature ir	n li	ving area T1	(fol	llo	w steps 3 to 7	7 in T	able 9c)			-	_	
(87)m=	17.82	17.98	18.33		18.87 19.44	4	2	0.03 20.41	20.	36 19.89	19.17	7 18.44	17.83		(87)
Tem	oerature	during h	eating	ре	eriods in rest	of c	wb	elling from Ta	able 9	9, Th2 (°C)					
(88)m=	18.43	18.44	18.45	T	18.5 18.5	1	1	8.57 18.57	18.	58 18.55	18.51	18.49	18.47]	(88)
Utilis	ation fac	tor for a	ains fo	r re	est of dwelling	n h	12	m (see Table	.9a)					-	
(89)m=	1	1 1	1	Ť	0.99 0.99		(<u> </u>	0.95 0.83	0.8	37 0.97	0.99	1	1]	(89)
Moor			oturo ir		ho rost of dw			T2 (follow etc		to 7 in Tabl				J	
(90)m=	15.78	15.94	16.3	Т	16.87 17.4	5	1 1	8.07 18.42	18.	39 17.92	17.18	3 16.43	15.81	1	(90)
()						- <u> </u>			1	f	LA = Li	ving area ÷ (4) =	0.28	(91)
N /		1.40.00.000			المعاملة			~) {I ^ · · T 4	. /4						`` ´
		165	16 86	T			ni 1	$\frac{y}{8.61} = 12.4 \times 11$	+(1	$-ILA) \times I2$	17 73	16.00	16.37	1	(92)
134/11=	1 10.04	I 10.0 I	10.00		11.74 0		- 1	0.01 1 10.3/	I 10.		11.15	, I IU.33	1 10.07		(04)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Spa	ace hea	ting requ	uirement	i										
Set Ti the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	mperatui using Ta	e obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	1	1	1	0.99	0.98	0.96	0.88	0.9	0.97	0.99	1	1		(94)
Usefu	Il gains,	hmGm	W = (94	4)m x (84	4)m									
(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)
Month	nly avera	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	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	4894.57	4696.37	4175.08	3360.71	2473.16	1539.74	908.64	968.7	1691.43	2798.15	3916.09	4862.41		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	3282.4	2799.11	2688.12	1999.95	1402.58	0	0	0	0	1718.57	2483.62	3274.32		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	19648.68	(98)
Space	e heating	g require	ement in	kWh/m²	/year								248.72	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme)					L		1
This pa	art is use	ed for sp	ace hea	iting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by	a c <mark>omm</mark>	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	<mark>n o</mark> f spa	ace heat	from co	<mark>mmu</mark> nity	syste <mark>m</mark>	1 – (301	1) =						1	(302)
The com	n <mark>mu</mark> nity so	cheme m <mark>a</mark> g	y obtain he	eat from se	everal sour	ces. The p	procedure	allows for	CHP and u	up to four (other heat	sou <mark>rces; t</mark> l	ne latter	
<i>includes</i> Fractio	boilers, h n of hea	eat pumps at from C	s, ge ^{otherr} Commun	<i>mal and wa</i> ity boiler	aste heat fi 'S	rom powei	r stations.	See Apper	ndix C.			[1	(303a)
Fractio	n of tota	al space	heat fro	<mark>m Co</mark> mn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting sys	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	I2c) for c	commun	ity heatir	ng syste	m				[1.1	(306)
Space	heating	9										L	kWh/year	1
Annua	space	heating	requirem	nent								[19648.68]
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [22694.22	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	e 4a or A	ppendix	E)	[0	(308
Space	heating	require	ment fro	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 -	- (308) =	[0	(309)
Water Annual	heating water h	j neating r	eauirem	ent								ſ	2102.07	1
If DHW	/ from co	ommunit	ty schem	ne: Dilers					(64) x (3(13a) x (304	5) x (306) -	ו - ר	2427.80]](310a)
Flootrid			t diatrib	ution				0.04	v [(2070)	(207~)	(3100) -	- 3100)] -	2421.03	$\left \begin{array}{c} (312) \\ (312) \end{array} \right $
Cooling					2			0.01	× [(ou≀a).	(3078) +	(J 10a)(5100)] =	251.22	$\left \begin{pmatrix} 3 & 3 \end{pmatrix} \right $
Cooline			y ⊑niciel			. :f	nter 0)		(407)	(24.4)		l	0	$\left \begin{array}{c} (314) \\ (345) \end{array} \right $
Space	cooling	(ii there	is a fixe		y system		enter U)		$=(107) \div$	(314) =			0	(315)
mecha	nical ve	ntilation	na tans v - balanc	within dv ed, extra	act or po	able 4f) sitive inj	: 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) + (33	30b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)		676.65	(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 two fuels repeat (363) t	o (366) for the second fu	iel 65	(367a)
CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$	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)(3	72)	= 8478.65	(373)
CO2 associated with space heating (secondary) (309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating $(373) + (374) + (375) =$		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) =		<mark>8829.8</mark> 4	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		111.77	(384)
El rating (section 14)		24.01	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20)12		Stroma Softwa	a Num ire Ver	ber: sion:		Versic	on: 1.0.3.15	
	landan	PI	roperty <i>i</i>	Address:	Unit 11					
Address :										
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) 1.9	(2a) =	Volume(m³ 96.9) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	le)+(1n)	51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	96.9	(5)
2. Ventilation rate:		_								
Number of chimneys Number of open flues	main heating 0 + 0 +	secondar heating 0 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent far	IS				Γ	2	x ′	10 =	20	(7a)
Number of passive vents					Ē	0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					0	X	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7 ded. proceed	a)+(7b)+(7	7c) = otherwise c	ontinue fro	20 om (9) to ((16)	÷ (5) =	0.21	(8)
Number of storeys in th Additional infiltration Structural infiltration: 0.3	e dw <mark>elling</mark> (ns) 25 for steel or timbe	r frame or	0.35 for	. masonr	y constr	uction	[(9)	-1]x0.1 =	0 0 0	(9) (10) (11)
if both types of wall are pre deducting areas of opening	esent, use the value corre gs); if equal user 0.35	esponding to	the greate	er wall area	a (after					
If no draught lobby, ont	or 0.05 else enter 0		i (Seale	iu), eise					0	(12)
Percentage of windows	and doors draught	stripped							0	
Window infiltration	and doore dradging	omppou		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cu	ubic metre	s per ho	our per so	quare m	etre of e	envelope	area	20	(17)
If based on air permeabili	ty value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				1.21	(18)
Air permeability value applies	if a pressurisation test h	as been don	e or a deg	gree air pei	meability	is being u	sed			_
Number of sides sheltered	t			(20) – 1 - 1	0 075 v (1	Q)] —			1	(19)
Infiltration rate incorporati	na chaltar factor			(20) = (18)	x (20) -	5)] –			0.92	(20)
Infiltration rate modified for	ry sheller laciol	od.		(21) = (10)	x (20) -				1.12	(21)
	Mar Apr May		hul	Διια	Sen	Oct	Nov	Dec		
Monthly over an wind on	ad from Toble 7		501	Aug	Oep	001		Dec		
$(22)m = \begin{bmatrix} 5 \\ 5 \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \end{bmatrix}$		3.8	3.8	37	4	43	4.5	47		
	···· ···	0.0	0.0	0.7	т	7.0	1.0		l	
Wind Factor (22a)m = (22 (22a)m = 1.27 1.25)m ÷ 4 .23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
· · · · ·							•		•	

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)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			
Calcul	ate effec	ctive air	change	rate for t	he appli	cable ca	se								
lf exh	aust air he		using App	andix N (2	(23a) – (23a	a) x Emv (e	equation (N	(15)) other	rwise (23h) – (23a)			0		
lf bal	anced with	heat reco	overv: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) –) = (200)			0		
a) If		d moch			with ho	of in ase in) = (2)) b)m i (22P) ^ [1 (22a)	0 · 1001		(230)
a) II (24a)m-									(22	$\frac{20}{10} + \frac{10}{10}$		$\frac{1 - (230)}{1 - 0}$	- 100j		(24a)
(240)11-		d moob			without	boot roc			$\sqrt{m} = (2)$) 22h)	Ū	I		(2.103)
(24b)m-								0 (240	0 $11 = (22)$		230)	0	1		(24b)
(240)III-										0	Ū	0	l		(=)
C) II	if (22b)n	use ex ו < 0.5 ×	(23b), t	hen (240	c) = (23b)); other	wise (24	c) = (22b)	butside b) m + 0.	5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	/e input	ventilatio	on from I	oft	0.51					
(24d)m		1 = 1, th	en (240)	m = (22)			(40)m =	0.5 + [(2 	20)m² x	0.5]	1.26	1 21	1		(24d)
(240)m=	1.42	1.39	1.37	1.23	1.2	1.00	1.00	1.03	1.12	1.2	1.20	1.31	J		(24u)
Effe	ctive air		rate - er	nter (24a) or (240	b) or (240	c) or (24		(25)	1.2	1.26	1 21	1		(25)
(25)11=	1.42	1.39	1.37	1.23	1.2	1.00	1.00	1.03	1.12	1.2	1.20	1.31			(23)
3. He	at losse	s and he	eat loss	oaramet	er:										
ELEN		Gros are <mark>a</mark>	ss (m²)	Openin m	gs 1 ²	Net Ar A ,r	rea m²	U-valı W/m2	ue K	A X U (W/I	≺)	k-value kJ/m²·l	e K	A X kJ/ł	k K
Doo <mark>rs</mark>						1.9	x	1.4	= [2.66					(26)
Windo	ws Type	e 1				1.67	x1.	/[1/(4.8)+	0.04] =	6.72	F				(27)
Windo	ws Type	2				0.84	x1	/[1/(4.8)+	0.04] =	3.38	Ξ				(27)
Walls	Type1	45.	3	2.51		42.79) X	2.1	=	89.86					(29)
Walls	Type2	15.3	39	1.9		13.49) X	2.1	= [28.33					(29)
Roof		31.	9	0		31.9	x	2.3	=	73.37					(30)
Total a	area of e	lements	, m²			92.59)								(31)
* for win ** inclua	ndows and le the area	roof wind as on both	ows, use e sides of ir	effective wi nternal wal	ndow U-va Is and part	alue calcul titions	ated using	ı formula 1,	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	3.2		
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				204.	33	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0		(34)
Therm	al mass	parame	eter (TMF	- = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450)	(35)
For desi can be u	ign assess used instea	ments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f			_
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						14		(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)									
Total f	abric he	at loss							(33) +	(36) =			218.	33	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			1	(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	45.5	44.6	43.71	39.25	38.36	33.9	33.9	33.01	35.68	38.36	40.14	41.93			(38)
Heat tr	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	263.82	262.93	262.04	257.58	256.69	252.22	252.22	251.33	254.01	256.69	258.47	260.25			-
									1	Average =	Sum(39)	12 /12=	257.	35	(39)

Heat lo	ss para	imeter (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		
L	r of day		nth (Tab	le 12)		1	1		,	Average =	Sum(40)1.	12 /12=	5.05	(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)
Ϋ́ L													l	
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag he annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by s r day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			1		1	
(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		
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	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	e volum	loss. le (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comm	nunity h	eating a	and no ta	ink in dw	elling, e	nter 110	litres in	(47)				100		()
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:											1	
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/y∉ ≫dindor l	ear ann faot	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02]	(51)
Volume	factor	from Ta	ble 2a	011 4.3							1	03		(52)
Temper	rature f	actor fro	m Table	2b							0	.6		(53)
Enerav	lost fro	m water	storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		03]	(54)
Enter (50) or ((54) in (5	55)	, ,						,	1.	03		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(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	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is fro	m Append	I lix 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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	ostat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h month	(61)m =	(60) ÷	365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
Total h	eat req	uired for	water I	neating c	alculated	l for ea	ch month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	- IW input	calculated	using Ap	pendix G c	or Appendix	H (nega	ative quantity	y) (enter 'C)' if no sola	r contribu	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	applie	es, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		_
								Out	put from w	ater heate	er (annual)₁	12	1831.51	(64)
Heat g	ains fro	m water	heating	g, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	n + (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	culation	of (65)m	n only if c	ylinde	is in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Int	ernal g	ains (see	e Table	5 and 5a	a):									
Metabo	olic daii	ns (Table	e 5). Wa	atts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso see	Table 5					
(67)m=	2 <mark>9.11</mark>	25.86	21.03	15.92	11.9	10.05	10.86	14.11	18.94	24.05	28.07	29.92	1	(67)
Applia	nces ga	ains (ca <mark>lc</mark>	ulated	n Appen	dix L, ea	uation	L13 or L1	3a), also	see Ta	ble 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)
Cookin	g gains	s (calcula	ted in /	Appendix	L, equat	tion L1	5 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 fa	ns gains	(Table	5a)					1					
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses	s e.q. e	vaporatio	n (neg	ative valu	ues) (Tab	le 5)	1	ļ	1	ļ	1	Į	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	-68.78]	(71)
Water	heatinc	ı gains (T	able 5			1			Į	<u> </u>			1	
(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 i	nterna	l gains =	I			ـــــــــــــــــــــــــــــــــــــ		ו 1 + (68)m -	+ (69)m +	l (70)m + (7	1 71)m + (72)	m	1	
(73)m=	307.46	304.02	291.68	273.33	255.61	239.3	3 229.78	236.35	246.83	265.35	285.61	299.93	1	(73)
6. Sol	lar gain	s:	1		1	1	1	1	1		1		1	
Solar g	ains are	calculated	using sol	ar flux fron	n Table 6a	and ass	ociated equa	ations to co	onvert to th	ne applical	ble orientat	ion.		
Orienta	ation:	Access F	actor	Area	a	F	lux		g_		FF		Gains	
		Table 6d		m²		Т	able 6a	Т	Table 6b	Т	able 6c		(W)	
East	0.9x	1		(1.	67	x	19.64	x	0.85	x	0.7	=	13.52	(76)
East	0.9x	1	;	(1.	67	×	38.42	x	0.85	x	0.7	=	26.46	(76)
East	0.9x	1		< <u> </u>	67	x	63.27	x 🗌	0.85	x	0.7	=	43.57	(76)
East	0.9x	1		(1.	67	x	92.28	x 🗌	0.85	x	0.7	=	63.54	(76)
East	0.9x	1		(1.	67	x	113.09) × [0.85	×	0.7	=	77.88	(76)

East	0.9x	1		x	1.6	7	x	1	15.77	x	0.85		x	0.7		=	79.72	(76)
East	0.9x	1		x	1.6	7	x	1	10.22	x	0.85		x	0.7		= [75.9	(76)
East	0.9x	1		x	1.6	7	x	9	94.68	x	0.85		x	0.7		= [65.19	(76)
East	0.9x	1		x	1.6	7	x	7	'3.59	x	0.85		x	0.7		= [50.67	(76)
East	0.9x	1		x	1.6	7	x	4	5.59	x	0.85		x	0.7		= [31.39	(76)
East	0.9x	1		x	1.6	7	x	2	24.49	x	0.85		x	0.7		= [16.86	(76)
East	0.9x	1		x	1.6	7	x	1	6.15	x	0.85		x	0.7		= [11.12	(76)
West	0.9x	0.77		x	0.8	4	x	1	9.64	x	0.85		x	0.7		= [6.8	(80)
West	0.9x	0.77		x	0.8	4	x	3	88.42	x	0.85		x	0.7		= [13.31	(80)
West	0.9x	0.77		x	0.8	4	x	6	3.27	x	0.85		x	0.7		= [21.92	(80)
West	0.9x	0.77		x	0.8	4	x	g	92.28	x	0.85		x	0.7		= [31.96	(80)
West	0.9x	0.77		x	0.8	4	x	1	13.09	x	0.85		x	0.7		= [39.17	(80)
West	0.9x	0.77		x	0.8	4	x	1	15.77	x	0.85		x	0.7		= [40.1	(80)
West	0.9x	0.77		x	0.8	4	x	1	10.22	x	0.85		x	0.7		= [38.18	(80)
West	0.9x	0.77		x	0.8	4	x	g	94.68	x	0.85		x	0.7		= [32.79	(80)
West	0.9x	0.77		x	0.8	4	x	7	'3.59	x	0.85		x	0.7		= [25.49	(80)
West	0.9x	0.77		x	0.8	4	x	4	5.59	x	0.85		x	0.7		= [15.79	(80)
West	0.9x	0.77		x	0.8	4	x	2	24.49	х	0.85		х	0.7		=[8.48	(80)
West	0.9x	0.77		x	0.8	4	x	1	6.15	x	0.85		x	0.7		= [5.59	(80)
Solar -	<mark>gain</mark> s in	watts, <mark>ca</mark>	alcula	ated	for eacl	n mon	th			(83)m	n = Sum(74))m(8	82)m					
(83)m=	20.33	39.76	65.4	19	95.51	117.0	5 1	19.82	114.07	97.	99 76.1	6 4	7.18	25.35	16.7	72		(83)
Total (gains – i	nternal a	ind so	olar	(84)m =	: (73)n	ו + (ד	83)m	, watts	r				_	·			
(84)m=	327.78	343.79	357.	16	368.84	372.6		359.2	343.85	334	.34 322.9	99 3	12.53	3 310.96	316.	.64		(84)
7. Me	ean inter	nal temp	oeratu	ure (heating	seaso	on)									_		
Tem	perature	during h	eatin	ig pe	eriods ir	the li	ving	area	from Tab	ole 9	, Th1 (°C))					21	(85)
Utilis	ation fac	tor for g	ains f	for li	ving are	ea, h1,	m (s	ee Ta	ble 9a)									
	Jan	Feb	Ma	ar	Apr	Ma	/	Jun	Jul	A	ug Se	ep 📃	Oct	Nov	De	ec		
(86)m=	1	1	1		1	0.99		0.99	0.97	0.9	0.99	9	1	1	1			(86)
Mear	n interna	l temper	ature	in li	iving are	ea T1	(follo	ow ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	17.82	17.97	18.3	31	18.84	19.41		20	20.38	20.	34 19.8	37 1	9.14	18.42	17.8	33		(87)
Tem	perature	during h	eatin	ig pe	eriods ir	n rest o	of dv	velling	from Ta	able 9	9, Th2 (°0	C)						
(88)m=	18.41	18.42	18.4	43	18.47	18.48		18.53	18.53	18.	54 18.5	51 1	8.48	18.47	18.4	45		(88)
Utilis	ation fac	tor for a	ains f	for re	est of d	wellinc	. h2	.m (se	e Table	9a)				•				
(89)m=	1	1	1		0.99	0.99		0.96	0.84	0.8	37 0.97	7 (0.99	1	1			(89)
Mear	interna	l temper	ature	in t	he rest	of dwe		1 T2 (f	n Now ste		to 7 in T	ahle (Ac)					
(90)m=	15.77	15.92	16.2	27	16.82	17.4		18.01	18.37	18.	34 17.8	37 1	7.14	16.4	15.7	79		(90)
	L	I	-						I			fLA	= Liv	ving area ÷ (4	4) =	\dashv	0.56	(91)
Maar	interne	Itomner	oture	(for	thouch	olo d.:		(a) f	ΙΛ Τ 4	. /4	fl ^ \	то				L	-	` ′
(92)m-	16.93			$\frac{101}{12}$	17.96	18 54		iy) = T 19.14	LA X 11	+ (1	- ILA) X 47 10	$1 \ge 1$	8 27	17 54	16 (94		(92)
102/11-	10.00	1 17.00		- 1	11.00	10.04			10.01	I 10.			0.21	1 17.07	1 10.0			

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r tilisation	mean int factor fo	ernal ter	nperatur using Ta	re obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	1	0.99	0.99	0.97	0.93	0.94	0.98	0.99	1	1		(94)
Usefu	ıl 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)
Month	nly avera	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	_m , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	3332.06	3201.23	2862.09	2334.25	1755.12	1144.26	733.51	771.75	1244.54	1968.7	2699.55	3315.79		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m=	2235.7	1920.8	1864.66	1416.78	1032.13	0	0	0	0	1233.67	1720.44	2231.8		-
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	13655.97	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								267.76	(99)
9b. En	ergy rec	quiremer	nts – Cor	nmunity	heating	scheme)							-
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by a	a c <mark>omm</mark>	unity sch	neme.		
Fractic	on of spa	ace heat	from se	condary/	/supplen	nentary l	neating (Table 1	1) '0' if n	one			0	(301)
Fractic	on of spa	ace heat	from co	<mark>mmu</mark> nity	, syste <mark>m</mark>	1 - (301	1) =						1	(302)
The con	nmunity so	cheme may	y obtain he	eat from se	everal sour	ces. The p	orocedure	allows for	CHP and u	up to four (other heat	sources; ti	he latter	1
includes	<mark>bo</mark> ilers, h	eat pumps	s, geothern	nal and wa	aste heat f	rom powei	r stations.	See Apper	ndix C.					-
Fractic	on of hea	at from C	Commun	ity boiler	s								1	(303a)
Fractic	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	iting syst	tem			1.05	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m					1.1	(306)
Space	heating	g											kWh/year	1
Annua	l space	heating	requirem	nent									13655.97	
Space	heat fro	om Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	15772.65	(307a)
Efficier	ncy of se	econdary	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment froi	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h) neating r	equirem	ent									1831.51	1
lf DHW Water	/ from c heat fro	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30	03a) x (30	5) x (306) =	=	2115.39	(310a)
Electri	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	(310a)(310e)] =	178.88	(313)
Coolin	g Syster	m Energ	y Efficiei	ncy Ratio	D								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electri mecha	city for p inical ve	oumps aintilation	nd fans v - balanc	within dw ed, extra	velling (1 act or po	able 4f) 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)				514.14	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh	Emis kg C	sions O2/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 fu	el	65	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	=	5944.33	(367)
Electrical energy for heat distribution [(313) x	0.52	-	92.84	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372)		-	6037.17	(373)
CO2 associated with space heating (secondary) (3	09) 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	73) + (374) + (375) =			6037.17	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	-	0	(378)
CO2 associated with electricity for lighting (3	32))) 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)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 207	12		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
A daha a a	London	Pro	operty A	Address:	Unit 12					
Address :	, LUNUUN									
Basement	310113.		Area	1 (m²) 55	(1a) x	Av. He	ight(m) .17	(2a) =	Volume(m³ 119.35) (3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1n)		55	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	119.35	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	$\begin{array}{c c} main & s \\ heating & l \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary heating 0 0	, + [0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)
Number of intermittent fan	s					2	x ′	10 =	20	(7a)
Number of passive vents					Γ	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	s, flues and fans = (en carried out or is intend e dwelling (ns) 25 for steel or timber sent, use the value corres is); if equal user 0.35	a)+(6b)+(7a ed, proceed frame or (sponding to t)+(7b)+(7 to (17), o 0.35 for the greate	c) = htherwise c masonr er wall area	ontinue fro y constr a (after	20 om (9) to (uction	(16) [(9)	÷ (5) = -1]x0.1 =	0.17 0 0 0 0	(8) (9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) 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 s	tripped							0	(14)
Window infiltration			(0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate	50 1. 1			(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
Air permeability value, q	50, expressed in cul	DIC metres $(7) \div 201+(8)$	per ho	ur per so so (18) – (quare m	etre of e	envelope	area	20	(17)
Air permeability value applies	if a pressurisation test ha	s been done	or a dec	iree air nei	meability	is heina u	sed		1.17	(18)
Number of sides sheltered			or a dog		incusinty i	o bonng u			2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0.99	(21)
Infiltration rate modified for	r monthly wind spee	d					_			
Jan Feb M	<i>l</i> lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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			_					I	
(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		

Adjuste	d infiltra	tion rat	e (allowi	ng for sh	elter 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		
Calculā	te effect	tive air	change i	rate for t	he appli	cable ca	se					-		
	ust air ba		using App	andix N (2	3h) - (23a) x Emv (e	auation (I	N5)) othe	nuisa (23h	(232)		l	0	(238)
lf balar	acod with	hoot rock			ollowing f	or in uso f	actor (from	a Tabla 4b) _	<i>(</i> 200)		l	0	(23D)
) = (0)		00h) [1 (00 a)	0	(230)
a) if b			anical ve					HR) (248	a m = (2)	20)m + (. 1	23D) × [⁻	1 - (23C)	÷ 100]	(242)
(24a)m=	•	0	0		0 	0	0					0		(24a)
מזו (מ סיוו (מ			anicai ve		without	neat rec	covery (r	VIV) (240 T	m = (22)	2b)m + (2 T	230)			(246)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(240)
C) It w	vhole ho		tract ven	itilation c	or positiv	e input v	ventilatio	on from (outside $a = 0$	5 v (23h				
(24c)m=	0	0.57	0) = (200 0		0	$\frac{0}{0} = \frac{221}{0}$,, 0	0		(24c)
		ontilati			o pocitiv		vontilativ		oft		ů	Ů		(/
if	(22b)m	= 1, th	en (24d)	m = (22k)	b)m othe	rwise (2	24d)m =	0.5 + [(2	2b)m ² x	0.5]				
(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		(24d)
Effect	tive air c	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in bo	k (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		(25)
	4.100000													_
3. Hea			eat loss (er:	Not Ar		Uyal				kyoluo		
ELEW	ENI	area	(m²)	openin	gs 2	A,r	ea n²	W/m2	2K	A X U (W/I	<)	kJ/m ² ·ł	; <	kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	=	2.66				(26)
Window	<mark>/s</mark> Type	1				4.6	x1	/[1/(1.6)+	0.04] =	6.92	F			(27)
Window	/s Type	2				1.87	x 1	/[1/(4.8)+	0.04] =	7.53	F			(27)
Window	/s Type	3				0.65		/[1/(4.8)+	0.04] =	2.62	Ę			(27)
Window	/s Type	4				1.87		/[1/(1.6)+	0.04] =	2.81				(27)
Floor						55	×	0.93		51.15	Ξ r			(28)
Walls T	ype1	28.	9	8.34		20.56	x	2.1	=	43.18	= i		\dashv	(29)
Walls T	vpe2	78	1	2.55		5 26		21		11.05			\dashv	(29)
Total ar	ea of el	ements	. m ²			91 71					L			(31)
Partv w	all					27.9		0		0				(32)
Party w	all					1.13	x	0		0			\dashv	(32)
* for wind	lows and r	oof wind	ows, use e	effective wil	ndow U-va	lue calcul	ated using	formula 1	 /[(1/U-valu	ue)+0.04] a	us given in	paragraph	3.2	、 /
** include	the areas	s on both	sides of in	nternal wall	s and part	itions								
Fabric h	neat loss	s, W/K :	= S (A x	U)				(26)(30) + (32) =				127.9 ⁻	1 (33)
Heat ca	pacity C	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therma	l mass j	barame	eter (TMF	P = Cm ÷	- TFA) in	ı kJ/m²K			Indica	tive Value	: High		450	(35)
For desig can be us	n assessr sed instea	ments wh d of a de	ere the de tailed calci	tails of the ulation.	constructi	ion are not	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therma	I bridge	s : S (L	x Y) cal	culated u	using Ap	pendix ł	<						14.4	(36)
<i>if details o</i> Total fal	of thermal bric hea	<i>bridging</i> It loss	are not kn	own (36) =	: 0.15 x (3	1)			(33) +	· (36) =		[142.3	1 (37)
												I		` ` <i>`</i>

Ventila	tion hea	t loss ca	alculated	monthl	y		-		(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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 tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	192.15	191.17	190.19	185.31	184.33	179.51	179.51	178.6	181.4	184.33	186.28	188.24		
	-					-	-			Average =	Sum(39)1	12 /12=	185.08	(39)
Heat lo	ss para	meter (H	HLP), W	/m²K	0.05	0.00	0.00	0.05	(40)m	= (39)m ÷	· (4)	0.40		
(40)m=	3.49	3.48	3.46	3.37	3.35	3.26	3.26	3.25	3.3	3.35	3.39	3.42	2.07	
Numbe	r of day	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 / 12=	3.37	
	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)
I								1						
4 Wa	ter heat	ina ener	.av reau	irement [.]								kWh/ve	ar:	
	tor noat	ing onor	971044											
	ed occu	ipancy, l	N + 1 76 v	/ [1 - ovo	(_0 0003		-13 Ω)2)] ± 0 (1013 v (⁻	FEA _13	1.	84		(42)
if TF.	A £ 13.9	9, N = 1 9, N = 1	+ 1.70 X	r [i - exh	(-0.0003	949 X (11	A -13.9	<i>)</i> 2)] + 0.0	JU13 X (IFA - 13.	.9)			
Annual	averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		77	.84		(43)
Reduce	the annua that 125	l average litres per l	hot water person pe	usage by r dav (all w	5% if the a ater use. I	lwelling is	designed t Id)	to achieve	a water us	se target o	f			
	lan	Ech	Mar		May	lun	/	<u> </u>	Can	Oct	Nev	Dee		
Hot wate	Jan r usage in	rep n litres per	dav for ea	Apr ach month	Vd.m = fa	ctor from 1	Table 1c x	(43)	Sep	Oct	INOV	Dec		
(44)m-	85.62	, 82.51	70 30	76.28	73 17	70.05	70.05	73 17	76.28	70 30	82.51	85.62		
(++)	05.02	02.01	79.59	70.20	13.11	70.03	10.00	75.17	- 10.20	$r_{0.00}$	m(44)1 42 =	00.02	934.05	(44)
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	lculated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)	004.00	
(45)m=	126.97	111.05	114.6	99. <mark>9</mark> 1	95.86	82.72	76.65	87.96	89.01	103.74	113.24	122.97		
									-	Fotal = Su	m(45) ₁₁₂ =	=	1224.68	(45)
lf instant	aneous w	ater heatii	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)					_
(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)
storage	storage	IOSS: o (litros)	includir		alar or M		storado	within or	mayas	sol		400		(47)
If comr	e volum		nd no ta	ng any su		ntor 110	litros in	(A7)		501		160		(47)
Otherw	ise if no	stored	hot wate	er (this in	icludes i	nstantar	eous co	(47) ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		- (· -					/	(/			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)	=		1	10		(50)
b) If m	anufact	urer's de	eclared of footor fr	cylinder l	oss fact	or is not	known:							
If comr	nunity h	eating s	ee secti	on 4.3	e∠(kvv	n/iitie/ua	iy)				0.	.02		(51)
Volume	e factor	from Tal	ble 2a	011 1.0							1.	.03		(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	storage	e, 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	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 cylinde	er contain	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	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)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (6	61)m
(62)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		(62)
Solar DH	HW input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies,	, see Ap	pendix G	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
								Outp	out from wa	ater heate	r (annual)₁	12	1875.5	2 (64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	60.83	53.73	56.71	51. <mark>2</mark> 3	50.48	45.51	44.1	47.86	47.61	53.1	55.66	59.5		(65)
inclu	de (57)	m in calc	culation of	of (65)m	only if c	ylinder is	s in th <mark>e</mark> c	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5) Wat	ts										
in o to to	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	91.87	91.87	91.87	91. <mark>87</mark>	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equati	on L9 oi	r L9a), a	lso see	Table 5					
(67)m=	25.06	22.26	18.1	13.7	10.24	8.65	9.35	12.15	16.3	20.7	24.16	25.76		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L ²	13 or L1	3a), also	see Tal	ble 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)
Cookin	ig gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e 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 fai	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49		(71)
Water	heating	gains (T	able 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 i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	317.57	314.63	302.55	284.16	266.15	249.33	239.01	245.21	255.35	273.92	294.57	309.4		(73)
6. Sol	lar gains	5:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicat	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	
	٦	Table 6d		m²		Tab	ole 6a	Т	able 6b	Ta	able 6c		(W)	

North	0.9x	0.77	x	1.87	x	10.63	x	0.85	x	0.7	=	8.2	(74)
North	0.9x	0.77	x	0.65	x	10.63	x	0.85	x	0.7] =	2.85	(74)
North	0.9x	0.77	×	1.87	x	20.32	x	0.85	x	0.7] =	15.67	(74)
North	0.9x	0.77	x	0.65	x	20.32	x	0.85	x	0.7	=	5.45	(74)
North	0.9x	0.77	x	1.87	x	34.53	x	0.85	x	0.7] =	26.63	(74)
North	0.9x	0.77	x	0.65	x	34.53	x	0.85	x	0.7] =	9.25	(74)
North	0.9x	0.77	x	1.87	x	55.46	x	0.85	x	0.7	=	42.77	(74)
North	0.9x	0.77	x	0.65	x	55.46	x	0.85	x	0.7] =	14.87	(74)
North	0.9x	0.77	x	1.87	x	74.72	x	0.85	x	0.7	=	57.61	(74)
North	0.9x	0.77	x	0.65	x	74.72	x	0.85	x	0.7	=	20.03	(74)
North	0.9x	0.77	x	1.87	x	79.99	x	0.85	x	0.7	=	61.67	(74)
North	0.9x	0.77	x	0.65	x	79.99	x	0.85	x	0.7	=	21.44	(74)
North	0.9x	0.77	x	1.87	x	74.68	x	0.85	x	0.7	=	57.58	(74)
North	0.9x	0.77	x	0.65	x	74.68	x	0.85	x	0.7	=	20.01	(74)
North	0.9x	0.77	x	1.87	x	59.25	x	0.85	x	0.7	=	45.68	(74)
North	0.9x	0.77	x	0.65	x	59.25	x	0.85	x	0.7] =	15.88	(74)
North	0.9x	0.77	x	1.87	x	41.52	x	0.85	x	0.7	=	32.01	(74)
North	0.9x	0.77	x	0.65	X	41.52	x	0.85	x	0.7	=	11.13	(74)
North	0.9x	0.77	x	1.87	x	24.19	x	0.85	x	0.7] =	18.65	(74)
North	0.9x	0.77	x	0.65	x	24.19] ×	0.85	x	0.7	=	6.48	(74)
North	0.9x	0.7 <mark>7</mark>	x	1.87	x	13.12	x	0.85	x	0.7	=	10.11	(74)
North	0.9x	0.77) ×	0.65	x	13.12	x	0.85	x	0.7	=	3.52	(74)
North	0.9x	0.77	x	1.87	x	8.86	x	0.85	x	0.7	=	6.84	(74)
North	0.9x	0.77	x	0.65	x	8.86	x	0.85	x	0.7	=	2.38	(74)
East	0.9x	1	x	1.87	x	19.64	x	0.76	x	0.7	=	13.54	(76)
East	0.9x	1	x	1.87	x	38.42	x	0.76	x	0.7	=	26.49	(76)
East	0.9x	1	x	1.87	x	63.27	x	0.76	x	0.7	=	43.62	(76)
East	0.9x	1	x	1.87	x	92.28	x	0.76	x	0.7	=	63.62	(76)
East	0.9x	1	x	1.87	x	113.09	x	0.76	x	0.7	=	77.97	(76)
East	0.9x	1	x	1.87	x	115.77	x	0.76	x	0.7	=	79.81	(76)
East	0.9x	1	x	1.87	x	110.22	x	0.76	x	0.7	=	75.99	(76)
East	0.9x	1	x	1.87	x	94.68	x	0.76	x	0.7	=	65.27	(76)
East	0.9x	1	x	1.87	x	73.59	x	0.76	x	0.7] =	50.73	(76)
East	0.9x	1	x	1.87	x	45.59	x	0.76	x	0.7	=	31.43	(76)
East	0.9x	1	x	1.87	x	24.49	x	0.76	x	0.7	=	16.88	(76)
East	0.9x	1	x	1.87	x	16.15	x	0.76	x	0.7] =	11.14	(76)
South	0.9x	0.77	×	4.6	×	46.75	x	0.76	x	0.7] =	79.29	(78)
South	0.9x	0.77	×	4.6	×	76.57	x	0.76	x	0.7	=	129.85	(78)
South	0.9x	0.77	x	4.6	x	97.53	x	0.76	x	0.7	=	165.41	(78)
South	0.9x	0.77	x	4.6	x	110.23	x	0.76	x	0.7	=	186.95	(78)
South	0.9x	0.77	x	4.6	x	114.87	x	0.76	x	0.7	=	194.81	(78)

South	0.9x	0.77	,	4	.6	x	1	10.55] x [0.76	x	Γ	0.7		=	187.48	(78)
South	0.9x	0.77	,	(4	.6	x	1	08.01	i _× ī		0.76	۲ × آ	Γ	0.7		=	183.18	(78)
South	0.9x	0.77	,	(4	.6	x	1	04.89] × [0.76	×	Γ	0.7		=	177.89	(78)
South	0.9x	0.77	,	(4	.6	x	1	01.89] × [0.76	۲ × آ	F	0.7		=	172.79	(78)
South	0.9x	0.77	,	(4	.6	x	ε	32.59	i _× [0.76	۲ × آ	F	0.7		=	140.06	(78)
South	0.9x	0.77	,	4	.6	x	5	55.42] × [0.76	۲ × آ	F	0.7	=	=	93.98	(78)
South	0.9x	0.77	,	(4	.6	x		40.4] × [0.76	۲ × آ	F	0.7		=	68.51	(78)
	L								J L				-					
Solar g	gains in	watts, ca	alculate	d for ead	ch mont	h			(83)m	= Su	ım(74)m .	(82)ı	n					
(83)m=	103.88	177.46	244.91	308.2	350.42	3	50.41	336.76	304.	73	266.66	196.	62	124.5	88.	86		(83)
Total g	jains – i	nternal a	and sola	ar (84)m	- = (73)m	+ (83)m	, watts										
(84)m=	421.44	492.08	547.46	592.36	616.56	5	99.74	575.77	549.9	93	522.01	470.	54	419.06	398	.26		(84)
7. Me	an inter	nal temp	berature	e (heating	g seaso	n)					-							
Temp	erature	during h	neating	periods i	n the liv	ring	area	from Tak	ole 9,	Th1	(°C)						21	(85)
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	ble 9a)			. ,							
	Jan	Feb	Mar	Apr	May	Ì	Jun	Jul	Au	ıg	Sep	0	ct	Nov	D	ес		
(86)m=	1	1	1	0.99	0.98	┢	0.95	0.88	0.9	1	0.97	0.9	9	1	1			(86)
Moan	interna	temper	i atura ir	living a	- 	follo	w sto	$r = 3 \text{ to } \overline{7}$	I 7 in Tr						L			
(87)m=	18.69	18.85	19.16	19.61	20.07		0.51	20.76	20.7		20.37	19.7	78	19.18	18	69		(87)
-											20101		<u> </u>					
Temp	erature	during h	neating	periods i	n rest o	t dw	elling	from Ta	able 9	, Th	2 (°C)	40.0	20	40.04	40	00		(00)
(88)m=	19.25	19.26	19.27	19.32	19.32		19.37	19.37	19.3	8	19.35	19.3	32	19.31	19.	29		(00)
Utilisa	ation fac	tor for g	ains for	rest of c	lwelling	h2	,m (se	e Table	9a)									
(89)m=	1	1	1	0.99	0.97		0.89	0.72	0.77	7	0.94	0.9	9	1	1			(89)
Mear	interna	l temper	ature ir	the rest	of dwe	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c</mark>)						
(90)m=	17.22	17.39	17.7	18.19	18.65		19.1	19.3	19.2	28	18.96	18.3	37	17.75	17.	25		(90)
											f	LA = l	ivin	g area ÷ (4	4) =		0.55	(91)
Mear	interna	l temper	ature (f	or the wl	nole dw	ellin	a) = f	LA x T1	+ (1 -	– fLA	4) × T2					-		
(92)m=	18.03	18.19	18.5	18.97	19.43	1	19.87	20.1	20.0	8	, 19.74	19.1	4	18.54	18.	04		(92)
Apply	v adjustr	nent to t	he mea	n interna	l tempe	ratu	ure fro	m Table	• 4e, v	wher	re appro	priat	e					
(93)m=	18.03	18.19	18.5	18.97	19.43	1	19.87	20.1	20.0	8	19.74	19.1	4	18.54	18.	04		(93)
8. Sp	ace hea	iting req	uiremer	nt				•										
Set T	i to the	mean int	ernal te	emperatu	ire obta	nec	at st	ep 11 of	Table	e 9b	, so tha	t Ti,n	n=(76)m an	d re-	calc	ulate	
the ut	tilisation	factor fo	or gains	using T	able 9a	-					1						l	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	0	ct	Nov	D	ес		
Utilisa	ation fac	tor for g	ains, hr	n:	0.07	-		0.04			0.05	0.0	0				l	(04)
(94)m=	1		0.99	0.99	0.97		0.92	0.81	0.84	4	0.95	0.9	9	1	1			(94)
Useru	II gains,	nmGm	VV = (S)	94)m x (8	54)m T 507.00			400.00	404		400.05	405	<u></u>	447.05	0.07	70	l	(05)
(95)m= Monti	420.73	490.56	544.20		o from]			406.29	404.,	34	490.95	400.	63	417.60	397	.73		(33)
(96)m-							14.6	16.6	16/	4	14.1	10	6	71	4	2		(96)
Heat	loss rate	for me	an inter	nal temr	erature	 m	۰	-[(30)m	x [/03	() 	- (96)m	1	5	(^{/.1}	4.	-		(00)
(97)m=	2637.43	2541.11	2282.93	1866.14	1424.20		46.56	628.68	656	45 I	1022.44	ו 1574	.85	2130.72	260	5,73		(97)
Space	e heatin	a require	ement f	or each	nonth I	َل W۲	/mon	I = 0.02	24 x [/	<u>ر</u> (97)	m – (95)ml v	(4	1)m			l	~ /
(98)m=	1649.22	1377.95	1293.57	922.56	615.31		0	0			0	,, ×	26	1233.26	1642	2.75		
1.1	L		<u> </u>	1	I			L	L									

	Total per year (kWh/y	ear) = Sum(98) _{15,912} :	= 9559.89	(98)
Space heating requirement in kWh/m²/year			173.82	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or wa Fraction of space heat from secondary/supplementary b	ater heating provided by a com neating (Table 11) '0' if none	munity scheme.	0	(301)
Fraction of space heat from community system $1 - (30)$	() =			(302)
The community scheme may obtain heat from several sources. The	' procedure allows for CHP and up to fo	ur other heat sources;	the latter	
includes boilers, heat pumps, geothermal and waste heat from power Fraction of heat from Community boilers	stations. See Appendix C.		1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) fo	r community heating system		1.05	(305)
Distribution loss factor (Table 12c) for community heating	ng system		1.1	(306)
Space heating			kWh/yea	ur
Annual space heating requirement			9559.89	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	11041.67	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supplemen	tary system (98) x (301) x 10	00 ÷ (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)(307€	e) + (310a)(310e)] =	132.08	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	enter 0) = (107) ÷ (314) =	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in	put from outside			 (330a)
warm air heating system fans			0	(330b)
nump for solar water beating			0	(330g)
Total electricity for the above kWb/year	=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix I.)	_(0000) * (0000) (((((((((((((((((((((((((((((((((((((442.58	
12b CO2 Emissions - Community heating scheme			442.50	
T20. 002 Emissions - Community heating scheme	Energy	Emission factor	- Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%) If there is	ot CHP) CHP using two fuels repeat (363) to (366) for the second fu	el 65	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0	= 4389.09	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 68.55	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372))	= 4457.64	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)

CO2 associated with water from immer	sion heater or insta	ntaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			4457.64	(376)
CO2 associated with electricity for pum	dwelling (331)) x	0.52	=	0	(378)	
CO2 associated with electricity for light	(332))) x	0.52	=	229.7	(379)	
Total CO2, kg/year	sum of (376)(382) =				4687.33	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				85.22	(384)
El rating (section 14)					41.26	(385)



			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	12 Pi	roperty A	Stroma Softwa	a Num are Ver Unit 13	ber: sion:		Versio	n: 1.0.3.15	
Address :	, london									
1. Overall dwelling dimer	isions:									
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) 17	(2a) =	Volume(m³ 110.67) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	110.67	(5)
2. Ventilation rate:				- 41						
Number of chimneys Number of open flues	$\begin{array}{c c} main & s \\ heating & h \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary neating 0	y] + [_] + [_	0 0] = [] = [0 0		40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	s					2	x /	10 =	20	(7a)
Number of passive vents						0	x /	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	X	40 =	0	(7c)
	ange <mark>s per</mark> ho	bur								
Infiltration due to chimney	s, flues and fans = (6	a)+(6b)+(7	a)+(7b)+(7	7c) =		20		÷ (5) =	0.18	(8)
If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2	en carried out or is intend e dwelling (ns) 25 for steel or timber	ed, proceed frame or	1 to (17), c 0.35 for	masonr	ontinue fro	om (9) to (uction	(16) [(9)·	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are pre deducting areas of opening	rsent, use the value corres rs); if equal user 0.35	sponding to	the greate	er wall are	a (after					
If suspended wooden flo	bor, enter 0.2 (unsea	led) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0	tripped							0	(13)
Window infiltration	and doors draught s	inpped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	
Air permeability value, c	50, expressed in cub	oic metre	s per ho	our per se	quare m	etre of e	envelope	area	20	(17)
If based on air permeabilit	y value, then (18) = [(1	(7) ÷ 20]+(8), otherwi	se (18) = (16)		·		1.18	(18)
Air permeability value applies	if a pressurisation test ha	s been don	e or a deg	ree air pei	rmeability	is being u	sed			
Number of sides sheltered	1			(22)		- 17			3	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.92	(21)
Infiltration rate modified to	r monthly wind speed	1 T.T			-	<u> </u>	<u> </u>			
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7			0-		4.0	4-	4-	l	
(22)m= 5.1 5 4	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						.		I	
(zza)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				_	
<u> </u>	1.17	1.14	1.12	1.01	0.98	0.87	0.87	0.85	0.92	0.98	1.03	1.08	ĺ	
Calcula If me	ate effe	ctive air al ventila	change	rate for t	he appli	cable ca	se						0	(232)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), othei	rwise (23b) = (23a)				(23b)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =	, , ,				(23c)
a) If	balance	ed mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	ı)m = (22	2b)m + (23b) x [⁻	1 – (23c)	÷ 1001	(100)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	covery (N	MV) (24b)m = (22	1 2b)m + (2	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	ntilation c	or positiv	/e input \	ventilatio	on from c	outside	1			1	
í	if (22b)r	n < 0.5 ×	(23b), t	then (24a	c) = (23b	o); otherv	wise (24	c) = (22b	o) m + 0.	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	ĺ	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft					
(0.4.1)	if (22b)r	n = 1, th	en (24d)	m = (22k)	o)m othe	erwise (2	.4d)m =	0.5 + [(2	2b)m² x	0.5]	4.00	4.00	1	(244)
(24d)m=	1.17	1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08	İ	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in boy	(25)	0.00	4.00	4.00	1	(25)
(25)m=	1.17	1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08	J	(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros are <mark>a</mark>	ss (m²)	Openin m	gs ²	Net Ar A ,r	rea m²	U-valı W/m2	le K	A X U (W/I	K)	k-value kJ/m²·l) K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	= [2.66				(26)
Win <mark>do</mark>	ws Type	e 1				4.59	x1	/[1/(1.6)+	0.04] =	6.9	Fi i			(27)
Win <mark>do</mark>	ws Type	e 2				4.64	x1	/[1/(4.8)+	0.04] =	18.68	F			(27)
Floor						51	×	0.99		50.49	F r			(28)
Walls ⁻	Type1	16.1	4	4.59		11.55	5 X	2.1	= [24.25	i F			(29)
Walls ⁻	Туре2	16.	1	6.54		9.56	×	2.1	= [20.08	i F		\dashv	(29)
Total a	rea of e	elements	, m²			83.24			เ					(31)
Party v	vall					33.3	×	0		0				(32)
* for win	dows and	l roof wind	ows, use e	effective wil	ndow U-va	alue calcula	ated using	g formula 1,	L /[(1/U-valu	ıe)+0.04] a	as given in	paragraph	⊥ ∟ ≀ 3.2	````
** inclua	le the area	as on both	sides of ir	nternal wall	s and par	titions								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				123.0	7 (33)
Heat c	apacity	Cm = S((A x k)			,			((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	² = Cm ÷	- TFA) ir	ו kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be ι	gn asses: Ised inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1t		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.8	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	:1)								
Total fa	abric he	at loss							(33) +	(36) =			135.8	7 (37)
Ventila	tion hea	at loss ca	alculated	d monthly	/			1	(38)m	= 0.33 × ((25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)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	l	(38)
Heat tr	ansfer o	coefficier	nt, W/K					-	(39)m	= (37) + (3	38)m	-	,	
(39)m=	178.48	177.64	176.81	172.63	171.8	167.93	167.93	167.21	169.42	171.8	173.46	175.13	ļ	
										Average =	Sum(39)1	12 /12=	172.5	2 (39)

Heat los	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.5	3.48	3.47	3.38	3.37	3.29	3.29	3.28	3.32	3.37	3.4	3.43		
L	r of day	rs in mor	u nth (Tab	le 12)					,	Average =	Sum(40)1.	12 /12=	3.38	(40)
	.lan	Feb	Mar	Anr	May	Jun	.Jul	Αυσ	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
`´L														
4. Wat	ter heat	ting ener	rgy requi	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu \ > 13.9 \ £ 13.9	ıpancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag he annua that 125	e hot wa al average litres per p	ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04		(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			1		1	
(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		
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =		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	e volum	e (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If comm	nunity h	eating a	ind no ta	ink in dw	elling, e	nter 110	litres in	(47)				100		()
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temper	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/y∉ wlindor l	ear ann faot	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	factor	from Tal	ble 2a	011 4.3							1	03		(52)
Temper	rature fa	actor fro	m Table	2b							0	.6		(53)
Enerav	lost fro	m water	storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		03		(54)
Enter (50) or ((54) in (5	55)	,, , .						,	1.	03		(55)
Water s	storage	loss cal	culated f	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	r 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	i lix 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	om Table	93							0		(58)
Primary	circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	t cylinde	r thermo	ostat)		I	(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 ca	alculated	for eac	h month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar Dł	HW input	calculated	using Ap	pendix G o	r Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	S and/or V	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		_
								Outp	out from w	ater heate	<mark>r (annual)</mark> ₁	12	1831.51	(64)
Heat g	ains fro	om water	heating	ı, kWh/m	onth 0.2	5 ´ [0.85	x (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	ide (57))m in calo	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ternal g	ains (see	Table	5 and 5a):									
Metab	olic aaii	ns (Table	e 5). Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	22.97	20.4	16.59	12.56	9.39	7.93	8.57	11.13	14.94	18.98	22.15	23.61		(67)
Applia	nces ga	ains (ca <mark>lc</mark>	ulated i	n Appen	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	1			
(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)
Cookir	ng gains	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a)	, also se	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 fa	ins gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.a. e	vaporatio	n (nega	ative valu	es) (Tab	le 5)	1		l	Į	1	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	-68.78		(71)
Water	heating	u dains (T	able 5)	1						<u> </u>	1			
(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 i	nterna	l gains =		1		(66)	m + (67)m	ı + (68)m -	I + (69)m + ((70)m + (7	I (1)m + (72)	m		
(73)m=	301.32	298.57	287.24	269.98	253.1	237.27	227.49	233.38	242.84	260.27	279.69	293.62		(73)
6. So	lar gain	s:												
Solar g	ains are	calculated	using sol	ar flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area	l	Flu	х		g_		FF		Gains	
		Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	>	4.0	64	x 1	0.63	x	0.85	x	0.7	=	20.34	(74)
North	0.9x	0.77)	4.0	64	x 2	20.32	x	0.85	×	0.7	=	38.88	(74)
North	0.9x	0.77)	4.0	64	х <u>з</u>	34.53	x	0.85	_ × [0.7	=	66.06	(74)
North	0.9x	0.77	,	4.0	64	× 5	5.46	x	0.85		0.7	=	106.12	(74)
North	0.9x	0.77)	4.0	64	x 7	4.72	x	0.85	_ × [0.7	=	142.95	(74)

North	0.9x	0.77		x	4.6	4	x	7	79.99	x	0.85		x	0.7		= [153.03	(74)
North	0.9x	0.77		x	4.6	4	x	7	74.68	x	0.85		x	0.7		= [142.87	(74)
North	0.9x	0.77		x	4.6	4	x	Ę	59.25	x	0.85		x	0.7		= [113.35	(74)
North	0.9x	0.77		x	4.6	4	x	4	11.52	x	0.85		x	0.7		= [79.43	(74)
North	0.9x	0.77		x	4.6	4	x	2	24.19	x	0.85		x	0.7		= [46.28	(74)
North	0.9x	0.77		x	4.6	4	x		13.12	x	0.85		x	0.7		= [25.1	(74)
North	0.9x	0.77		x	4.6	4	x		8.86	x	0.85		x	0.7		= [16.96	(74)
South	0.9x	0.77		x	4.5	9	x	4	16.75	x	0.76		x	0.7		= [79.11	(78)
South	0.9x	0.77		x	4.5	9	x	7	76.57	x	0.76		x	0.7		= [129.57	(78)
South	0.9x	0.77		x	4.5	9	x		97.53	x	0.76		x	0.7		= [165.05	(78)
South	0.9x	0.77		x	4.5	9	x	1	10.23	x	0.76		x	0.7		= [186.54	(78)
South	0.9x	0.77		x	4.5	9	x	1	14.87	x	0.76		x	0.7		= [194.39	(78)
South	0.9x	0.77		x	4.5	9	x	1	10.55	x	0.76		x	0.7		= [187.07	(78)
South	0.9x	0.77		x	4.5	9	x	1	08.01	x	0.76		x	0.7		= [182.78	(78)
South	0.9x	0.77		x	4.5	9	x	1	04.89	x	0.76		x	0.7		= [177.5	(78)
South	0.9x	0.77		x	4.5	9	x	1	01.89	x	0.76		x	0.7		= [172.41	(78)
South	0.9x	0.77		x	4.5	9	x	8	32.59	x	0.76		x	0.7		= [139.75	(78)
South	0.9x	0.77		x	4.5	9	x	Ę	55.42	х	0.76		х	0.7		=	93.78	(78)
South	0.9x	0.77		x	4.5	9	x		40.4	x	0.76		x	0.7		= [68.36	(78)
Solar (gains in 1	watts, ca	alcula: 231.1	ted	for each	n mont	:h	340.1	325.65	(83)m	n = Sum(74) 86 251.8	m(82	2)m	118.88	85.3	32		(83)
Total g	gains – ii	nternal a	nd so	blar	(84)m =	: (73)m) + (83)m	, watts									
(84)m=	400.77	467.02	518.3	35	562.63	590.4	3 5	, 77.37	553.14	524	.23 494.6	38 44	6.31	398.57	378.	94		(84)
7. Me	an inter	nal temp	eratu	ire (heating	seaso	on)											
Temp	perature	during h	eating	g pe	eriods ir	the liv	ving	area	from Tab	ole 9	, Th1 (°C))					21	(85)
Utilis	ation fac	tor for ga	ains f	or li	ving are	a, h1,	m (s	see Ta	ble 9a)						-			
	Jan	Feb	Ma	ar	Apr	May	/	Jun	Jul	A	ug Se	р (Oct	Nov	D	эc		
(86)m=	1	1	1		0.99	0.98		0.95	0.88	0.	9 0.97	' 0	.99	1	1			(86)
Mear	interna	l tempera	ature	in li	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	18.69	18.86	19.1	7	19.62	20.08		20.52	20.77	20.	73 20.37	7 19	9.79	19.18	18.	7		(87)
Temp	perature	during h	eating	g pe	eriods ir	rest o	of dv	velling	from Ta	able 9	9, Th2 (°C	C)						
(88)m=	19.25	19.26	19.2	7	19.31	19.32		19.35	19.35	19.	36 19.34	4 19	9.32	19.3	19.2	28		(88)
Utilis	ation fac	tor for a	ains f	or re	est of d	velling	. h2	.m (se	ee Table	9a)		•						
(89)m=	1	1	0.99)	0.99	0.96	T	0.89	0.7	0.7	76 0.94	+ O	.99	1	1			(89)
Mear	interna	l temper	ature	in t	he rest (of dwe		1 T2 (f	n Now ste		to 7 in Ta	ahle 9	c)		1			
(90)m=	17.22	17.39	17.7	1	18.19	18.65		19.09	19.29	19.	27 18.9	5 18	3 .36	17.75	17.2	25		(90)
	L	I]							Į	I		fLA =	= Liv	ring area ÷ (4	1 4) =	\dashv	0.55	(91)
Moor	intorno	ltompor	atura	(for	tho wh	olo du	ماللم	va) – f	ΙΛ 🗸 Τ1	т (1	fL∧\ ∽ 7	го				L		´
(92)m=	18.04	18.21	18.5	2	18.98	19.44		19.88	20.11	+ (1 20.		4 19	9.15	18.55	18.0)5		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.04	18.21	18.52	18.98	19.44	19.88	20.11	20.08	19.74	19.15	18.55	18.05		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	nperatui using Ta	re obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:				<u> </u>						
(94)m=	1	1	0.99	0.99	0.97	0.91	0.8	0.84	0.95	0.99	1	1		(94)
Usefu	I gains,	hmGm ,	, W = (94	4)m x (84	4)m									
(95)m=	400.04	465.49	515.13	554.95	570.35	525.77	444.34	439.13	469.74	441.33	397.32	378.39		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m x	x [(93)m-	– (96)m]				
(97)m=	2452.14	2363.57	2124.4	1740.29	1329.98	887.27	589.33	615.38	955.98	1469.13	1985.5	2425.87		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	4 x [(97)	m – (95)m] x (4	1)m			
(98)m=	1526.76	1275.51	1197.3	853.44	565.17	0	0	0	0	764.69	1143.49	1523.32		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	8849.69	(98)
Space	e heatin	a require	ement in	kWh/m ²	/vear							Ì	173.52	(99)
	oray roo		ata Car	nmunity	hooting	oobomo						l], ,
90. En	ergy rec					scheme	tor boot		ided by		unity on			
Fractic	in of spa	ace heat	from se	ting, spa condarv/	supplen/	ng or wa	neating	Table 11	10ed by a 1) '0' if no	a comm one	unity scr	ieme.	0	(301)
Fractio			(man 20	oorraary,		(004	1) 1)		., •	0110				
Fractic	n of spa	ace neat	from co	mmunity	system	1 - (30	1) =					[1	(302)
The con	nmunity so	cheme may	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four (other heat	sources; th	ne latter	
Fractic	n of hea	at from C	commun	ity boiler	'S	rom power	stations.	See Apper	idix C.			[1	(303a)
Fractic	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting syst	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng systei	m				[1.1	(306)
Space	heating	a										•	kWh/year	-
Annua	l space	heating	requirem	nent								[8849.69]
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [10221.39	(307a)
Efficier	ncy of se	econdary	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308
Space	heating	requirer	ment fro	m secon	dary/sup	oplemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =	[0	(309)
Water Annua	heating I water h	j neating r	equirem	ent								ſ	1831.51	1
lf DHW Water	/ from contract from heat from the structure of the struc	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30)3a) x (30	5) x (306) =	ו = [2115.39) (310a)
Electri	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(310e)] =	123.37	(313)
Coolin	g Syster	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)
Electrie mecha	city for p nical ve	oumps aintilation	nd fans v - balanc	within dv ed, extra	velling (1 act or po	Table 4f) 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)			4	05.69	(332)									
12b. CO2 Emissions – Community heating scheme														
	Energy kWh/year	Emission factor kg CO2/kWh	Emiss kg CO	sions)2/year										
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using the source of	two fuels repeat (363) to (366) for the second fu	el	65	(367a)									
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	=	4099.61	(367)									
Electrical energy for heat distribution [(313) x	0.52	=	64.03	(372)									
Total CO2 associated with community systems (3	63)(366) + (368)(372)		=	4163.63	(373)									
CO2 associated with space heating (secondary) (3	09) 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	73) + (374) + (375) =		4	4163.63	(376)									
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	-	0	(378)									
CO2 associated with electricity for lighting (3	32))) x	0.52	=	210.55	(379)									
Total CO2, kg/year sum of (376)(382) =			4	4374.19	(383)									
Dwelling CO2 Emission Rate (383) ÷ (4) =				85.77	(384)									
El rating (section 14)				42.43	(385)									
		User D	etails:											
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Assessor Name: Software Name: Stroma	FSAP 2012	roportu	Stroma Softwa	a Num ire Ver	ber: sion:		Versic	on: 1.0.3.15						
	P	roperty <i>i</i>	Address:	Unit 14										
Address: , london														
Basement		Area	a(m²) 51	(1a) x	Av. He	ight(m) .18	(2a) =	Volume(m³ 111.18) (3a)					
Total floor area $TFA = (1a)+(1b)+(1)$	c)+(1d)+(1e)+(1n	I)	51	(4)										
Dwelling volume				(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	111.18	(5)					
2. Ventilation rate:								<u> </u>						
main heati Number of chimneys Number of open flues	$\begin{array}{ccc} n & secondar \\ ng & heating \\ \hline 0 & + & 0 \\ \hline 0 & + & 0 \end{array}$	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)					
Number of intermittent fans				Γ	2	X .	10 =	20	(7a)					
Number of passive vents				Ē	0	x .	10 =	0	(7b)					
Number of flueless gas fires				Ē	0	× 4	40 =	0	(7c)					
umber of passive vents 0 $x 10 =$ 0 $(7b)$ umber of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourfiltration due to chimpour, flues and fans $=$ $(67) + (7c) + (7c) =$														
Infiltration due to chimneys, flues an If a pressurisation test has been carried o Number of storeys in the dwelling	nd fans = (6a)+(6b)+(7 put or is intended, proceed g (ns)	a)+(7b)+(7 d to (17), c	7c) = otherwise c	ontinue fre	20 om (9) to ((16)	÷ (5) =	0.18	(8) (9)					
Additional infiltration						[(9)	-1]x0.1 =	0	(10)					
Structural infiltration: 0.25 for stee if both types of wall are present, use th deducting areas of openings); if equal	el or timber frame or le value corresponding to user 0.35 0.2 (upsealed) or 0.	0.35 for the greate	masonr er wall area	y constr a <i>(after</i>	uction	-		0	(11)					
If no draught lobby enter 0.05 el	$1 \le 2 = (1 + 3 \le 2 \le 3 \le 3 \le 3 \le 3 \le 3 \le 3 \le 3 \le 3 \le$							0	(12)					
Percentage of windows and door	s draught stripped							0	(14)					
Window infiltration	5 11		0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)					
Infiltration rate			(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)					
Air permeability value, q50, expre	essed in cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	20	(17)					
If based on air permeability value, the	hen (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				1.18	(18)					
Air permeability value applies if a pressur	isation test has been don	e or a deg	ree air per	meability	is being u	sed			_					
Number of sides sheltered			(20) = 1 - [0.075 x (1	9)] =			2	(19)					
Infiltration rate incorporating shelter	factor		(21) = (18)	x (20) =	-/1			0.85	(20)					
Infiltration rate modified for monthly	wind speed		() (·-)	()				I	(21)					
	pr May Jun	Jul	Αυσ	Sep	Oct	Nov	Dec]						
Monthly average wind speed from 7	[2010] [2011] [2	041	, (49	000	000		200	1						
(22)m= 5.1 5 4.9 4.4	4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]						
Wind Factor (22a)m = $(22)m = 4$						1	1	l						
(22a)m= 1.27 1.25 1.23 1.7	1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]						

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-			
~ / /	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		
Calcul If m	ate ette	<i>ctive air</i> al ventila	change	rate for t	ne appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	rwise (23b) = (23a)			0	(23b)
If bala	anced with	h heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, (,			0	(23c)
a) If	halance	ed mech	anical ve	ntilation	with he	at recove	∍rv (MVI	HR) (24a	n)m = (2)	2h)m + (23h) x [1	1 – (23c)	 ∸ 1001	(200)
(24a)m=				0	0	0			0	0	0	0]	(24a)
b) If	balance	L d mech	I anical ve	I	without	L heat rec	L coverv (N	L //V) (24b	l = (2)	I 2b)m + ()	L 23b)		l	
(24b)m=	0	0		0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	i ouse ex	ract ver	ntilation of	or positiv	input v	ı ventilatio	n from c	utside				I	
•)	if (22b)r	n < 0.5 ×	(23b), t	then (24	c) = (23b	o); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from l	oft		•			
	if (22b)r	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		1	1	
(24d)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)	i		i	1	
(25)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
	/IENT	Gros	s	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	e l	AXk
_		area	(m²)	m	1 ²	A ,r	n²	W/m2	K	(VV/I	K)	kJ/m ² ·l	K	kJ/K
Doors	_					1.9	×	1.4	=	2.66				(26)
Windo	ws Type	e 1				4.42	x1	/[1/(1.6)+	0.04] =	6.65				(27)
Windo	ws Type	e 2				4.96	x1	/[1/(4.8)+	0.04] =	19.97				(27)
Floor						51	x	0.97	=	49.47				(28)
Walls	Type1	39.	2	4.96	;	34.24	k X	2.1	=	71.9				(29)
Walls	Type2	10.9	99	6.32	2	4.67	x	2.1	=	9.81				(29)
Total a	area of e	elements	, m²			101.1	9							(31)
Party v	wall					16.1	x	0	=	0				(32)
* for win	idows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
** incluc	le the area	as on both	sides of in	nternal wal	ls and par	titions		(00) (00)	(22)				r	
Fabric	heat los	SS, W/K :	= S (A x	U)				(26)(30)	(32) =	(00) (0)		(00.)	160.46	(33)
Heat c	apacity	Cm = S((A X K)		TEAL	1 1/			((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
I nerm	al mass	parame		- = Cm ÷	- IFA) Ir	n KJ/M²K			Indica	tive Value	: High		450	(35)
can be u	used inste	ad of a de	ere trie de tailed calc	ulation.	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP IN T	adie 11		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.2	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			175.66	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y			1	(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	46.91	45.99	45.08	40.48	39.56	35	35	34.13	36.8	39.56	41.4	43.24		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	222.58	221.66	220.74	216.14	215.22	210.66	210.66	209.79	212.46	215.22	217.06	218.9		
										Average =	Sum(39)1	12 /12=	215.92	(39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	4.36	4.35	4.33	4.24	4.22	4.13	4.13	4.11	4.17	4.22	4.26	4.29		
L	r of day		nth (Tab	le 12)		1	1		,	Average =	Sum(40)1	12 /12=	4.23	(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)
, , L													l	
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ıpancy, l 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by s r day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea I	ach month I	Vd,m = fa	ctor from 1	Table 1c x I	(43) T					1	
(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	000.40	
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	total = Su h(see Ta)	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =		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	storage	loss: e (litres)	includir	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comm	nunitv h	eating a	and no ta	ink in dw	vellina. e	nter 110	litres in	(47)				100		()
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/y€	ear		lun numu	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	whown. ay)				0.	02]	(51)
If comm	nunity h factor	from Ta	ee secti bla 22	on 4.3								00	1	(52)
Tempe	rature f	actor fro	m Table	2b							1.	03 6		(52)
Energy	lost fro	m water	storage		ar			(47) x (51)) x (52) x (53) =		.0		(54)
Enter ((50) or ((54) in (5	55)	, itt vii/yt	501			() / (0.)	, x (o_) x (,	1.	03		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(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	s dedicate	l d solar sto	rage, (57)ı	m = (56)m	x [(50) – (I H11)] ÷ (5	1 60), else (5	7)m = (56)	m where (H11) is fro	m Append	l lix 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	nnual) fro	om Table	93							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
mod) ا	ified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eacl	h month	(61)m =	(60) ÷ 3	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	for eac	ch month	(62)m =	• 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	W input	calculated	using Ap	pendix G o	r Appendix	H (negat	tive quantity	/) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applies	s, see Ap	pendix (G)			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	vater hea	ter											
(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		_
								Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	om water	heating	ı, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder	is in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic dair	ns (Table	e 5). Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	, (calcula	ted in A	ppendix	L, equat	ion L9 c	or L9a), a	lso see	Table 5					
(67)m=	22.92	20.36	16.55	12.53	9.37	7.91	8.55	11.11	14.91	18.93	22.1	23.55		(67)
Appliar	nces ga	ains (calc	ulated i	n Appen	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 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)
Cookin	a gains	s (calcula	ited in A		L. equat	ion L15	or L15a), also se	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 fa	ins gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se a e	vaporatio	n (nega	i ative valu	i les) (Tab	le 5)	<u> </u>				I			
(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		(71)
Water	heating	L 1 dains (T	l able 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 i	nterna	l Laains –			1	(66)m + (67)m	L 1 + (68)m ·	L+ (69)m +	L (70)m + (7	1 (1)m + (72)			. ,
(73)m=	301.26	298.52	287.2	269.95	253.08	237.25	227.47	233.35	242.8	260.23	279.64	293.56	l	(73)
6. Sol	ar gain	s:		1	1		1							· ,
Solar g	ains are	calculated	using sola	ar flux from	Table 6a	and asso	ciated equa	tions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area	l	Fl	ux		g_		FF		Gains	
		Table 6d		m²		Ta	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	×	4.9	96	x	10.63	x	0.85	X	0.7	=	21.75	(74)
North	0.9x	0.77	×	4.9	96	x	20.32	×	0.85	= × [0.7	=	41.56	(74)
North	0.9x	0.77	×	4.9	96	x	34.53	×	0.85	╡ x	0.7	=	70.62	(74)
North	0.9x	0.77	×	4.9	96	×	55.46	x 🗌	0.85	╡ <u> </u>	0.7	=	113.43	– (74)
North	0.9x	0.77	×	4.9	96	x 📃	74.72	×	0.85	╡ × Г	0.7	=	152.81	(74)

North	0.9x	0.77		x	4.9	6	×	7	9.99	x	0.85	5	x	0.7		= [163.58	(74)
North	0.9x	0.77		x	4.9	6	×	7	4.68	x	0.85	5) x [0.7		= [152.73	(74)
North	0.9x	0.77		x	4.9	6	x	5	59.25	x	0.85	5	x	0.7		= [121.17	(74)
North	0.9x	0.77		x	4.9	6	x	4	1.52	x	0.85	5] × [0.7		= [84.91	(74)
North	0.9x	0.77		x	4.9	6	×	2	24.19	x	0.85	5) × [0.7		= [49.47	(74)
North	0.9x	0.77		x	4.9	6	×	1	3.12	x	0.85	5] × [0.7		= [26.83	(74)
North	0.9x	0.77		x	4.9	6	x	6	8.86	x	0.85	5] × [0.7		= [18.13	(74)
South	0.9x	0.77		x	4.4	2	×	4	6.75	x	0.76	6] × [0.7		= [76.18	(78)
South	0.9x	0.77		x	4.4	2	x	7	6.57	x	0.76	6	x	0.7		= [124.77	(78)
South	0.9x	0.77		x	4.4	2	x	g	97.53	x	0.76	6) × [0.7		= [158.94	(78)
South	0.9x	0.77		x	4.4	2	x	1	10.23	x	0.76	6	x [0.7		= [179.63	(78)
South	0.9x	0.77		x	4.4	2	x	1	14.87	x	0.76	6) × [0.7		= [187.19	(78)
South	0.9x	0.77		x	4.4	2	x	1	10.55	x	0.76	6	x [0.7		= [180.14	(78)
South	0.9x	0.77		x	4.4	2	×	1	08.01	x	0.76	6	x [0.7		=	176.01	(78)
South	0.9x	0.77		x	4.4	2	×	1	04.89	x	0.76	6] x [0.7		= [170.93	(78)
South	0.9x	0.77		x	4.4	2	×	1	01.89	x	0.76	6] x [0.7		=	166.03	(78)
South	0.9x	0.77		x	4.4	2	×	8	32.59	x	0.76	6	x	0.7		= [134.58	(78)
South	0.9x	0.77		x	4.4	2	×	5	5.42	x	0.76	6	x	0.7		=[90.3	(78)
South	0.9x	0.77		x	4.4	2	x		40.4) x	0.76	6	× [0.7		= [65.83	(78)
															_			
Solar (gains in	watts, ca	alculat	ed	for eacl	n mon	th			(83)m	n = Sum(74	4)m	<mark>(8</mark> 2)m					(00)
(83)m=	97.93	166.33	229.5	6	293.07	340	3	43.73	328.74	292	2.1 250	0.94	184.05	117.13	83.9	96		(83)
l otal (jains – i	nternal a	nd so	lar	(84)m =	: (73)n		83)m	, watts	1 505	45 400		11100	000.77	077			(0.4)
(84)m=	399.19	464.85	516.7	6	563.01	593.0	(5	80.97	556.21	525	.45 493	5.74	444.28	396.77	377.	52		(84)
7. Me	ean inter	nal temp	eratu	re (heating	seaso	on)									_		
Temp	perature	during h	eating	g pe	eriods ir	the li	ving	area	from Tab	ole 9	, Th1 (°C	C)					21	(85)
Utilis	ation fac	tor for ga	ains fo	or li	ving are	a, h1,	<u>m (s</u>	ee Ta	ble 9a)	-					-			
	Jan	Feb	Ma	r	Apr	Ma	y 📘	Jun	Jul	A	ug S	ер	Oct	Nov	De	ec		
(86)m=	1	1	1		0.99	0.98		0.95	0.9	0.9	0.9	97	0.99	1	1			(86)
Mear	n interna	l tempera	ature	in li	iving are	ea T1	(follo	ow ste	ps 3 to 7	7 in T	able 9c))						
(87)m=	18.24	18.42	18.76	3	19.27	19.81	2	20.33	20.64	20.	59 20.	.17	19.49	18.8	18.2	24		(87)
Temp	perature	during h	eating	g pe	eriods ir	rest o	of dv	velling	from Ta	able 9	9, Th2 (°	°C)						
(88)m=	18.82	18.83	18.84	1	18.88	18.89	· ·	18.93	18.93	18.	94 18.	.92	18.89	18.87	18.8	35		(88)
Utilis	ation fac	tor for a	ains fo	or re	est of d	vellinc	ı. h2	.m (se	e Table	9a)		•		-	•			
(89)m=	1	1	0.99		0.99	0.96	,,,. <u>_</u>	0.89	0.7	0.7	76 0.9	94	0.99	1	1			(89)
Moor			atura	in t	ha rast	of dwe		T2 (f	l ollow ste		to 7 in 7	 Tabla	9c)		Į			
(90)m=	16.47	16.65	17		17.54	18.07	·	18.6	18.85	18.	83 18.	44	17.76	17.06	16.4	19		(90)
										L		fL/	A = Liv	ing area ÷ (4) =	-	0.47	(91)
N 4		14		/1 -			I. ¹				£1 A \	To		,		L		``/
Iviear				$\frac{101}{2}$			/eilin	(g) = f(g)	$LA \times 11$	+ (1	$- TLA) \times$: 12 26 T	19 50	17.00	474	22		(02)
(92)111=	17.31	17.40	17.63	'	10.30	10.09		13.42	19.7	1 ^{19.}	19.	.20	10.50	17.09	L 17.3)Z		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.31	17.48	17.83	18.36	18.89	19.42	19.7	19.66	19.26	18.58	17.89	17.32		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains (nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	0.99	0.98	0.96	0.91	0.81	0.84	0.95	0.99	1	1		(94)
Usefu	I gains,	hmGm	W = (94	4)m x (84	4)m						-			
(95)m=	398.11	462.77	512.68	554.06	571.5	529.3	449.02	441.67	467.88	438.34	395.04	376.68		(95)
Month	nly avera	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	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2894.91	2789.11	2501.17	2044.2	1547.59	1014.5	652.1	684.29	1096.11	1716.87	2341.08	2871.55		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	1857.62	1563.3	1479.44	1072.9	726.21	0	0	0	0	951.23	1401.15	1856.18		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	10908.02	(98)
Space	e heating	g require	ement in	kWh/m²	/year]	213.88	(99)
9b En	erav rea	wiremer	nts – Cor	nmunitv	heating	scheme						L		7
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by	a c <mark>omm</mark>	unity sch	neme.		1
Fractio	n of spa	ace heat	from see	condary/	supplem	nentary I	neating (l able 1	1) '0' if n	one			0	(301)
Fractio	<mark>n o</mark> f spa	ace heat	from co	<mark>mmu</mark> nity	system	1 - (301	1) =						1	(302)
The com	nmunity so	heme mag	y obtain he	eat from se	everal sour	ces. The p	procedure	allows for	CHP and u	up to four (other heat	sources; th	ne latter	-
<i>includes</i> Fractio	<i>bo</i> ilers, h n of hea	eat pumps at from C	s, geothern Commun	nal and wa ity boiler	aste heat fi S	rom powei	r stations.	See Apper	ndix C.			[1	(303a)
Fractio	n of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting syst	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	communi	ity heatir	ng syste	m					1.1	(306)
Space	heating	3											kWh/year	-
Annua	space	heating	requirem	nent								[10908.02]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	- [12598.76	(307a)
Efficier	ncy of se	econdary	//supplei	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fror	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								[1831.51	1
If DHW	/ from co	ommunii m Comn	ty schem	ne:					(64) x (3()32) x (30)	5) x (306) -	ו _ [2115 20]](310a)
Flectri			nunny DC	Ition				0.01	(0+) X (30 x [(307=)	(307a) ±	(310a) (- 310e)1 -	147 14	(313)
Coolin	n Sveter	n Energ	v Efficier	ncv Ratio	n			0.01		(0076) T	(0100)(0](314)
Space	coolina	(if there	is a fixe	d coolin	o svstem	n. if not e	enter 0)		= (107) -	(314) =		l I	0](315)
	site of the second								().	() -			v],,
mecha	nical 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) + (330b)) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			404.74	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	[·] Emissions kg CO2/yea	r
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	two fuels repeat (363) to (366) for the second fu	el 65	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	= 4889.63	(367)
Electrical energy for heat distribution [(313) x	0.52	= 76.37	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372)		= 4965.99	(373)
CO2 associated with space heating (secondary) (3	09) 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	73) + (374) + (375) =		4965.99	(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	32))) x	0.52	= 210.06	(379)
Total CO2, kg/year sum of (376)(382) =			5176.05	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			101.49	(384)
El rating (section 14)			35.49	(385)

			User D	etails:									
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num Ire Ver	ber: sion:		Versio	n: 1.0.3.15				
A daha a a	London	Pr	operty /	Address:	Unit 15								
Address :	, London												
Basement	310113.		Area	a(m²) 55	(1a) x	Av. He	ight(m) 17	(2a) =	Volume(m³ 119.35) (3a)			
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1n)	55	(4)								
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	119.35	(5)			
2. Ventilation rate:				_									
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} 0 \\ \hline 0 \\ \end{array} $	econdary heating 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)			
Number of intermittent fan	s					2	× ′	10 =	20	(7a)			
Number of passive vents						0	x ′	10 =	0	(7b)			
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)			
Number of passive vents 0 $x \ 10 =$ Number of flueless gas fires 0 $x \ 40 =$ Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 $\div (5) =$ Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 $\div (5) =$													
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	s, flues and fans = (en carried out or is intend e dwelling (ns) 25 for steel or timber sent, use the value corre is); if equal user 0.35	6a)+(6b)+(7 led, proceed frame or sponding to	a)+(7b)+(7 I to (17), c 0.35 for the greate	7c) = otherwise c masonr er wall area	ontinue fro y constr a (after	20 om (9) to a	(16) [(9)	÷ (5) = -1]x0.1 =	0.17 0 0 0 0	(8) (9) (10) (11)			
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0.	1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, ente	er 0.05, else enter 0								0	(13)			
Percentage of windows	and doors draught s	tripped							0	(14)			
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)			
Infiltration rate	50 1.			(8) + (10) ·	+ (11) + (1	2) + (13)	+ (15) =		0	(16)			
Air permeability value, q	50, expressed in cu		s per ho	our per so	quare m	etre of e	envelope	area	20	(17)			
Air permeability value applies	if a pressurisation test ha	as been done	e or a deo	aree air nei	meability	is heina u	sed		1.17	(18)			
Number of sides sheltered			o or a aog	, ee an per	mousing	io sonig a			2	(19)			
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)			
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0.99	(21)			
Infiltration rate modified for	r monthly wind spee	d											
Jan Feb M	<i>I</i> lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind spe	ed 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						1		I				
(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					

Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(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		
Calcula	ate effec	ctive air	change i	rate for t	he appli	cable ca	se						-	(00-)
II Me	echanica		llion.	ondix NL (2	2h) - (22a		austion (N	(IE)) otho	nuico (22h	(220)			0	(23a)
If bolo				$\frac{1}{2}$	(23d) = (23d)	or in uno f	otor (from)) = (23a)			0	(23b)
			very. enic		allowing r) =			4 (00.)		(23c)
a) If I	balance		anical ve		with nea	at recove		HR) (248	a)m = (22)	2b)m + (2 1	23b) × [1 – (23C)) ÷ 100j 1	(240)
(24a)m=	0			0	0	0	0				0	0]	(24a)
b) If I	balance	d mecha	anical ve	entilation	without	heat rec	overy (N	/IV) (24b	m = (22)	2b)m + (2	23b)		1	(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(240)
c) If v i	whole h f (22b)m	ouse ex า < 0.5 <mark>×</mark>	tract ver < (23b), t	itilation c hen (24d	or positiv c) = (23b	ve input v o); otherv	ventilatio vise (24	on from (c) = (22t	outside o) m + 0.	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If i	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from $ $	oft 2b)m² v	0.51			•	
(24d)m-	1 (220)11	1 24	1 22	1 09	1 07		40/11 – 1 0 94			1.07	1 12	1 17	1	(24d)
Effor		change		tor (24a) or $(24k$	$1 - \frac{0.04}{24}$	$rac{0.04}{0.04}$		(25)	1.07	1.12	1.17]	()
(25)m-	1 27	1 24	1 22	1 09) 01 (24t					1.07	1 12	1 17	1	(25)
	1.21	1.24	1.22	1.00	1.07	0.04	0.04	0.52	0.00		1.12	<u> </u>]	(20)
3. Hea	at losse	s and he	eat loss	oaramete	er:									
ELEN	IENT	Gros	ss (m ²)	Openin	gs	Net Ar	ea	U-val	ue	A X U		k-value	e l	A X k
Doors		arca	(111)			1.0		1.4		2.66				(26)
Window		1				1.9		/[1/(1 6)+	0.041	2.00	H			(20)
Windo						3		/[1/(1.0))	0.041	4.51	H			(27)
Window	ws Type	2				1.76		/[1/(4.0)+	0.04] =	7.09	L.			(27)
	ws туре т					0.64		/[1/(4.0)+	0.04] =	2.58				(27)
	ws type	94				3.84	x1,	/[1/(1.6)+	0.04] =	5.77	╡,			(27)
Floor						55	x	0.93	=	51.15				(28)
Walls T	Type1	28.	9	8.6		20.3	X	2.1	=	42.63				(29)
Walls T	ype2	7.8	1	2.54		5.27	x	2.1	=	11.07				(29)
Total a	rea of e	lements	, m²			91.71								(31)
Party w	vall					27.9	x	0	=	0				(32)
Party w	vall					1.13	x	0	=	0				(32)
* for wind ** include	dows and e the area	roof winde as on both	ows, use e sides of ir	effective wi nternal wal	ndow U-va Is and part	alue calcula titions	ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	h 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				127.	.46 (33)
Heat ca	apacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therma	al mass	parame	ter (TMF	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	High		45	0 (35)
For desig	gn assess sed instea	ments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						14.	4 (36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)							L	
Total fa	abric he	at loss							(33) +	(36) =			141.	86 (37)

Ventila	ation hea	at loss ca	alculated	dmonthl	у				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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 t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	191.69	190.72	189.74	184.85	183.88	179.05	179.05	178.15	180.95	183.88	185.83	187.79		_
Heat l		motor (l	יאי ים ור	/m21/					(40)m	Average = $-(20)m^{-1}$	Sum(39) ₁	12 /12=	184.63	(39)
(40)m=	3.49	3.47	3.45	3.36	3.34	3.26	3.26	3.24	3.29	3.34	3.38	3.41		
(,										Average =	Sum(40)1		3.36	(40)
Numb	er of day	vs 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. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assun	ned occu	ipancy,	N								1.	84		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 ×	(1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)	-		
	A £ 13.9	9, N = 1 e hot wa	ater usa	ae in litre	es ner da	av Vd av	erage =	(25 x N)	+ 36		77	<u>ν</u> ο <i>ι</i>		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	welling is	designed	to achieve	a water us	se target o	f	.04		(40)
not mor	e that 125	litres per	person pe	r day (all w	/ater use, l	hot and co	ld)							
List west	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage li	n litres per	day for ea	acn month	va,m = ra			(43)						
(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	024.05	
Energy	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	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		
			Į					ļ		Total = Su	r m(45) ₁₁₂ =	=	1224.68	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)					
(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)
Storac	siorage ie volum	e (litres)) includir	na anv si	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If com	munitv h	eating a	and no ta	ank in dv	vellina. e	nter 110) litres in	(47)				100		()
Other	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		· · ·		<i></i>	<i>.</i>							
a) If n 	nanufact	urer's de	eclared I	loss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b				(40) (40)				0		(49)
b) If n	y lost fro nanufact	m water urer's de	r storage eclared (e, KWh/ye cvlinder	ear loss fact	or is not	known:	(48) x (49)) =		1	10		(50)
Hot wa	ater stora	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)				0.	02		(51)
If com	munity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a m Tabla	2h							1.	.03		(52)
Tempe				; ZU				(47) × (64)	V (EQ) V (50)		.6		(53)
Enter	y iost iro (50) or (54) in <i>(</i> 5	55)	; KVV[1/Y	edi			(41) X (51	, x (32) X (55) =	1.	03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m	L'.			()
(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)
· /	-	-	-	1			-	-		-		-		

If cylinde	er contain	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)i	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)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinder	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 ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (6	51)m
(62)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		(62)
Solar DH	- W input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no solai	r contribut	on to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies.	, see Ap	pendix G	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
								Outp	out from wa	ater heate	r (annual)₁	12	1875.52	2 (64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	i] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	
(65)m=	60.83	53.73	56.71	51. <mark>2</mark> 3	50.48	45.51	44.1	47.86	47.61	53.1	55.66	59.5		(65)
inclu	de (57)	m in calc	culation of	of (65)m	only if c	ylinder is	s in th <mark>e c</mark>	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gair	s (Table	5) Wat	ts										
in o to to	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	91.87	91.87	91.87	91. <mark>87</mark>	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	24.95	22.16	18.02	13.64	10.2	8.61	9.3	12.09	16.23	20.61	24.05	25.64		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ole 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)
Cookin	ig gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e 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 fa	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49		(71)
Water	heating	gains (T	able 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 i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	317.45	314.53	302.47	284.1	266.1	249.29	238.97	245.15	255.28	273.83	294.46	309.29		(73)
6. Sol	ar gains	5:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicat	le orientat	ion.		
Orienta	ation: /	Access F	actor	Area		Flu	х		g_		FF		Gains	
		Table 6d		m²		Tab	ole 6a	Т	able 6b	Ta	able 6c		(W)	

North	0.9x	0.77	x	1.76	x	10.63	x	0.85	x	0.7	=	7.72	(74)
North	0.9x	0.77	x	0.64	x	10.63	x	0.85	x	0.7] =	2.81	(74)
North	0.9x	0.77	×	1.76	x	20.32	x	0.85	x	0.7] =	14.75	(74)
North	0.9x	0.77	x	0.64	x	20.32	x	0.85	x	0.7	=	5.36	(74)
North	0.9x	0.77	×	1.76	x	34.53	x	0.85	x	0.7] =	25.06	(74)
North	0.9x	0.77	x	0.64	x	34.53	x	0.85	x	0.7	=	9.11	(74)
North	0.9x	0.77	x	1.76	x	55.46	x	0.85	x	0.7	=	40.25	(74)
North	0.9x	0.77	x	0.64	x	55.46	x	0.85	x	0.7	=	14.64	(74)
North	0.9x	0.77	x	1.76	x	74.72	x	0.85	x	0.7] =	54.22	(74)
North	0.9x	0.77	x	0.64	×	74.72	x	0.85	x	0.7	=	19.72	(74)
North	0.9x	0.77	x	1.76	x	79.99	x	0.85	x	0.7	=	58.05	(74)
North	0.9x	0.77	x	0.64	x	79.99	x	0.85	x	0.7	=	21.11	(74)
North	0.9x	0.77	x	1.76	x	74.68	x	0.85	x	0.7	=	54.19	(74)
North	0.9x	0.77	x	0.64	x	74.68	x	0.85	x	0.7	=	19.71	(74)
North	0.9x	0.77	x	1.76	x	59.25	x	0.85	x	0.7	=	43	(74)
North	0.9x	0.77	x	0.64	x	59.25	x	0.85	x	0.7	=	15.63	(74)
North	0.9x	0.77	x	1.76	x	41.52	x	0.85	x	0.7	=	30.13	(74)
North	0.9x	0.77	x	0.64	X	41.52	x	0.85	х	0.7] =	10.96	(74)
North	0.9x	0.77	x	1.76	х	24.19	x	0.85	x	0.7	=	17.55	(74)
North	0.9x	0.77	x	0.64	x	24.19	x	0.85	x	0.7	=	6.38	(74)
North	0.9x	0.77	x	1.76	x	13.12	x	0.85	x	0.7] =	9.52	(74)
North	0.9x	0.77] ×	0.64	×	13.12	х	0.85	x	0.7	=	3.46	(74)
North	0.9x	0.77	x	1.76	x	8.86	x	0.85	x	0.7	=	6.43	(74)
North	0.9x	0.77	x	0.64	×	8.86	x	0.85	x	0.7	=	2.34	(74)
East	0.9x	1	x	3.84	x	19.64	x	0.76	x	0.7	=	27.81	(76)
East	0.9x	1	x	3.84	x	38.42	x	0.76	x	0.7	=	54.39	(76)
East	0.9x	1	x	3.84	×	63.27	x	0.76	x	0.7	=	89.58	(76)
East	0.9x	1	x	3.84	x	92.28	x	0.76	x	0.7	=	130.64	(76)
East	0.9x	1	x	3.84	x	113.09	x	0.76	x	0.7	=	160.11	(76)
East	0.9x	1	x	3.84	×	115.77	x	0.76	x	0.7] =	163.9	(76)
East	0.9x	1	x	3.84	x	110.22	x	0.76	x	0.7	=	156.04	(76)
East	0.9x	1	x	3.84	x	94.68	x	0.76	x	0.7	=	134.03	(76)
East	0.9x	1	x	3.84	×	73.59	x	0.76	x	0.7] =	104.18	(76)
East	0.9x	1	x	3.84	x	45.59	x	0.76	x	0.7	=	64.54	(76)
East	0.9x	1	x	3.84	×	24.49	x	0.76	x	0.7] =	34.67	(76)
East	0.9x	1	x	3.84	x	16.15	x	0.76	x	0.7	=	22.87	(76)
South	0.9x	0.77	×	3	×	46.75	x	0.76	x	0.7	=	51.71	(78)
South	0.9x	0.77	×	3	×	76.57	x	0.76	x	0.7	=	84.69	(78)
South	0.9x	0.77	×	3	×	97.53	x	0.76	x	0.7] =	107.88	(78)
South	0.9x	0.77	×	3	×	110.23	×	0.76	x	0.7] =	121.92	(78)
South	0.9x	0.77	×	3	×	114.87	x	0.76	x	0.7	=	127.05	(78)

South	0.9x	0.77		x	3		x	1	10.55	x		0.76	x	Γ	0.7		=	122.27	(78)
South	0.9x	0.77	_	x	3		x	1	08.01	x		0.76	۲ × آ	Γ	0.7		=	119.46	(78)
South	0.9x	0.77		x	3		x	1	04.89	x		0.76	×	Γ	0.7		=	116.02	(78)
South	0.9x	0.77		x	3		x	1	01.89	x		0.76	۲ × آ	Γ	0.7		=	112.69	(78)
South	0.9x	0.77		x	3		x	6	32.59	x		0.76	۲ × آ	Γ	0.7		=	91.34	(78)
South	0.9x	0.77		x	3		x	5	5.42	x		0.76	- x	Γ	0.7		=	61.29	(78)
South	0.9x	0.77		x	3		x		40.4	x		0.76	۲ × آ	Γ	0.7		=	44.68	(78)
	•																		
Solar g	gains in	watts, ca	alculate	ed '	for each	n mont	h			(83)m	i = Si	um(74)m .	(82)ı	n				_	
(83)m=	90.04	159.19	231.62	2	307.45	361.1	3	865.32	349.4	308	.68	257.95	179.	82	108.94	76.	32		(83)
Total g	jains – i	nternal a	and sola	ar	(84)m =	= (73)m) + (83)m	, watts										
(84)m=	407.49	473.72	534.09)	591.55	627.2	6	614.61	588.37	553	.83	513.23	453.	65	403.4	385	6.61		(84)
7. Me	an inter	nal temp	peratur	e (l	heating	seaso	n)												
Temp	erature	during h	neating	ре	eriods ir	n the liv	/ing	area	from Tab	ole 9,	Th	1 (°C)						21	(85)
Utilisa	ation fac	tor for g	ains fo	r liv	ving are	ea, h1,r	m (s	see Ta	ble 9a)										
	Jan	Feb	Mar		Apr	Мау	/	Jun	Jul	A	ug	Sep	0	ct	Nov	D	ec		
(86)m=	1	1	1		0.99	0.98		0.95	0.88	0.9	Э	0.97	0.9	9	1	1	I		(86)
Mean	interna	temper	ature i	n li	ving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	able	e 9c)							
(87)m=	18.68	18.84	19.15	T	19.62	20.08	T	20.52	20.77	20.	73	20.37	19.7	77	19.17	18.	69		(87)
Tom		during			vriode in	rosto	uf du	velling			<u>ד</u> ר מ	2 (°C)							
(88)m=	19.26	19.27	19.28	T	19.32	19.33		19.37	19.37	19.3	38	19.36	19.3	33	19.31	19.	29		(88)
(~				l de la companya de la	
Utilisa	ation fac	ctor for g	ains fo	r re	est of d	welling	, h2	.,m (se		9a)	16	0.04		0	1	1	1		(89)
(09)11=			-	_	0.99	0.97		0.89	0.71	0.7	0	0.94	0.9	9				1	(00)
Me <mark>ar</mark>	interna	I temper	ature ii	n tł	ne rest	of dwe	lling) T2 (f	ollow ste	eps 3	to 7	7 in Tabl	e 9 <mark>c</mark>)						(00)
(90)m=	17.22	17.38	17.7		18.19	18.66		19.11	19.31	19.:	29	18.96	18.3	36	17.75	17.	25		(90)
												I	LA = 1	_17111	g area ÷ (4	+) =		0.55	(91)
Mean	interna	l temper	ature (for	the wh	ole dw	ellir	ng) = f	LA × T1	+ (1	– fL	A) × T2							
(92)m=	18.02	18.18	18.5		18.97	19.44		19.89	20.11	20.	08	19.73	19. <i>*</i>	3	18.53	18.	04		(92)
Apply	v adjustr	nent to t	he mea	an T	internal	tempe	erati	ure fro	m Table	e 4e, 1	whe	re appro	opriat	e				1	(00)
(93)m=	18.02	18.18	18.5		18.97	19.44		19.89	20.11	20.	80	19.73	19.1	3	18.53	18.	04		(93)
8. Sp	ace nea	tting requ			norotur	o obto	ina		on 11 of	Tabl		o o tho	4 Ti m	o ('	76) m an	dro		vulata	
the ut	tilisation	factor fo	or gains	em s u	iperatur sing Ta	e obta ible 9a	ineo	at st	ерттог	Tabi	e 9t	o, so tha	t II,n	1=(76)m and	a re-	calc	ulate	
	Jan	Feb	Mar		Apr	May	,	Jun	Jul	A	ug	Sep	0	ct	Nov	D	ec		
Utilisa	ation fac	tor for g	ains, h	m:	·						<u> </u>	·							
(94)m=	1	1	0.99		0.99	0.97		0.91	0.81	0.8	84	0.95	0.9	9	1	1			(94)
Usefu	ul gains,	hmGm	, W = (94))m x (84	4)m													
(95)m=	406.87	472.44	531.2		584.04	606.62	2 5	60.74	474.04	466	.31	489.62	449	.4	402.37	385	.15		(95)
Mont	hly aver	age exte	ernal te	mp	erature	e from	Tab	le 8										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	e for mea	an inte	rna	al tempe	erature	, Ln	n, W =	=[(39)m	x [(93	3)m-	– (96)m]			_		l	(0-)
(97)m=	2630.15	2533.33	2276.4	7	1862.38	1423.02	2 9	46.44	628.47	655	6.6 (C=)	1019.39	1569	.27	2124.11	2598	8.62	l	(97)
Spac	e neatin	g require		or or	each m		KVVI T	n/mon	tn = 0.02	24 X [(97))m – (95))m] x	(4 [*]	1)m	164	0.00		
(90)10=	1054.12	1304.92	1298.4	٥L	9∠U.4	007.41		U				U	033.	10	1239.00	1046	0.03	l	

	Total per year (kWh/y	ear) = Sum(98) _{15,912}	=	9584.99	(98)
Space heating requirement in kWh/m²/year				174.27	(99)
9b. Energy requirements – Community heating scheme)				
This part is used for space heating, space cooling or wa Fraction of space heat from secondary/supplementary	ater heating provided by a com heating (Table 11) '0' if none	munity scheme.		0	(301)
Fraction of space heat from community system $1 - (30)$	1) =			1	(302)
The community scheme may obtain heat from several sources. The	procedure allows for CHP and up to fo	our other heat sources	s; the la	tter	4
includes boilers, heat pumps, geothermal and waste heat from powe Fraction of heat from Community boilers	r stations. See Appendix C.			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			1.05	(305)
Distribution loss factor (Table 12c) for community heating	ng system			1.1	(306)
Space heating				kWh/year	_
Annual space heating requirement				9584.99	
Space heat from Community boilers	(98) x (304a) x ((305) x (306) =		11070.66	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Append	dix E)		0	(308
Space heating requirement from secondary/supplemen	tary system (98) x (301) x 10	00 ÷ (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)(307e	e) + (310a)(310e)] :	=	132.37	(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)	:				J 7
mechanical ventilation - balanced, extract or positive 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)				440.61	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto kg CO2/kWh	or Emi kg (issions CO2/year	
CO2 from other sources of space and water heating (ne Efficiency of heat source 1 (%)	ot CHP) CHP using two fuels repeat (363) to (366) for the second f	uel	65	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0	= [4398.72	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [68.7	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	= [4467.42	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [0	(374)

CO2 associated with water from immer	sion heater or insta	antaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			4467.42	(376)
CO2 associated with electricity for pum	ps and fans within	dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	=	228.68	(379)
Total CO2, kg/year	sum of (376)(382)	=			4696.1	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				85.38	(384)
El rating (section 14)					41.18	(385)



			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	I2 Pr	roperty A	Stroma Softwa	a Num are Ver Unit 16	ber: sion:		Versio	n: 1.0.3.15	
Address :	, london									
1. Overall dwelling dimer	isions:									
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) .17	(2a) =	Volume(m³ 110.67) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	110.67	(5)
2. Ventilation rate:			-	a the an		total				-
Number of chimneys Number of open flues	$\begin{array}{c} \text{main} \qquad \text{s} \\ \text{heating} \qquad \text{h} \\ \hline 0 \qquad + \\ \hline 0 \qquad + \\ \hline 0 \qquad + \\ \hline \end{array}$	econdary neating 0 0	y + [] + []	0 0] = [0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	S				Г	2	x ´	10 =	20	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	38				Ē	0	x 4	40 =	0	(7c)
								Air ch	ange <mark>s per</mark> ho	our
Infiltration due to chimney	s, flues and fans = (6 en ca <mark>rried out or is intend</mark>	a)+(6b)+(7a	a)+(7b)+(7 I to (17), c	(c) =	ontinue fro	20 om (9) to ((16)	÷ (5) =	0.18	(8)
Number of storeys in the Additional infiltration	e dwelling (ns)	frome or	0.25 for	-		uction	[(9)	-1]x0.1 =	0	(9) (10)
if both types of wall are pre deducting areas of opening	sent, use the value corres (s); if equal user 0.35	sponding to	the greate	er wall area	y constr a (after	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) 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 s	tripped		0.25 [0.2	$\mathbf{v}(1\mathbf{A}) \cdot 1$	001 -			0	(14)
				(8) + (10) -	× (14) ÷ 1 ⊧ (11) + (1	2) + (13) -	+ (15) -		0	(15)
Air permeability value	150 expressed in cut	nic metre	s ner ho	ur ner so	uare m	etre of e	nvelone	area	0	(10)
If based on air permeabilit	v value. then $(18) = [(1)$	17) ÷ 20]+(8), otherwis	se (18) = (16)		invelope	area	1 18	= (17) $=$ (18)
Air permeability value applies	if a pressurisation test ha	s been don	e or a deg	iree air pei	meability	is being u	sed		1.10	
Number of sides sheltered	1								3	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.92	(21)
Infiltration rate modified fo	r monthly wind speed	t T					1	i	I	
Jan Feb N	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7	, , , , , , , , , , , , , , , , , , ,					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)m ÷ 4					4.00		4.15	I	
(zza)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m	-	-		_	
<u> </u>	1.17	1.14	1.12	1.01	0.98	0.87	0.87	0.85	0.92	0.98	1.03	1.08	ĺ	
Calcula If me	ate ette echanic:	<i>ctive air</i> al ventila	cnange	rate for t	ne appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	rwise (23b) = (23a)				(23b)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =					(23c)
a) If	balance	ed mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22	2b)m + (23b) x [[,]	1 – (23c)	÷ 100]	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	covery (N	и VV) (24b)m = (22	1 2b)m + (2	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	ntilation c	or positiv	/e input \	ventilatio	on from c	outside				1	
í	if (22b)r	n < 0.5 ×	(23b), t	then (24o	c) = (23b	o); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b)		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	ĺ	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft					
i	if (22b)r	n = 1, th	en (24d)	m = (22t	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	1.17	1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08	l	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in boy	(25)	0.00	4.00	4.00	1	(25)
(25)m=	1.17	1.14	1.12	1.01	0.98	0.88	0.88	0.86	0.92	0.98	1.03	1.08		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros are <mark>a</mark>	ss (m²)	Openin m	gs ²	Net Ar A ,r	rea m²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²·l) K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	= [2.66				(26)
Windo	ws Type	91				4.8	x1	/[1/(1.6)+	0.04] =	7.22	F			(27)
Windo	ws Type	e 2				4.16	x 1	/[1/(4.8)+	0.04] =	16.75	F			(27)
Floor						51	×	0.99		50.49	F r			(28)
Walls ⁻	Type1	16.1	4	4.8		11.34		2.1	= 	23.81	5		$\exists \vdash$	(29)
Walls ⁻	Type2	16.	1	6.06		10.04		2.1		21.08	\dashv		\dashv	(29)
Total a	area of e	elements	. m²			83.24			[J L			(31)
Partv v	vall		,			33.3		0		0				(32)
* for win	dows and	l roof wind	ows, use e	effective wil	ndow U-va	alue calcula	ated using	formula 1	L /[(1/U-valu	ie)+0.04] a	L as given in	paragraph		(02)
** includ	le the area	as on both	sides of ir	nternal wall	ls and par	titions	J			, <u>-</u>	0	, ,		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				122.0	(33)
Heat c	apacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TM	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be u	ign asses: Ised inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.8	(36)
if details	of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	:1)			()	<i>(</i>)				
Total fa	abric he	at loss							(33) +	(36) =			134.8	(37)
Ventila	tion hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × (25)m x (5)		1	
(00) -	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	42.61	41.//	40.94	36.76	35.93	32.06	32.06	31.34	33.55	35.93	37.6	39.27	I	(30)
Heat tr	ansfer o		nt, W/K						(39)m	= (37) + (3	38)m		1	
(39)m=	1/7.43	176.59	1/5.76	1/1.58	170.75	166.88	166.88	166.16	168.37	1/0.75	1/2.41 Sum(20)	1/4.08	171 4	17 (30)
									1	hverage =	Juiii(39)1	12 / 14=	1 1/1.4	

Heat lo	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.48	3.46	3.45	3.36	3.35	3.27	3.27	3.26	3.3	3.35	3.38	3.41		
L	r of day		u nth (Tab	l <u>a</u> 12)					,	Average =	Sum(40)1.	12 /12=	3.36	(40)
]	.lan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
					-		_					_		
4. Wa	ter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
Assum if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, I 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average i litres per j	ater usag hot water person per	ge in litre usage by ^r day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	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		_
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	900.48	(44)
(45)m=	122.41	107.06	110.48	96. <mark>3</mark> 2	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	•	1180.67	(45)
(46)m=	18.36	16.06	16.57	14. <mark>45</mark>	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
Water a	storage	loss:												
Storage	e volum	ie (litres)	Includir	ig any so	Diar or V	WHRS	storage		ame ves	sei		160		(47)
Otherw	nunity r rise if no	eating a	nd no ta hot wate	ink in aw er (this ir	elling, e Icludes i	nter 110 nstantar	neous co	(47) mbi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:		. (,		,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:						I	
If com	nunity h	age loss heating s	ee secti	on 4.3	e z (kvv	n/iitre/ua	iy)				0.	02		(51)
Volume	factor	from Tal	ble 2a	011 1.0							1.	03		(52)
Tempe	rature f	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 s	storage	loss cal	culated f	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 cylinde	r 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 Append	l lix 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	om Table	93							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
mod) ا	lified by	factor fi	rom Tab	le H5 if t I	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	ostat)	-	I	
(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 ca	alculated	for eac	h month	(61)m =	(60) ÷ 3	365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	for ea	ch month	(62)m =	• 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	W input	calculated	using Ap	pendix G o	r Appendix	H (nega	tive quantity	/) (enter '0	' if no sola	r contribut	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHRS	S and/or V	WWHRS	applie	s, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
					-			Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder	is in the o	dwelling	or hot w	ater is f	rom com	munity h	- neating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic dair	ns (Table	e 5). Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso see	Table 5					
(67)m=	2 <mark>3.08</mark>	20.5	16.67	12.62	9.43	7.96	8.61	11.19	15.01	19.06	22.25	23.72		(67)
Applia	nces ga	ains (calc	ulated i	n Appen	dix L, eq	uation I	13 or L1	3a), also	see Ta	ble 5			1	
(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)
Cookin	g gains	s (calcula	ited in A		L, equat	ion L15	5 or L15a), also se	ee Table	5			1	
(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 fa	ns gains	(Table	5a)				1				1		
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses	s e.a. e	vaporatio	n (nega	ative valu	ies) (Tab	le 5)		I			I	I	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	-68.78]	(71)
Water	heating	u dains (T	able 5)	1							<u> </u>		1	
(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 i	nterna	l gains =	l			(6)	 6)m + (67)m	L 1 + (68)m ·	L + (69)m +	L (70)m + (7	1 (1)m + (72)	l	1	
(73)m=	301.42	298.66	287.32	270.03	253.14	237.3	227.53	233.43	242.91	260.36	279.8	293.73	1	(73)
6. So	ar gain	s:		1									J	· ,
Solar g	ains are	calculated	using sol	ar flux from	Table 6a	and asso	ciated equa	itions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area	l	FI	ux		g_		FF		Gains	
		Table 6d		m²		Та	able 6a	Т	able 6b	Т	able 6c		(VV)	
North	0.9x	0.77)	4.	16	x	10.63	x	0.85	x	0.7	=	18.24	(74)
North	0.9x	0.77	,	4.	16	x 🗌	20.32	x	0.85		0.7	=	34.86	(74)
North	0.9x	0.77	,	4.	16	x	34.53	x 🗌	0.85	= × [0.7	=	59.23	(74)
North	0.9x	0.77	,	4.	16	x	55.46	x	0.85	=	0.7	=	95.14	(74)
North	0.9x	0.77	>	4.	16	x 📃	74.72	x 🗌	0.85	× [0.7	=	128.16	(74)

North	0.9x	0.77	×	(4.16	x	7	79.99	x	0.85	x	0.7	=	137.2	(74)
North	0.9x	0.77	×	(4.16	×	7	74.68	×	0.85	×	0.7	=	128.09	(74)
North	0.9x	0.77	×	(4.16	x	5	59.25	x	0.85	×	0.7	=	101.63	(74)
North	0.9x	0.77	×	(4.16	×	4	1.52	x	0.85	x	0.7	=	71.21	(74)
North	0.9x	0.77	×	(4.16	×	2	24.19	x	0.85	×	0.7	=	41.49	(74)
North	0.9x	0.77	×	· [4.16	×	1	3.12	x	0.85	×	0.7	=	22.5	(74)
North	0.9x	0.77	×	· [4.16	×		8.86	x	0.85	×	0.7	=	15.21	(74)
South	0.9x	0.77	×	(4.8	×	4	46.75	x	0.76	×	0.7	=	82.73	(78)
South	0.9x	0.77	×	(4.8	x	7	76.57	x	0.76	x	0.7	=	135.5	(78)
South	0.9x	0.77	×	(4.8	x	9	97.53	x	0.76	x	0.7	=	172.6	(78)
South	0.9x	0.77	×	(4.8	×	1	10.23	x	0.76	×	0.7	=	195.08	(78)
South	0.9x	0.77	×	(4.8	x	1	14.87	x	0.76	×	0.7	=	203.28	(78)
South	0.9x	0.77	×	< [4.8	x	1	10.55	x	0.76	×	0.7	=	195.63	(78)
South	0.9x	0.77	×	(4.8	×	1	08.01	x	0.76	×	0.7	=	191.14	(78)
South	0.9x	0.77	×	· [4.8	×	1	04.89	x	0.76	×	0.7	=	185.63	(78)
South	0.9x	0.77	×	(4.8	×	1	01.89	x	0.76	×	0.7	=	180.3	(78)
South	0.9x	0.77	×	(4.8	×	3	32.59	x	0.76	x	0.7	=	146.15	(78)
South	0.9x	0.77	×		4.8	×	5	55.42	x	0.76	x	0.7	=	98.07	(78)
Sout <mark>h</mark>	0.9x	0.77	×	(4.8	x		40.4	x	0.76	x	0.7		71.49	(78)
Sola <mark>r</mark> (<mark>gain</mark> s in	watts, <mark>ca</mark>	lculate	<u>d 1</u>	for each mon	th			(83)m	n = Sum(74)m .	<mark>(8</mark> 2)m			,	
(83)m=	100.97	170.35	231.83	L	290.21 331.4	4 3	332.83	319.24	287	.25 251.52	187.6	4 120.57	86.7		(83)
Total g	gains – i	nternal a	nd sola	ar ((84)m = (73)n	n + ((83)m	, watts	1			_			
(84)m=	402.4	469.02	519.15	L	560.25 584.5	8 5	570.13	546.77	520	.68 494.42	448	400.37	380.42		(84)
7. Me	ean inter	nal temp	erature	e (I	heating seaso	on)									
Temp	perature	during he	eating	pe	eriods in the li	ving	area	from Tab	ble 9	, Th1 (°C)				21	(85)
Utilis	ation fac	tor for ga	ins for	liv	ving area, h1,	m (s	see Ta	ble 9a)	·					7	
	Jan	Feb	Mar		Apr Ma	y 📘	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m=	1	1	1		0.99 0.98		0.95	0.88	0.	9 0.97	0.99	1	1		(86)
Mear	interna	l tempera	ature in	li	ving area T1	(foll	ow ste	ps 3 to 7	7 in T	able 9c)				_	
(87)m=	18.71	18.87	19.18		19.62 20.08	3	20.52	20.77	20.	73 20.38	19.79	19.2	18.71		(87)
Temp	perature	during he	eating	ре	riods in rest o	of dv	velling	from Ta	able 9	9, Th2 (°C)					
(88)m=	19.26	19.27	19.28		19.32 19.33	3	19.36	19.36	19.	37 19.35	19.33	19.31	19.29]	(88)
Utilis	ation fac	tor for a	ins for	re	est of dwelling	1. h2	2.m (se	ee Table	9a)	•		•	•	-	
(89)m=	1	1	0.99	T	0.99 0.97	<u> </u>	0.89	0.71	0.7	76 0.94	0.99	1	1]	(89)
Mear	interna	l tempera	ature in		ne rest of dwe		n T2 (f	n Now ste		to 7 in Tabl	e 9c)	!		4	
(90)m=	17.24	17.41	17.72	T	18.2 18.66	5	19.1	19.3	19.	28 18.97	18.38	17.77	17.27]	(90)
. /	L			-						f	LA = Liv	/ing area ÷ (4) =	0.55	(91)
Mag	interne	Itomnor	turo /f	~-	the whole de	(OII)-) (۲۸ ۲۷	. /4	fl A) T O					` ′
(92)m =		18 22	18.53	T	18.99 19.45		(y) = T 19.89	LA X 11	+ (1	$\frac{-1LA}{09} \times 12$	19 16	18 56	18.07	1	(92)
(SE/III-	1 10.00	1 10.44	10.00	1	10.00 10.40				1 <u>2</u> 0.		1 10.10	1 10.00	1 10.07	1	(0-)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.06	18.22	18.53	18.99	19.45	19.89	20.11	20.09	19.75	19.16	18.56	18.07		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain Ible 9a	ed at ste	ep 11 of	Table 9b	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	0.99	0.99	0.97	0.91	0.81	0.84	0.95	0.99	1	1		(94)
Usefu	I gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	401.66	467.47	515.92	552.71	565.2	520.44	440.95	436.91	469.49	442.97	399.1	379.87		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8					-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m·	– (96)m]				
(97)m=	2440.61	2352.49	2114.31	1731.46	1322.83	882.33	586.33	612.39	951.5	1462.29	1976.03	2414.17		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	h = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	1516.98	1266.73	1189.2	848.7	563.68	0	0	0	0	758.38	1135.39	1513.52		
								Tota	l per year	(kWh/yeai	.) = Sum(9	8)15,912 =	8792.58	(98)
Space	e heating	g require	ement in	kWh/m ²	/year							ĺ	172.4	(99)
Qh En	erav rea	uiromon	ote – Cor	nmunity	heating	schomo						l]
This na	art is use	ed for sp	ace hea	ting spa	neating	ng or wa	ater heat	ting prov	ided by	a comm	unity sch	neme		
Fractio	n of spa	ice heat	from se	condary/	supplen/	nentary l	neating	Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ce heat	from co	mmunity	system	1 - (301	1) =						1	(302)
The cor	munity or	homo mou	cobtain be	at from so	woral sour	The The	,	allows for	CHR and	up to four	othor hoot	sources: t]`´´
includes	boilers, h	eat pumps	, geotherr	nal and wa	aste heat f	rom power	r stations.	See Apper	ndix C.		Siner near	3001003, 11		
Fractio	<mark>n o</mark> f hea	at from C	ommun	ity boiler	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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting sys	tem		[1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m					1.1	(306)
Space	heating	3										-	kWh/year	-
Annua	space	heating	requirem	nent									8792.58]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	- [10155.43	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment fro	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating water h	l neating r	equirem	ent								[1831.51	1
If DHW Water	/ from co heat from	ommunit m Comn	y schem nunity bo	ne: pilers					(64) x (30	03a) x (30	5) x (306) :	= [2115.39] (310a)
Electric	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	122.71] (313)
Cooling	g Syster	n Energ	y Efficie	ncy Ratio	C				,	·			0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electric mecha	city for p nical ve	oumps ar ntilation	nd fans v - balanc	within dw ed, extra	velling (1 act or po	Table 4f) sitive inj	: 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) + (330b)) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L)				407.59	(332)
12b. CO2 Emissions – Community heating scheme					-
	Energy kWh/year	Emission facto kg CO2/kWh	r Em kg (issions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to (3	366) for the second fu	iel	65	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	=	4077.69	(367)
Electrical energy for heat distribution [(3	13) x	0.52	=	63.69	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372)		=	4141.37	(373)
CO2 associated with space heating (secondary) (3	09) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		Γ	4141.37	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	=	211.54	(379)
Total CO2, kg/year sum of (376)(382) =				4352.91	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				85.35	(384)
El rating (section 14)				42.63	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2	2012		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
	london	P	roperty /	Address:						
Address :										
Basement	310113.		Area	a(m²) 51	(1a) x	Av. He	ight(m) 18	(2a) =	Volume(m³ 111.18) (3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+	(1e)+(1n	I)	51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	111.18	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	main heating 0 + 0 +	secondar heating	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)
Number of intermittent fan	s					2	× ′	10 =	20	(7a)
Number of passive vents					Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	s, flues and fans = en carried out or is inte e dwelling (ns) 25 for steel or timb sent, use the value co. (s): if equal user 0.35	(6a)+(6b)+(7 ended, proceed er frame or rresponding to	a)+(7b)+(7 d to (17), c 0.35 for the greate	7c) = otherwise c masonr er wall area	ontinue fro y constr a (after	20 om (9) to (uction	(16) [(9)	÷ (5) = -1]x0.1 =	0.18 0 0 0 0 0	(8) (9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (uns	ealed) 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 draugh	t 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, q	50, expressed in o	cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	20	(17)
If based on air permeabilit	y value, then (18) =	= [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)	:	I		1.18	(18)
Air permeability value applies	If a pressurisation test	nas been don	e or a deg	gree air pei	meability	is being u	sea		2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(10)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				1	(21)
Infiltration rate modified fo	r monthly wind spe	eed								
Jan Feb M	<i>l</i> lar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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	8 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m	-	-		_	
.	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		
Calcul If m	ate effe echanic:	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(232)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), othei	wise (23b) = (23a)			0	(23b)
If bal	anced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,			0	(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a)m = (22	2b)m + (23b) x [′	1 – (23c)	÷ 100]	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	coverv (N	MV) (24b)m = (22	1 2b)m + ()	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside				1	
,	if (22b)n	n < 0.5 ×	(23b), t	then (24o	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft	_				
(0.1.1)	if (22b)n	n = 1, th	en (24d)	m = (22t	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	J	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24k	o) or (24)	c) or (24	d) in boy	(25)	4.00	4.40	4.40	ı	(25)
(25)m=	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros area	ss (m²)	Openin m	gs I ²	Net Ar A ,r	rea m²	U-valı W/m2	le K	A X U (W/I	K)	k-value kJ/m²·l	e K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	=	2.66				(26)
Windo	<mark>ws</mark> Type	e 1				4.8	x1	/[1/(1.6)+	0.04] =	7.22				(27)
Win <mark>do</mark>	ws Type	e 2				4.32	x1	/[1/(4.8)+	0.04] =	17.4				(27)
Floor						51	x	0.97	=	49.47				(28)
Walls [·]	Type1	39.	2	4.32	2	34.88	3 X	2.1		73.25			$\exists \square$	(29)
Walls [·]	Type2	10.9	9	6.7		4.29	x	2.1		9.01			$\exists \square$	(29)
Total a	area of e	elements	, m²			101.1	9							(31)
Party v	wall					16.1	x	0	=	0				(32)
* for win	idows and le the area	l roof wind as on both	ows, use e sides of ir	effective wi	ndow U-va Is and par	alue calcul titions	ated using	g formula 1,	/[(1/U-valu	ιe)+0.04] ε	as given in	paragraph	n 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				159	(33)
Heat c	apacity	Cm = S((Axk)	,					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	- = Cm ÷	- TFA) ir	n kJ/m²K			Indica	itive Value	: High		450	(35)
For des can be i	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pi	recisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.2	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			174.2	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y			1	(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	46.91	45.99	45.08	40.48	39.56	35	35	34.13	36.8	39.56	41.4	43.24	J	(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m		1	
(39)m=	221.12	220.2	219.28	214.68	213.76	209.2	209.2	208.33	211	213.76	215.6	217.44		
										Average =	Sum(39)1	12 /12=	214.46	(39)

Heat lo	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	4.34	4.32	4.3	4.21	4.19	4.1	4.1	4.08	4.14	4.19	4.23	4.26		
L	r of day		L			<u> </u>			,	Average =	Sum(40)1.	12 /12=	4.21	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Ϋ́ L													l	
4. Wat	ter heat	ing enei	rgy requi	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ipancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	FFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag he annua that 125	e hot wa al average litres per p	ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					1	
(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		—
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	900.48	(44)
(45)m=	122.41	107.06	110.48	96. <mark>3</mark> 2	92.42	79.75	73.9	84.8	85.81	100.01	109.17	118.55		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	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	e volum	e (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comm	nunity h	eating a	ind no ta	ink in dw	elling, e	nter 110	litres in	(47)				100		()
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:											1	
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/y∉ wlindor l	ear ann faot	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02]	(51)
Volume	factor	from Tal	ble 2a	011 4.3							1	03		(52)
Temper	rature fa	actor fro	m Table	2b							0	.6		(53)
Enerav	lost fro	m water	storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		03]	(54)
Enter (50) or ((54) in (5	55)	,, , .						,	1.	03		(55)
Water s	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m			1	
(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	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	I lix 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	om Table	93							0		(58)
Primary	circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
mod) ٦	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	ostat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eacl	n month	(61)m =	(60) ÷ 3	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	W input	calculated	using Ap	pendix G o	r Appendix	H (negat	ive quantity	/) (enter '0	' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applies	, see Ap	pendix (G)			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
							-	Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	x (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder	s in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ernal g	ains (see	e Table :	5 and 5a):									
Metabo	olic dair	ns (Table	e 5). Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	, (calcula	ted in A	ppendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	2 <mark>3.02</mark>	20.44	16.63	12.59	9.41	7.94	8.58	11.16	14.98	19.01	22.19	23.66		(67)
Appliar	nces ga	ains (calc	ulated i	n Appene	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 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)
Cookin	a gains	s (calcula	ted in A	ppendix	L. equat	ion L15	or L15a), also se	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 fa	ins gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	sea e	vaporatio	n (neas	utive valu	es) (Tab	le 5)	I				I			
(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		(71)
Water	heating	L 1 dains (T	able 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 i	nterna	l Laains –		1		(66])m + (67)m	L 1 + (68)m ·	L+ (69)m + (L(70)m + (7	1 (1)m + (72)			. ,
(73)m=	301.36	298.61	287.27	270	253.12	237.28	227.51	233.4	242.87	260.31	279.74	293.66	l	(73)
6. Sol	ar gain	s:		1			1		[1				· ,
Solar g	ains are	calculated	using sola	ar flux from	Table 6a a	and assoc	iated equa	tions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area		Flu	х		g_		FF		Gains	
		Table 6d		m²		Та	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	×	4.:	32	x	10.63	x	0.85	x	0.7	=	18.94	(74)
North	0.9x	0.77	×	4.3	32	x	20.32	×	0.85	= × [0.7	=	36.2	(74)
North	0.9x	0.77	×	4.:	32	x :	34.53	×	0.85	= × F	0.7	=	61.51	(74)
North	0.9x	0.77	×	4.:	32	x :	55.46	x 🗌	0.85	╡ <u> </u>	0.7	=	98.8	– (74)
North	0.9x	0.77	×	4.3	32	x	74.72	×	0.85	≓ × [0.7	=	133.09	(74)

North		~ 77	<u> </u>	, 1	4.00	٦.	_	70.00	٦ ۷	0.05		Г	07		_ Г	4 4 0 4 0	
North		0.77	<u> </u>		4.32	`_		79.99	」 × 」 、	0.85	╡	Ľ	0.7		= L _ r	142.48	$\begin{bmatrix} (74) \\ (74) \end{bmatrix}$
North	0.9x	0.77	╡ (4.32	╡∁		4.68	」 × ヿ 、	0.85		Ľ	0.7		= [133.02	(74)
North	0.9	0.77	= (4.32	╡∁		14.50	」^ ┐、	0.85	= $$	Ĺ	0.7			72.05	$\begin{bmatrix} (74) \\ (74) \end{bmatrix}$
North	0.9	0.77	= (4.32	╡ Û		1.52	」^ ┐、	0.85	=	Ľ	0.7			73.95	$\begin{bmatrix} (74) \\ (74) \end{bmatrix}$
North	0.9x	0.77	= (4.32	╡ Û		24.19	」 ^ ヿ 、	0.85		Ľ	0.7		= L _ T	43.09	$\begin{bmatrix} (74) \\ (74) \end{bmatrix}$
North	0.9	0.77	= (4.32	╡ Û		0.00	」^ ┐、	0.85	╡ Ĵ	Ľ	0.7			23.37	
South	0.9	0.77	= (4.32	╡ Û		8.80	」 ^ ヿ _	0.85	=	Ľ	0.7			15.79	$\begin{bmatrix} (74) \\ (79) \end{bmatrix}$
South	0.9x	0.77	= (4.8	╡ ゚		10.75	」 ^ ヿ _	0.76		Ľ	0.7			82.73	
South	0.9x	0.77	<u> </u>		4.8	- ^ - `		(6.57	」 × 1 …	0.76		Ľ	0.7		= [135.5	$ \begin{bmatrix} (70) \\ (70) \end{bmatrix} $
South	0.9x	0.77			4.8	- ×		97.53	」 × 1	0.76		L	0.7		= [172.6	
South	0.9x	0.77	'		4.8	_ ×		10.23] × 1	0.76	×		0.7		= [195.08	(78)
South	0.9x	0.77			4.8	Ľ ×	1	14.87	」 × 1	0.76	×		0.7		= [203.28	(78)
South	0.9x	0.77	'		4.8	_ ×	1	10.55	X	0.76	×		0.7		= [195.63	(78)
South	0.9x	0.77	,	<	4.8	_ ×	1	08.01	X	0.76	×		0.7		=	191.14	(78)
South	0.9x	0.77	,		4.8	_ ×	1	04.89	X	0.76	×		0.7		=	185.63	(78)
South	0.9x	0.77	,	<	4.8	_ ×	1	01.89	×	0.76	×	ļ	0.7		= [180.3	(78)
South	0.9x	0.77	,	\	4.8	_ ×	8	32.59	×	0.76	×	Ľ	0.7		=	146.15	(78)
South	0.9x	0.77	,	< l	4.8		<u> </u>	55.42	x	0.76	×	ļ	0.7		= ļ	98.07	(78)
South	0.9x	0.77	,		4.8	×		40.4	x	0.76	x		0.7		=	71.49	(78)
Solar (pains in	watts, <mark>ca</mark>	Iculate	d '	for each moi	nth			(83)m	n = Sum(74)n	n(82)	m	101 10	07			(02)
(83)m=	101.68	1/1./	234.11		(94)m = (73)	37	$\frac{338.11}{(92)m}$	324.16	291	.16 254.25	5 189.	.24	121.43	87	.28		(03)
(84)m-		470.21	521.28		(04) = (73)		(03)III	, walls	524	56 407 1	2 440	55	401 17	200	0.05		(84)
(04)11=	403.04	470.31	521.50	L	505.87 569.	+9	575.59	551.07	524	.50 497.12	2 449.	.55	401.17	300	0.95		(04)
7. Me	ean inter	nal tempe	erature	e (I	heating seas	son)		_							F		_
Temp	perature	during he	eating	pe	eriods in the	living	g area	from Tal	ble 9	, Th1 (°C)						21	(85)
Utilis	ation fac	tor for ga	ins for	· liv	ving area, h1	l,m (see Ta	able 9a)	1.					<u> </u>			
	Jan	Feb	Mar	+	Apr Ma	ay	Jun	Jul	A	ug Sep		ct	Nov)ec		(00)
(86)m=	1	1	1		0.99 0.98	3	0.95	0.9	0.9	0.97	0.9	9	1		1		(86)
Mear	interna	l tempera	ature ir	n li	ving area T1	(fol	ow ste	ps 3 to 7	7 in T	able 9c)			-				
(87)m=	18.26	18.44	18.78		19.29 19.8	1	20.33	20.64	20	.6 20.18	19.	5	18.82	18	.26		(87)
Temp	perature	during he	eating	ре	eriods in rest	of d	welling	from Ta	able	9, Th2 (°C))						
(88)m=	18.83	18.84	18.85	Τ	18.9 18.9	э	18.95	18.95	18.	96 18.93	18.	9	18.89	18	.87		(88)
Utilis	ation fac	tor for a	ins for	· re	est of dwellin	a. h	2.m (se	e Table	9a)	8							
(89)m=	1	1	0.99	Ť	0.99 0.9	3	0.89	0.71	0.7	76 0.94	0.9	9	1		1		(89)
Moor		l tempera	nturo ir	 \ +k	ne rest of dw		a T2 (f	I ollow sta	- ans 3	to 7 in Ta		\	1	Į			
(90)m=	16.49	16.67	17.02	T	17.56 18.0	9	<u>9 12 (1</u> 18.61	18.86	18.	84 18.46		, 78	17.09	16	.52		(90)
·- ·/··· ·									L		fLA = I	Livi	ing area ÷ (4	1 4) =		0.47) (91)
					d					(1.4) -			- · ·		L		
Mear	interna	tempera	ature (f	or	the whole d	welli	ng) = f	$LA \times T1$	+ (1	- tLA) × T	2		47.04	4-	24		(00)
(92)M=	17.33	17.51	17.85	1	18.3/ 18.9	ا ۲	19.42	19.7	1 19.	o/ 19.27	 18.	0	17.91	 17	.34		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.33	17.51	17.85	18.37	18.9	19.42	19.7	19.67	19.27	18.6	17.91	17.34		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	nperatur using Ta	e obtain Ible 9a	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	0.99	0.98	0.96	0.91	0.81	0.84	0.95	0.99	1	1		(94)
Usefu	I gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	401.93	468.15	517.2	554.91	568.37	525.13	446.54	441.04	470.71	443.39	399.39	380.09		(95)
Month	nly avera	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	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-			
(97)m=	2880.84	2775.86	2489.34	2033.99	1539.48	1009.14	649.23	681.51	1091.59	1709.24	2329.82	2857.21		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mon	th = 0.02	24 x [(97])m – (95)m] x (4	1)m			
(98)m=	1844.31	1550.78	1467.27	1064.94	722.5	0	0	0	0	941.79	1389.91	1842.98		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	10824.48	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year							ĺ	212.24	(99)
Qh En	orav roc	uiromor	ote – Cor	nmunity	heating	scheme						l]
This n	art is use	ad for sp		ting spa			ator hoat	ting prov	ided by	a comm	unity sch	ome		
Fractic	on of spa	ace heat	from se	condary/	supplen/	nentary l	neating	Table 1	1) '0' if n	one		leme.	0	(301)
Fractic	n of spa	ace heat	from co	mmunity	system	$1 - (30)^{2}$	1) -		,				1	$\left[(302) \right]$
	in or spe			initiatinty	system	- (50	') –							(002)
The com	nmunity so boilers h	cheme may	y obtain he s geotherr	eat from se mal and wa	everal soul aste heat f	ces. The p	orocedure	allows for See Appel	CHP and indix C	up to four	other heat	sources; tl	ne latter	
Fractic	on of hea	at from C	Commun	ity boiler	'S	ioni ponoi	olaliono.	000 11000	idix 0.				1	(303a)
Fractic	on of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem		ĺ	1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.1	(306)
Space	heating	a										I	kWh/vear	J
Annua	l space	heating	requirem	nent								[10824.48]
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	-	12502.28	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment froi	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h	j neating r	equirem	ent									1831.51	1
If DHW Water	/ from co heat fro	ommunit m Comn	ty schem	ne: pilers					(64) x (30	03a) x (30	5) x (306) :	ا =	2115.39] (310a)
Electri	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	146.18	」`´´´´](313)
Coolin	g Syster	n Energ	y Efficier	ncy Ratio	C				/			· · · · ·	0	(314)
Space	cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	· (314) =			0	(315)
Electri	city for p	oumps ai	nd fans v	within dw	velling (1	Table 4f)	:					ı r		J 1

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)			40	6.51	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh	Emissi kg CO2	ons 2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to (3	366) for the second fu	el	65	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	= 48	357.56	(367)
Electrical energy for heat distribution [(3	13) x	0.52	= 7	′5.87	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372)		= 49	933.43	(373)
CO2 associated with space heating (secondary) (3	09) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		49	933.43	(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	32))) x	0.52	= 2	10.98	(379)
Total CO2, kg/year sum of (376)(382) =			51	144.41	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			1	00.87	(384)
El rating (section 14)				5.74	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12 Pi	roperty A	Stroma Softwa Address:	a Num are Ver Unit 18	ber: sion:		Versic	n: 1.0.3.15	
Address :	, london									
1. Overall dwelling dimer	isions:									
Basement			Area	a(m²) 79	(1a) x	Av. He	ight(m) 2.6	(2a) =	Volume(m³ 205.4) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n)	79	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	205.4	(5)
2. Ventilation rate:	•			- 41						
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} 0 \\ 0 \\ \end{array} $	heating 0 0	y + [] + [] + [0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	S				Γ	2	x ′	10 =	20	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)
								Air ch	ange <mark>s per</mark> ho	ur
Infiltration due to chimney If a pressurisation test has be	s, flues and fans = (en carried out or is intend	6a)+(6b)+(7 led, proceed	a)+(7b)+(7 d to (17), c	7c) = otherwise c	ontinue fro	20 om (9) to ((16)	÷ (5) =	0.1	(8)
Number of storeys in the Additional infiltration	e dwelling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural Inflitration: 0.2 if both types of wall are pre deducting areas of opening	25 for steel or timber esent, use the value corre gs); if equal user 0.35	sponding to	0.35 for the greate	er wall area	y constr a (after	UCTION			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) 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 s	stripped		0.05 [0.0	~ (1 4) • 4	001			0	(14)
VVINDOW INflitration				(8) ± (10) .	X (14) ÷ 1 ⊾ (11) ⊥ (1	(00] =	± (15) –		0	(15)
	150 expressed in cu	hic metre	s nor ho			etre of e		area	0	(16)
If based on air permeabilit	y value then $(18) = [($	17) ÷ 20]+(8	3), otherwi	se (18) = (16)		invelope	aica	20	(17)
Air permeability value applies	if a pressurisation test ha	as been don	e or a deg	ree air per	meability	is being u	sed		1.1	
Number of sides sheltered	1								1	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				1.02	(21)
Infiltration rate modified fo	r monthly wind spee	d								
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7	·							L	
(22)m= 5.1 5 4	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4	· · · ·					1	I	I	
(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		

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)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			
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	se	-	-	-					
II III			ucing App	ondix N (2	(26) = (22)	$) \times Emv(c)$	ocuption (I		nuico (22h) = (22a)			0		$\left[\begin{array}{c} (23a) \\ (23a) \end{array} \right]$
lf bol	anood with				.50) – (258		octor (from	\mathbf{v}_{0}	1WI3C (200) – (238)			0		(230)
									$) = (\Omega)$	2 h)	00k) [4 (00 a)	0		(23c)
a) If	balance		anical ve					HR) (24a I	m = (22)	20)m + (23D) × [1 - (23c)	÷ 100] I		(242)
(24a)m=						0	0					0			(24a)
D) IT	balance	ed mecha	anical ve			neat rec	covery (r	VIV) (24b	m = (22)	20)m + (2 	230)		1		(24b)
(240)m=		0			0				0	0	0	0			(240)
C) If	if (22b)r	iouse ex n < 0.5 >	tract ver (23b), t	tilation of then (240	c) = (23b)); otherv	ventilatio wise (24	c) = (22b)	butside p) m + 0.	5 × (23b))				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural if (22b)r	ventilation ventilation	on or wh en (24d)	ole hous m = (22	e positiv c)m othe	ve input [,] erwise (2	ventilatio 24d)m =	on from l 0.5 + [(2	oft 2b)m² x	0.5]					
(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			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)	-	-				
(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)
3 He	at losse	s and he	at loss	naramet	or:										
		Gros	35	Openin		Net Ar	ea	U-valı	Ie	ΑΧΠ		k-value		ΑX	(k
		area	(m²)	m	90 1 ²	A ,r	n²	W/m2	K	(W/I	K)	kJ/m ² ·l	ĸ	kJ/	K
Doo <mark>rs</mark>						1.6	x	1.4	=	2.24					(26)
Win <mark>do</mark>	ws Type	e 1				11.64	1 x1	/[1/(4.8)+	0.04] =	46.87					(27)
Win <mark>do</mark>	ws Type	e 2				4.55	x1	/[1/(4.8)+	0.04] =	18.32	Fi i				(27)
Walls	Type1	89.	2	16.1	9	73.01	x	1.27] = [92.87					(29)
Walls [·]	Type2	26.6	63	1.6		25.03	3 X	2.1	 = [52.56			= F		(29)
Total a	area of e	elements	, m²			115.8	3	L	`		'				(31)
Party v	wall					5.3	x	0		0					(32)
* for win	ndows and le the area	l roof wind as on both	ows, use e sides of ii	effective wi nternal wal	ndow U-va Is and par	alue calcul titions	ated using	formula 1,	 /[(1/U-valu	ie)+0.04] a	as given in	n paragraph	 1 3.2		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				212	.86	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0		(34)
Therm	al mass	parame	eter (TMI	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		45	 0	(35)
For des can be t	ign asses used inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	construct	ion are not	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			_
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						24.	8	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)									_
Total f	abric he	at loss							(33) +	(36) =			237.	66	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y I	 		I	(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	87.72	86	84.28	75.68	73.96	65.41	65.41	63.77	68.8	73.96	77.4	80.84			(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	325.39	323.67	321.95	313.35	311.63	303.07	303.07	301.43	306.47	311.63	315.07	318.51			-
										Average =	Sum(39)	12 /12=	312	93	(39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	4.12	4.1	4.08	3.97	3.94	3.84	3.84	3.82	3.88	3.94	3.99	4.03		
						1	1		,	Average =	Sum(40)1.	12 /12=	3.96	(40)
Numbe	r of day	/s in moi	nth (Tab		Mov	lun		<u> </u>	Son	Oct	Nov	Dee		
(41)m-	31	28	1VIAI 31	Арі 30	1VIAY	30	31	Aug 31	30	31	30	21 21		(41)
(41)11-	51	20	51	50	51	50		51	50	51	50	51		(41)
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 ×	(1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	2. .9)	44		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person pe	ge in litre usage by r day (all w	es per da 5% if the c vater use, l	ay Vd,av Iwelling is hot and co	erage = designed ld)	(25 x N) to achieve	+ 36 a water us	se target o	92 f	.24		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					L	
(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		-
Energy c	ontent of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,ı	m x nm x L	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1106.83	(44)
(45)m=	150.46	131.59	135.79	118.39	113.6	9 <mark>8.02</mark>	90.83	104.23	105.48	122.93	134.18	145.71		_
lf instanta	aneous w	vater heati	ing at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1 <mark>4</mark> 51.23	(45)
(46)m=	22.57	19.74	20.37	17.76	17.04	14.7	13.63	15.64	15.82	18.44	20.13	21.86		(46)
Storage	storage	loss:	Vincludir	ng any se	olar or M	WHRS	storage	within sa	ame ves	sel		160		(47)
lf comn	nunity h	neating a	and no ta	ank in dw	vellina. e	enter 110) litres in	(47)			L	100		()
Otherw	ise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	e 2b								0		(49)
Energy	lost fro	m water	r storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If ma Hot was	anufact	urer's de	eclared (cylinder l rom Tabl	loss fact = 2 (k\N	or is not h/litre/da	known:				0	00	l	(51)
If comn	nunity h	neating s	see secti	on 4.3		n/ nti 0/ dc	×y)				0.	02		(01)
Volume	factor	from Ta	ble 2a								1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	r storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter ((50) or ((54) in (5	55)								1.	03		(55)
Water s	storage	loss cal	culated	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 cylinde	r contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	lculated	for each	month (59)m =	(58) ÷ 36	65 × (41)	m					
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	t cylinde	r thermo	stat)		I	
(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 ca	alculated	for eac	ch	month ((61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0		(61)
Total h	eat rec	quired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)m =	= 0.85 × ((45)m +	- (46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.74	181.52	191.0	7	171.88	168.87	15	51.52	146.11	159.51	158.97	178.2	187.68	200.99		(62)
Solar DI	HW input	calculated	using A	ppe	ndix G or	· Appendix	н (negativ	ve quantity	v) (enter '0)' if no sola	r contribu	ution to wate	er heating)		
(add a	dditiona	al lines if	FGHR	Sa	and/or \	WWHRS	ар	plies	see Ap	pendix (G)		-		-	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0]	(63)
Output	from v	vater hea	ter									•			-	
(64)m=	205.74	181.52	191.0	7	171.88	168.87	15	51.52	146.11	159.51	158.97	178.2	187.68	200.99		-
										Out	put from w	ater heat	er (annual)₁	12	2102.07	(64)
Heat g	ains fro	om water	heatin	g,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)n	n] + 0.8 >	k [(46)n	n + (57)m	+ (59)m	<u>[</u>]	
(65)m=	68.64	60.56	63.76	;	57.37	56.38	5	50.6	48.81	53.27	53.08	59.48	62.63	67.06		(65)
inclu	ide (57)m in calo	culation	n o	f (65)m	only if c	ylir	nder is	s in the c	dwelling	or hot w	ater is	from com	munity ł	neating	
5. Int	ernal g	jains (see	e Table	95	and 5a):										
Metab	olic gai	ns (Table	e 5), W	att	S	-	_					-		-	_	
	Jan	Feb	Mai	r	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	122.18	122.18	122.18	в	122.18	122.18	12	22.18	122.18	122.18	122.18	122.18	122.18	122.18		(66)
Ligh <mark>tin</mark>	g gains	s (calcula	ted in <i>l</i>	Ap	pendix	L, equat	ion	L9 oi	⁻ L9a), a	lso see	Table 5					
(67)m=	<mark>3</mark> 2.94	29.26	23.79		18.01	13.46	1	1.37	12.28	15.97	21.43	27.21	31.76	33.85		(67)
Applia	nces ga	ains (ca <mark>lc</mark>	ulated	in	Append	dix L, eq	uat	ion L'	13 o <mark>r L1</mark> :	3a), also	o see Ta	ble 5			•	
(68)m=	217.34	219.59	213.9 ⁻	1	201.81	186.54	17	72.18	162.59	160.34	166.02	178.12	193.39	207.75		(68)
Cookir	ng gains	s (calcula	ated in	Ap	pendix	L, equat	ion	1 L15	or L15a)	, also s	ee Table	5				
(69)m=	35.22	35.22	35.22	: [35.22	35.22	3	5.22	35.22	35.22	35.22	35.22	35.22	35.22	1	(69)
Pumps	and fa	ans gains	(Table	e 5a	a)								•			
(70)m=	0	0	0	Τ	0	0		0	0	0	0	0	0	0]	(70)
Losses	s e.g. e	vaporatic	n (neg	jati	ve valu	es) (Tab	le :	5)			•	-		•	•	
(71)m=	-97.74	-97.74	-97.74	4	-97.74	-97.74	-9	97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74		(71)
Water	heating	, g gains (T	Table 5	5)									•		•	
(72)m=	92.26	90.13	85.7	Τ	79.69	75.78	7	0.28	65.61	71.6	73.72	79.95	86.98	90.13		(72)
Total i	nterna	l gains =						(66)	m + (67)m	+ (68)m	+ (69)m +	(70)m + (71)m + (72)	m		
(73)m=	402.19	398.63	383.00	6	359.16	335.44	31	13.49	300.14	307.56	320.83	344.93	371.79	391.39	1	(73)
6. So	lar gain	is:	<u>,</u>									<u>.</u>	•			
Solar g	jains are	calculated	using sc	olar	flux from	Table 6a	and	associ	ated equa	tions to co	onvert to th	ne applica	able orientat	ion.		
Orienta	ation:	Access F	actor		Area			Flu	x	_	g	_	FF		Gains	
		Table 6d			m²			Tat	ole 6a	1	able 6b		Table 6c		(VV)	
North	0.9x	0.77		x	4.5	55	x	1	0.63	x	0.85	x	0.7	=	19.95	(74)
North	0.9x	0.77		x	4.5	55	x	2	0.32	x	0.85	x	0.7	=	38.12	(74)
North	0.9x	0.77		x	4.5	55	×	3	4.53	x	0.85	x	0.7	=	64.78	(74)
North	0.9x	0.77		x	4.5	55	x	5	5.46	x	0.85	x	0.7	=	104.06	(74)
North	0.9x	0.77		x	4.5	55	x	7	4.72	x	0.85	x	0.7	=	140.18	(74)

North	0.9x	0.77		x	4.5	5	x	7	9.99	×	0.85	×	Γ	0.7		= [150.06	(74)
North	0.9x	0.77		x	4.5	5	x	7	4.68	×	0.85	×	Ē	0.7		=	140.1	(74)
North	0.9x	0.77		x	4.5	5	x	5	9.25	x	0.85	x	Ē	0.7		= [111.15	(74)
North	0.9x	0.77		x	4.5	5	x	4	1.52	x	0.85	x	Ē	0.7		= [77.89	(74)
North	0.9x	0.77		x	4.5	5	x	2	4.19	×	0.85	×	Ē	0.7		=	45.38	(74)
North	0.9x	0.77		x	4.5	5	x	1	3.12	x	0.85	×	Ē	0.7		= [24.61	(74)
North	0.9x	0.77		x	4.5	5	x	6	8.86	x	0.85	x	Ē	0.7		= [16.63	(74)
South	0.9x	0.77		x	11.	64	x	4	6.75	x	0.85	×	Ē	0.7		= [224.39	(78)
South	0.9x	0.77		x	11.	64	x	7	6.57	x	0.85	x	Ē	0.7		= [367.49	(78)
South	0.9x	0.77		x	11.	64	x	g	7.53	x	0.85	x	Ē	0.7		= [468.12	(78)
South	0.9x	0.77		x	11.	64	x	1	10.23	x	0.85	x	Ē	0.7		= [529.08	(78)
South	0.9x	0.77		x	11.	64	x	1	14.87	x	0.85	x	Ľ	0.7		=	551.33	(78)
South	0.9x	0.77		x	11.	64	×	1	10.55	×	0.85	x		0.7		= [530.58	(78)
South	0.9x	0.77		x	11.	64	x	1	08.01	x	0.85	x		0.7		=	518.41	(78)
South	0.9x	0.77		x	11.	64	x	1	04.89	x	0.85	x		0.7		=	503.45	(78)
South	0.9x	0.77		x	11.	64	x	1	01.89	x	0.85	x		0.7		=	489.01	(78)
South	0.9x	0.77		x	11.	64	x	8	2.59	x	0.85	x		0.7		=	396.38	(78)
South	0.9x	0.77		x	11.	64	×	5	5.42	x	0.85	×		0.7		= [265.98	(78)
South	0.9x	0.77		x	11.0	64	x		40.4	x	0.85	×		0.7		=	193.89	(78)
Solar g	gains in	watts, ca	alcula	ted	for eacl	n mon	th			(83)m	n = Sum(74)r	m(82)	m			_		(22)
(83)m=	244.34	405.62	532.	9	633.14	691.5°	1 6	80.65	658.51	614	1.6 566.9	9 441.	.76	290.59	210.	52		(83)
					(84)m =	= (73)	$\frac{1+1}{2}$	83)m	, watts	000	40 007 7	0 700	<u> </u>	000.07	004	00		(94)
(84)m=	646.53	804.25	915.9	96	992.3	1026.5	15 9	94.13	958.65	922	.16 887.7	3 786.	.69	662.37	601.	92		(04)
7. Me	ean inter	nal temp	eratu	re (heating	seaso	on)			_								_
Temp	perature	during h	eatin	g pe	eriods ir	n the li	ving	area	from Tab	ole 9	, Th1 (°C)						21	(85)
Utilis	ation fac	tor for ga	ains f	or li	ving are	ea, h1,	m (s	ee Ta	ble 9a)	<u> </u>								
(22)	Jan	Feb	Ma	ar	Apr	Ma	y	Jun	Jul	A	ug Sep	p O	ct	Nov	De	ec		(00)
(86)m=	1	1	0.99	,	0.99	0.97		0.94	0.87	0.8	39 0.96	0.9	9	1	1			(00)
Mear	n interna	l temper	ature	in li	iving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able 9c)			1		_		
(87)m=	18.38	18.58	18.9	4	19.44	19.95	2	20.44	20.72	20.	68 20.3	19.0	63	18.94	18.3	88		(87)
Temp	perature	during h	eatin	g pe	eriods ir	n rest o	of dw	elling	from Ta	able 9	9, Th2 (°C	;)						
(88)m=	18.94	18.95	18.9	6	19.02	19.03	1	9.08	19.08	19.	09 19.06	6 19.0	03	19.01	18.9	98		(88)
Utilis	ation fac	ctor for ga	ains f	or re	est of d	welling	j, h2	,m (se	e Table	9a)								
(89)m=	1	1	0.99)	0.98	0.95		0.86	0.66	0.7	71 0.91	0.9	8	1	1			(89)
Mear	n interna	l temper	ature	in t	he rest	of dwe	elling	T2 (f	ollow ste	eps 3	to 7 in Ta	able 9c))					
(90)m=	16.69	16.9	17.2	6	17.8	18.3	Τ	18.8	19.02	1	9 18.66	6 18	3	17.3	16.7	2		(90)
	·									-	•	fLA = I	Livir	ng area ÷ (4	4) =		0.28	(91)
Mear) interna	l temper	ature	(for	the wh	ole dw	ellin	a) = f	LA x T1	+ (1	– fLA) ¥ T	[2				L		
(92)m=	17.15	17.36	17.7	2	18.25	18.76		9, <u>–</u> 1 19.25	19.49	19.	47 19.11	1 18.4	45	17.75	17.1	8		(92)
	L	1							I	I				1				

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.15	17.36	17.72	18.25	18.76	19.25	19.49	19.47	19.11	18.45	17.75	17.18		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r tilisation	nean int factor fo	ernal ter or gains	nperatui using Ta	re obtain Ible 9a	ed at ste	ep 11 of ⁻	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:					·					
(94)m=	1	0.99	0.99	0.98	0.95	0.87	0.72	0.76	0.92	0.98	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	644.59	799.41	905.44	969.19	973.44	868.03	694.41	702.66	813.49	770.92	658.83	600.52		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8	•							
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m x	(93)m-	– (96)m]				
(97)m=	4182.76	4033.88	3612.68	2930.74	2199	1410.02	874.6	924.55	1536.9	2446.33	3355.66	4133.94		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m=	2632.4	2173.56	2014.19	1412.31	911.82	0	0	0	0	1246.5	1941.71	2628.87		
								Tota	l per year	(kWh/year	·) = Sum(9	8)15,912 =	14961.36	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year							[189.38	(99)
0h En	oray roc	uiromor	ote – Cor	nmunity	heating	schomo						L]. ,
This pr	ergy rec			ting one			ator booti		ided by	0.00000				
Fractic	on of spa	ace heat	from se	condarv	supplen/	ng or wa	heating (Table 1	1) '0' if n	a comm one	unity Scr	ieme.	0	(301)
Freedie						4 (20)	1)		., •					
Fractic	on or spa	ace neat	from co	mmunity	system	1 - (30	1) =					[1	(302)
The con	nmunity so	heme may	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four o	other heat	sources; th	ne latter	
Fractic	on of hea	at from C	commun	ity boiler	'S	ioin power	r stations. c	see Apper	iuix C.				1	(303a)
Fractic	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	nity hea	ting sys	tem		ĺ	1.05	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syster	n				[1.1	(306)
Space	heating	9										-	kWh/year	-
Annua	l space	heating	requirem	nent								[14961.36]
Space	heat fro	m Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [17280.37	(307a)
Efficier	ncy of se	econdary	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308
Space	heating	require	ment froi	m secon	dary/sup	oplemen	tary syste	em	(98) x (30	01) x 100 -	÷ (308) =	[0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								[2102.07	1
lf DHW Water	/ from contract from heat from the structure of the struc	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30	03a) x (30	5) x (306) :	ו = [2427.89] (310a)
Electri	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(310e)] =	197.08	(313)
Coolin	g Syster	n Energ	y Efficiei	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)
Electrie mecha	city for p inical ve	oumps aintilation	nd fans v - balanc	within dv ed, extra	velling (1 act or po	Table 4f) sitive inj	: 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)				581.71	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh	· Em kg	issions 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 fu	iel	65	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0	= [6549.21	(367)
Electrical energy for heat distribution [(313) x	0.52	= [102.29	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372)		= [6651.49	(373)
CO2 associated with space heating (secondary) (3	309) 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) =		Γ	6651.49	(376)
CO2 associated with electricity for pumps and fans within dwellin	(331)) x	0.52	- [0	(378)
CO2 associated with electricity for lighting (3	332))) x	0.52	= [301.91	(379)
Total CO2, kg/year sum of (376)(382) =				6953.4	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				88.02	(384)
El rating (section 14)				33.87	(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 CO_2 emissions of the development.



					User D	etails:						
Assessor Name: Software Name:	Str	oma FS	AP 201	2 P	ropertv	Strom Softwa	a Num are Ver Unit 1	ber: sion:		Versio	on: 1.0.3.15	
Address :	, lo	ndon, NV	V3 4PB									
1. Overall dwelling di	mension	s:										
					Area	a(m²)		Av. He	ight(m)	-	Volume(m ³)	_
Basement						33	(1a) x	2	.25	(2a) =	74.25	(3a)
Ground floor						19	(1b) x	1	.65	(2b) =	31.35	(3b)
Total floor area TFA =	(1a)+(1l	b)+(1c)+((1d)+(1e)+(1r	ı)	52	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	105.6	(5)
2 Ventilation rate:												7
2. Vontilation rate.		main	Se	econdar	у	other		total			m ³ per hour	
Number of chimneys	Г		ייי ה ר ד ר] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	L L	0		0] + [0] = [0	x 2	20 =	0] (6b)
Number of intermitten	L t fans							2	x 1	10 =	20]](7a)
Number of passive ve	nts							0	x 1	10 =		$\left \frac{1}{2} \right $
Number of flueless ga	e firoe							0		40 =	0	
Number of nucless ga	5 11 23							0	^	Air ch	anges per hou](/c) Jr
Infiltration due to chim	neys, flu	es and fa	ans = (6)	a)+(6b)+(7	′a)+(7b)+(7c) =		20	-	÷ (5) =	0.19	(8)
Number of storeys i	n the dw	elling (ns	s)	a, procee	a to (17), (otherwise (continue tr	om (9) to (16)		0] (9)
Additional infiltration	1	<u> </u>	.)						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration	: 0.25 fo	r steel or	timber f	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall an	e present,	use the va	lue corres	ponding to	the great	er wall are	a (after					-
If suspended woode	enings), ii en floor, (equal user enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0](12)
If no draught lobby,	enter 0.0	05, else e	enter 0	,	,	,,					0	(13)
Percentage of winde	ows and	doors dr	aught st	ripped							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 valu	ue, q50, (expresse	d in cub	bic metre	s per ho	bur per solution $(18) = (18)$	quare m	etre of e	nvelope	area	10	(17)
If based on air permea	adility val Indies if a p	lue, then	(10) = [(1)	7) - 20]+(0	o), otherwise or a dec	nse (10) = (19 air ne	rmeahility	is heina u	sed		0.69	(18)
Number of sides shelt	ered					groo an po	inite ability i	io sonig ut	500		1	(19)
Shelter factor						(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpo	orating sh	nelter fac	tor			(21) = (18) x (20) =				0.64	(21)
Infiltration rate modifie	d for mo	nthly win	d speed	1		ı —	· · · · ·	· · · · ·			1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind	speed f	rom Tabl	e 7			i	i	i	i	i	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 F	actor (2	2a)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			
Adjuste	ed infiltra	ation rat	e (allowi	ing for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m						
	0.81	0.8	0.78	0.7	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75			
Calcula	ate effec	ctive air	change	rate for t	he appli	cable ca	se		-		-	-	- 	_	
II IIIe			ucing App	ondix N (2	(25) = (22)) x Emy (c	ocuption (N	NE)) otho	nuico (22h	(220)				0	(23a)
If bold					(200) = (200)	a) X FIIIV (e	equation (i			i) = (23a)				0	(23b)
									() = (0)	0h)ma (/	00h) [/	(00.0)	. 4001	0	(23c)
a) If			anical ve					HR) (248	a m = (2)	20)m + (. 1	23D) × [*	1 - (23C)	÷ 100] I		(24a)
(24a)III=					U		()					0			(24a)
D) IT	balance	a mech	anical ve	entilation	without	neat rec	covery (N	VIV) (240 1	m = (22)	2b)m + (2 1	23b)	0	1		(24b)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(240)
c) If	whole h	ouse ex	tract ver	tilation (or positiv	/e input v	ventilatio	on from c a) = (22k)	outside	5 v (22h					
(24c)m-		0.5			(231) = (231)			C = (ZZL)	$\frac{1}{1}$.5 × (230		0	1		(24c)
(240)III-		un tilati								0	0	0			(210)
a) n	if (22b)m	r = 1, th	en (24d)	m = (22)	b)m othe	e input erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]					
(24d) <mark>m=</mark>	0.83	0.82	0.81	0.75	0.73	0.68	0.68	0.67	0.7	0 <mark>.73</mark>	0.76	0.78			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24	o) or (24	c) or (24	d) in boy	(25)						
(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			(25)
0.116															
				naramen											
			5at 1055	Oponin		Not Ar	200					k volu	、 、		k
ELEN		Gros	ss (m²)	Openin m	gs 1 ²	Net Ar A ,r	ea n²	U-valu W/m2	ue 2K	A X U (W/ł	K)	k-value kJ/m²·l	e K	A X I kJ/K	k
ELEN Doors	IENT Type 1	Gros area	ss (m²)	Openin m	gs J ²	Net Ar A ,r 7.3	rea m² x	U-valu W/m2	ue 2K =	A X U (W/I 10.22	<)	k-value kJ/m²₊l	e K	A X I kJ/K	k (26)
ELEN Doors	IENT Type 1 Type 2	Gros	ss (m²)	Openin r	gs J ²	Net Ar A ,r 7.3	ea n ² x	U-valu W/m2 1.4	ue 2K =	A X U (W/ł 10.22 6.02	<)	k-value kJ/m²·I	e K	A X I kJ/K	k (26) (26)
Doors Window	IENT Type 1 Type 2 ws Type	Gros area	35 (m ²)	Openin m	gs _{j²}	Net Ar A ,r 7.3 4.3	ea n ² x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+	ue 2K = =	A X U (W/ł 10.22 6.02 3.1	<)	k-value kJ/m²·I	e K	A X I kJ/K	k (26) (26) (27)
Doors Doors Windov	IENT Type 1 Type 2 ws Type ws Type	Gros area	ss (m ²)	Openin m	gs ₂ 2	Net Ar A ,r 7.3 4.3 1.6	ea n ² x x x ¹ x ¹	U-valu W/m2 1.4 (1/(2.1)+ /[1/(2.1)+	ue 2K □ = ○ 0.04] = ○ 0.04] =	A X U (W/I 10.22 6.02 3.1 3.82	<)	k-value kJ/m²-I	e K	A X I kJ/K	k (26) (26) (27) (27)
ELEN Doors Doors Windov Floor	IENT Type 1 Type 2 ws Type ws Type	Gros area	(m ²)	Openin m	gs ₁₂	Net Ar A ,r 7.3 4.3 1.6 1.97	ea n ² x x x x ¹ x ¹	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+	ue 2K = = 0.04] = ○ 0.04] =	A X U (W/I 10.22 6.02 3.1 3.82 7.546		k-value kJ/m²+l	× K	A X I kJ/K	k (26) (26) (27) (27) (28)
Doors Doors Doors Windov Floor Walls	IENT Type 1 Type 2 ws Type ws Type	Gros area	4 (m2)	Openin m	gs ,2	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3	ea n ² x x x ¹ x ¹ x ¹ x	U-valu W/m2 1.4 (1/(2.1)+ /[1/(2.1)+ /[1/(2.1)+	ue 2K = = = ○ 0.04] = = ○ 0.04] = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546		k-value kJ/m²·I		A X I kJ/K	(26) (26) (27) (27) (28) (29)
Doors Doors Windov Windov Floor Walls	IENT Type 1 Type 2 ws Type ws Type Type1	Grosarea	4 1	Openin m	gs ₁ 2 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23	ea n ² x x x x ¹ x ¹ x ¹ x ²	U-valu W/m2 1.4 [1/(2.1)+ /[1/(2.1)+ [0.22 0.28	ue 2K = = = 0.04] = = 0.04] = = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98		k-value kJ/m²+l		A X I kJ/K	k (26) (27) (27) (27) (28) (29)
Doors Doors Windov Windov Floor Walls ⁻ Roof	A Providence of the second sec	Gros area 29. 29. 44.	4 1	Openin m 15.1 0	gs ,2	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1	ea n ² x x x x ¹ x ¹ x ¹ x ² x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28	ue 2K = = 0.04] = ○ 0.04] = = = = =	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98 12.35		k-value kJ/m²+l		A X I kJ/K	k (26) (27) (27) (28) (29) (29) (29)
Doors Doors Windov Windov Floor Walls ⁻ Roof	A Provide America Antipage 1 Type 1 Type 2 ws Type ws Type Type1 Type2	Gros area 1 29. 29. 44.	4 1 m ²	Openin m 15.1' 0 0 0	gs ,2 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19	ea n ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.16	ue 2K = = = 0.04] = = 0.04] = = = = = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		k-value kJ/m²·I		A X I kJ/K	k (26) (27) (27) (28) (29) (29) (29) (30)
Doors Doors Windov Windov Floor Walls ⁻ Roof Total a	A Providence of e	Grosarea area 1 29. 44. 19. Iements	4 1 , m ²	Openin m 15.1 0 0	gs ² 7	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8	ea n ² x x x x ¹ x ¹ x ¹ x ² x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28	ue 2K = = = 0.04] = = 0.04] = = = = = = =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		k-value kJ/m²+l			k (26) (27) (27) (28) (29) (29) (30) (31)
S. ree ELEN Doors Doors Windov Floor Walls ⁻ Roof Total a Party v	IENT Type 1 Type 2 ws Type ws Type Type1 Type2 area of e wall	Grosarea area 1 29. 44. 19 Iements	4 1 , m ²	Openin m 15.1 0 0	gs ,2 7	Net Ar A,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9	ea n ² x x x ¹ x ¹ x ¹ x ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 (1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.16	ue 2K = = 0.04] = = 0.04] = = = = = = = = =	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04		k-value kJ/m²·l			 (26) (27) (27) (27) (28) (29) (30) (31) (32)
S. ree ELEN Doors Doors Windov Windov Floor Walls ⁻ Roof Total a Party v * for win ** includ	A Providence of endows and le the area	Gros area 4 29. 44. 19 19 19 19 19 19 19 19 19 19 19 19 19	4 1 , m ² ows, use e sides of in	Openin m 15.1 0 0 effective with ternal wal	gs ⁷ ndow U-va ¹ / ₂ ¹ / ₂	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul titions	ea n ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.16	ue : = : 0.04] : = : = : = : = : = : = : = : = : = : = : = : = : = : = : = : = : = : =	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] a	<)	k-value kJ/m²+l			k (26) (27) (27) (28) (29) (29) (30) (31) (32)
S. ree ELEN Doors Doors Windov Floor Walls ⁻ Roof Total a Party v * for win ** includ Fabric	A Providence of environmental of the area of environmental of the area of environmental of the area of environmental of the area of the ar	Gros area 4 2 2 29. 44. 19 19 19 19 19 19 19 19 19 19 19 19 19	4 1 , m ² ows, use e sides of ir = S (A x	Openin m 15.1 0 0 effective wi internal wal U)	gs ⁷ mdow U-va ls and par	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 14.9 alue calculations	ea n ² x x x ¹ x ¹ x ¹ x ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 [1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.16 0.16	$\begin{array}{c} ue \\ 2K \\ = \\ 0.04] = \\ 0.04] = \\ = \\ = \\ = \\ = \\ = \\ \\ = \\ \\ \\ \\ \\ $	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 12.35 3.04	<)	k-value kJ/m²+l	× K	A X I kJ/K	k (26) (27) (27) (28) (29) (29) (30) (31) (32) (33)
S. ree ELEN Doors Doors Windou Windou Floor Walls ⁻ Roof Total a Party v * for win ** includ Fabric Heat c	A Providence of environmental losses of environmental losses of environmental losses of environmental loss and le the area heat loss apacity (Gros area Grosarea129. $44.19191919191919191919191919$	4 1 , m ² ows, use e sides of ir = S (A x (A x k)	Openin m 15.1 0 0 effective winternal wal	gs j2 7 Indow U-va Is and par	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculations	ea n ² x x x ¹ x ¹ x ¹ x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ /[1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.28 0.16	$\begin{array}{c} ue \\ 2K \\ = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ = \\ = \\ 0 = \\$	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 12.35 3.04	K) Image: spin sector of the secto	k-value kJ/m²-I		A X I kJ/K	k (26) (27) (27) (28) (29) (30) (31) (32) (33) (33) (34)
S. ree ELEN Doors Doors Windou Floor Walls ⁻ Walls ⁻ Roof Total a Party v * for win ** includ Fabric Heat c Therm	ALENT Type 1 Type 2 ws Type ws Type ws Type Type1 Type2 area of e wall dows and le the area heat los apacity (al mass	Gros area 4 1 2 2 29. 44. 19 lements roof wind as on both as on both as, W/K = Cm = Sc parame	$\frac{4}{1}$ $\frac{4}{2}$ $\frac{1}{2}$ penin m $ \begin{array}{c} 15.1\\ \hline 0\\ \hline 0\\ \hline 0\\ \hline 0\\ \hline 0\\ \hline 0\\ \hline 0\\ \hline $	gs ⁷ ⁷ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ² ² ² ² ³ ⁴ ⁴ ⁴ ⁴ ⁵ ⁶ ⁶ ⁶ ⁶ ⁷ ⁷ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calculations	ea n ² x x x ¹ x ¹ x ¹ x ² x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 /[1/(2.1)+ /[1/(2.1)+ (1/(2.1)+ 0.22 0.28 0.28 0.28 0.28 0.28 0.28 0.16	$\begin{bmatrix} ue\\2K \\ = \\ 0.04] = \\ 0.04] = \\ = \\ = \\ = \\ = \\ (1) = \\ (1/U-value) \\ (1/U-value) \\ (28). \\ Indices$	A X U (W// 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 0 ue)+0.04] a (30) + (32 (30) + (32	<pre>K)</pre>	k-value kJ/m²-l		A X I kJ/K	k (26) (27) (27) (28) (29) (29) (30) (31) (32) (33) (33) (34) (35)	
S. ree ELEN Doors Doors Windou Windou Floor Walls ⁻ Roof Total a Party v * for win ** includ Fabric Heat c Therm. For desi can be	ALENT Type 1 Type 2 ws Type ws Type ws Type Type1 Type2 area of e wall dows and le the area heat los apacity (al mass ign assess used instea	Gros area Grosarea129. $(44.)(19)lementsroof windas on bothas, W/K =Cm = S(parameand of a de$	$\frac{4}{1}$ $\frac{4}{1}$ $\frac{1}{2}$ $\frac{4}{3}$ $\frac{1}{3}$ penin m $ \begin{array}{c} 15.1\\ 0\\ 0\\ \end{array} $ effective winternal wall $U)$ $P = Cm + \frac{1}{2}$ etails of the ulation.	gs 2 7 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Net Ar A ,r 7.3 4.3 1.6 1.97 34.3 14.23 44.1 19 126.8 14.9 alue calcul titions	ea n ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1.4 1.4 [1/(2.1)+ /[1/(2.1)+ [1/(2.1)+ [0.22 0.28 0.28 0.28 0.28 0.28 0.16 (26)(30) recisely the	$\begin{array}{c} ue \\ 2K \\ = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ = \\ = \\ = \\ 0 \\ = \\ 0 \\ 0.04] = \\ = \\ 0.04] = \\$	A X U (W/I 10.22 6.02 3.1 3.82 7.546 3.98 12.35 3.04 12.35 3.04 0 ue)+0.04] a (30) + (32 (30) + (32 c) values of	<pre>K)</pre>	k-value kJ/m²-l		A X I kJ/K	k (26) (27) (27) (28) (29) (30) (31) (32) (33) (33) (34) (35)	

if detail	s of therm	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								_
Total	fabric he	eat loss							(33) +	(36) =			70.07	(37)
Ventil	ation hea	at loss ca	alculated	d monthly	у				(38)m	= 0.33 × (25)m x (5)	-	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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 t	ransfer	coefficie	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		
							•			Average =	Sum(39)1	12 /12=	96.07	(39)
Heat I	oss para	ameter (H	HLP), W	/m²K	· · · · ·	· · · · ·		,	(40)m	= (39)m ÷	· (4)		1	
(40)m=	1.9	1.9	1.89	1.85	1.84	1.81	1.81	1.8	1.82	1.84	1.86	1.87		-
Numb	er of da	ys in mo	nth (Tab	le 1a)						Average =	Sum(40)1	12 /12=	1.85	(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. W	ater hea	ting ene	rgy requ	irement:								kWh/y	ear:	
											_		1	
Assun	ned occ≀ =∆	upancy, o N – 1	N ⊥176 v	/ [1 <u>- evn</u>			-130	(12)1 + 0(1013 v (⁻	TFA -13	1.	75		(42)
if TF	FA £ 13.	9, N = 1	1 1.707	τι σχρ	(0.0000	,45 X (11	A 10.0	<i>[]2)</i>] 10.0	5015 X (11 A 10				
Ann <mark>ua</mark>	al averag	ge hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		75	.74		(43)
Reduce	e the annua	al average	hot water	usage by	5% if the c	lwelling is	designed :	to achieve	a water us	se target o	f			
					aler use, i								1	
Hotwo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HOL WA	ler usage i	n illies pei T		ach month 1	va,m = ra			(43)					,	
(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		-
Energy	content o	f hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	9 <mark>08.89</mark>	(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		
										Total = Su	m(45) ₁₁₂ =	=	1191.69	(45)
lf instar	ntaneous v	vater heati	ng at point	t of use (no	o 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)
vvater	storage	loss:) includir		alar ar M		ctorago	within or		col		4.0.0	1	(47)
				iy ariy so		ntor 110	Sillaye	(47)	anie ves	301		160	J	(47)
Other	wise if n	n stored	hot wate	arik iri uw er (this ir	vennig, e ncludes i	nstantar		mhi hoil	ers) ente	≥r '0' in <i>(</i>	47)			
Water	storage	loss:	not wat			nstantai								
a) If r	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
Temp	erature f	actor fro	m Table	2b								0		(49)
Enera	v lost fro	om watei	r storage	. kWh/ve	ear			(48) x (49)) =		1	10]	(50)
b) If r	nanufac	turer's d	eclared	cylinder	loss fact	or is not	known:				· ·	10	J	()
Hot w	ater stor	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)				0.	.02]	(51)
If com	munity h	neating s	see secti	on 4.3									1	
Volum	ne tactor	Trom Ta	ble 2a	2h							1.	03	4	(52)
remp E				; ZU				(1 1 1 1 1 1 1 1		50)		.6]	(53)
Energ	y lost fro	om water	r storage	e, KVVh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter	(00) Or	(34) IN (3	55)								1.	.03		(55)

Water	storage	loss cal	culated	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 cylind	er 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 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)
Prima	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar 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 ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	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 DI	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(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)₁	12	1842.53	(64)
Heat g	ains fro	m water	heating	kWh/m	onth 0.2	5 ´[0.85	× (45)m	ı + (61)n	ı] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	59.69	52.74	<mark>5</mark> 5.69	50.33	49.63	44.77	43.41	47.07	46.81	52.17	54.65	58.4		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	leating	
5. In	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	ts				-						
	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)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				L	
(67)m=	16.66	14.8	12.03	9.11	6.81	5.75	6.21	8.08	10.84	13 76	16.06	1710		(67)
Applia	0000 00								10.04	15.70	10.00	17.12		
(68)m=	nces ya	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5	10.00	17.12		
	152.43	ins (calc 154.01	ulated ir 150.02	141.54	dix L, eq 130.83	uation L 120.76	13 or L1 114.03	3a), alsc 112.45	see Tal 116.44	ble 5 124.92	135.63	145.7		(68)
Cookir	152.43 ng gains	ins (calc 154.01 (calcula	ulated ir 150.02 ited in A	Append 141.54 ppendix	dix L, eq 130.83 L, equat	uation L 120.76 tion L15	13 or L1 114.03 or L15a)	3a), alsc 112.45), also se	see Tal 116.44 ee Table	ble 5 124.92 5	135.63	145.7		(68)
Cookir (69)m=	152.43 ng gains 31.75	ins (calc 154.01 (calcula 31.75	ulated ir 150.02 ited in A 31.75	Append 141.54 ppendix 31.75	dix L, eq 130.83 L, equat 31.75	uation L 120.76 tion L15 31.75	13 or L1 114.03 or L15a) 31.75	3a), also 112.45), also se 31.75	o see Tal 116.44 ee Table 31.75	5 31.75	135.63 31.75	145.7 31.75		(68) (69)
Cookir (69)m= Pumps	152.43 ng gains 31.75 s and fai	ins (calc 154.01 (calcula 31.75 ns gains	ulated ir 150.02 ted in A 31.75 (Table \$	Append 141.54 ppendix 31.75 5a)	dix L, eq 130.83 L, equa 31.75	uation L 120.76 tion L15 31.75	13 or L1 114.03 or L15a) 31.75	3a), alsc 112.45), also se 31.75	9 see Tal 116.44 29 Table 31.75	13.70 ble 5 124.92 5 31.75	135.63 31.75	145.7 31.75		(68) (69)
Cookir (69)m= Pumps (70)m=	$\begin{bmatrix} 152.43 \\$	ins (calc 154.01 (calcula 31.75 ns gains 0	ulated ir 150.02 ted in A 31.75 (Table \$ 0	Append 141.54 ppendix 31.75 5a) 0	dix L, eq 130.83 L, equat 31.75 0	uation L 120.76 tion L15 31.75	13 or L1 114.03 or L15a) 31.75 0	3a), also 112.45), also se 31.75 0	0 see Tal 116.44 2ee Table 31.75	13.70 ble 5 124.92 5 31.75 0	135.63 31.75 0	145.7 31.75		(68) (69) (70)
Cookir (69)m= Pumps (70)m= Losses	$\begin{bmatrix} 152.43 \\ 152.43 \\ 31.75 \\ s and far \\ 0 \\ s e.g. events$	ins (calc 154.01 (calcula 31.75 ns gains 0 raporatic	ulated ir 150.02 Ited in A 31.75 (Table § 0 n (nega	Append 141.54 ppendix 31.75 5a) 0 tive valu	dix L, eq 130.83 L, equat 31.75 0 es) (Tab	uation L 120.76 tion L15 31.75 0 ule 5)	13 or L1 114.03 or L15a) 31.75 0	3a), also 112.45), also se 31.75	0 see Tal 116.44 ee Table 31.75	13.70 ble 5 124.92 5 31.75 0	135.63 31.75 0	145.7 31.75 0		(68) (69) (70)
Cookir (69)m= Pumps (70)m= Losses (71)m=	152.43 152.43 ng gains 31.75 s and fai 0 s e.g. ev -69.96	INS (CAIC 154.01 (calcula 31.75 INS gains 0 raporatic -69.96	ulated ir 150.02 ited in A 31.75 (Table 9 0 n (nega -69.96	Append 141.54 ppendix 31.75 5a) 0 tive valu -69.96	dix L, eq 130.83 L, equat 31.75 0 es) (Tab -69.96	uation L 120.76 tion L15 31.75 0 le 5) -69.96	13 or L1 114.03 or L15a) 31.75 0 -69.96	3a), also 112.45), also se 31.75 0	0 see Tal 116.44 2e Table 31.75 0	13.70 ble 5 124.92 5 31.75 0	135.63 31.75 0 -69.96	145.7 31.75 0 -69.96		(68) (69) (70) (71)
Cookir (69)m= Pumps (70)m= Losses (71)m= Water	152.43 ng gains 31.75 s and fa 0 s e.g. ev -69.96 heating	INS (CAIC 154.01 (Calcula 31.75 INS gains 0 raporatic -69.96 gains (T	ulated ir 150.02 ted in A 31.75 (Table 9 0 n (nega -69.96 Fable 5)	Append 141.54 ppendix 31.75 5a) 0 tive valu -69.96	dix L, eq 130.83 L, equat 31.75 0 es) (Tab	uation L 120.76 tion L15 31.75 0 le 5) -69.96	13 or L1 114.03 or L15a) 31.75 0 -69.96	3a), also 112.45), also se 31.75 0 -69.96	0 see Tal 116.44 2e Table 31.75 0 -69.96	13.70 ble 5 124.92 5 31.75 0 -69.96	135.63 31.75 0 -69.96	145.7 31.75 0 -69.96		(68) (69) (70) (71)
Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	152.43 152.43 ng gains 31.75 s and fail 0 s e.g. ev -69.96 heating 80.23	INS (CAIC 154.01 (calcula 31.75 INS gains 0 raporatic -69.96 gains (T 78.48	ulated ir 150.02 ited in A 31.75 (Table 9 0 n (nega -69.96 Table 5) 74.85	Append 141.54 ppendix 31.75 5a) 0 tive valu -69.96	dix L, eq 130.83 L, equat 31.75 0 es) (Tab -69.96	uation L 120.76 tion L15 31.75 0 le 5) -69.96 62.19	13 or L1 114.03 or L15a) 31.75 0 -69.96 58.35	3a), also 112.45), also se 31.75 0 -69.96	0.034 0 see Tal 116.44 2e Table 31.75 0 -69.96 65.01	13.70 ble 5 124.92 5 31.75 0 -69.96 70.12	135.63 31.75 0 -69.96 75.9	145.7 31.75 0 -69.96 78.49		(68) (69) (70) (71) (72)
Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	152.43 ng gains 31.75 s and fa 0 s e.g. ev -69.96 heating 80.23	INS (CAIC 154.01 (calcula 31.75 INS gains 0 vaporatic -69.96 gains (T 78.48 gains =	ulated ir 150.02 ited in A 31.75 (Table 8 0 n (nega -69.96 Table 5) 74.85	Append 141.54 ppendix 31.75 5a) 0 tive valu -69.96	dix L, eq 130.83 L, equat 31.75 0 es) (Tab -69.96 66.7	uation L 120.76 tion L15 31.75 0 le 5) -69.96 62.19 (66)	13 or L1 114.03 or L15a) 31.75 0 -69.96 58.35 m + (67)m	3a), also 112.45), also se 31.75 0 -69.96 63.27 n + (68)m +	0.04 0 see Tal 116.44 2e Table 31.75 0 -69.96 65.01 - (69)m + (13.70 ble 5 124.92 5 31.75 0 -69.96 70.12 70)m + (7	135.63 31.75 0 -69.96 75.9 1)m + (72)	145.7 31.75 0 -69.96 78.49		(68) (69) (70) (71) (72)
Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	152.43 ng gains 31.75 s and fa 0 s e.g. ev -69.96 heating 80.23 internal 298.55	INS (CAIC 154.01 (calcula 31.75 INS gains 0 raporatic -69.96 gains (T 78.48 gains = 296.52	ulated ir 150.02 ited in A 31.75 (Table 9 0 n (nega -69.96 Table 5) 74.85	Appendix 141.54 ppendix 31.75 5a) 0 tive valu -69.96 69.91	dix L, eq 130.83 L, equat 31.75 0 es) (Tab -69.96 66.7	uation L 120.76 tion L15 31.75 0 le 5) -69.96 62.19 (66) 237.93	13 or L1 114.03 or L15a) 31.75 0 -69.96 58.35 m + (67)m 227.83	3a), also 112.45), also se 31.75 0 -69.96 63.27 n + (68)m = 233.03	0.04 0 see Tal 116.44 2e Table 31.75 0 -69.96 65.01 - (69)m + (241.52	13.70 ble 5 124.92 5 31.75 0 -69.96 70.12 70)m + (7 258.05	135.63 31.75 0 -69.96 75.9 1)m + (72) 276.83	145.7 31.75 0 -69.96 78.49 m 290.55		 (68) (69) (70) (71) (72) (73)

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

Orienta	ation:	Access F Table 6d	actor		Area m²			Flu Tal	x ble 6a		Та	g_ able 6b		FF Table 60	5		Gains (W)	
North	0.9x	0.77		x	1.9)7	x	1	0.63	×		0.76	x	0.7] =	7.72	(74)
North	0.9x	0.77		x	1.9)7	x	2	0.32	x		0.76	×	0.7] =	14.76	(74)
North	0.9x	0.77		x	1.9)7	x	3	4.53	x		0.76	×	0.7] =	25.08	(74)
North	0.9x	0.77		x	1.9)7	x	5	5.46	×		0.76	×	0.7] =	40.28	(74)
North	0.9x	0.77		x	1.9)7	x	7	4.72	x		0.76	×	0.7		=	54.27	(74)
North	0.9x	0.77		x	1.9)7	x	7	9.99	×		0.76	×	0.7] =	58.09	(74)
North	0.9x	0.77		x	1.9)7	x	7	4.68	×		0.76	×	0.7] =	54.24	(74)
North	0.9x	0.77		x	1.9	97	x	5	9.25	×		0.76	×	0.7] =	43.03	(74)
North	0.9x	0.77		x	1.9)7	x	4	1.52	×		0.76	x	0.7] =	30.15	(74)
North	0.9x	0.77		x	1.9)7	x	2	4.19	x		0.76	×	0.7] =	17.57	(74)
North	0.9x	0.77		x	1.9)7	x	1	3.12	x		0.76	×	0.7] =	9.53	(74)
North	0.9x	0.77		x	1.9)7	x	3	3.86	x		0.76	×	0.7] =	6.44	(74)
South	0.9x	0.77		x	1.0	6	x	4	6.75	x		0.76	×	0.7] =	27.58	(78)
South	0.9x	0.77		x	1.0	6	x	7	6.57	×		0.76	×	0.7] =	45.17	(78)
South	0.9x	0.77		x	1.0	6	x	9	7.53	x		0.76	×	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)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	х	1.	14.87	x		0.76	x	0.7] =	67.76	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	х	1	10.55	×		0.76	×	0.7] =	65.21	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	x	10	08.01	x		0.76	x	0.7] =	63.71	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	x	10	04.89	x		0.76	x	0.7		=	61.88	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	x	10	01.89	×		0.76	x	0.7] =	60.1	(78)
Sout <mark>h</mark>	0.9x	0.77		x	1.0	6	х	8	2.59	x		0.76	x	0.7		=	48.72	(78)
South	0.9x	0.77		x	1.0	6	x	5	5.42	x		0.76	×	0.7		=	32.69	(78)
South	0.9x	0.77		x	1.0	6	x	2	10.4	x		0.76	x	0.7		=	23.83	(78)
Solar g	ains ir	n watts, ca		ted	for eac	h mont	h I	123.3	117.05	(83)n		um(74)m . 00.25	<mark>(82)m</mark>	12 22	30	1 27		(83)
Total o	ains –	internal a	and so	<u>)</u> Slar	(84)m =	= (73)m	<u>' </u>) + (83)m	watts			50.25	00.20	, 42.22		5.21		(00)
(84)m=	333.85	356.45	368.	75	375.1	375.6	3	61.23	345.78	337	.93	331.78	324.3	3 319.0	5 32	0.82		(84)
7 Mo	on inte	arnal tomr		uro ((hooting		n)			I	I				<u>I</u>			
Temp	eratur	e durina h	neatin		eriods ir	the liv	in) vina	area f	rom Tak	nle 9	Th	1 (°C)					21	(85)
Litilisa	ation fa	e during r	ains f	or li	iving are	ha h1	'''''y m (s	ee Ta	hle 9a)		,	r (0)					21	(00)
Otimot	Jan	Feb	Ma	ar	Apr	May	/	Jun	Jul	A	ua	Sep	Oct	: Nov	/ [Dec		
(86)m=	1	1	1		1	1	╈	0.98	0.91	0.9	93	0.99	1	1		1		(86)
Mean	intern	al temper	ature	in l	iving are	ea T1 (follo	ow ste	os 3 to 7	r in 1	Table	9c)						
(87)m=	19.65	19.74	19.9	92	20.19	20.47		20.74	20.9	20.	.88	20.67	20.31	19.95	19	9.65		(87)
Temp	eratur	e durina h	neatin		eriods ir	n rest c	f dv	vellina	from Ta	ble	9. Th	n2 (°C)						
(88)m=	19.4	19.4	19.4	11	19.44	19.44	T	19.47	19.47	19.	.47	19.46	19.44	19.43	19	9.42		(88)
Utilise	ation fa	ctor for a	ains f	or r	est of d	welling	. h2	.m (se	e Table	9a)					_!		I	
(89)m=	1	1	1		1	0.99	, <u></u>	0.93	0.73	0.7	77	0.97	1	1		1		(89)
																	l i i i i i i i i i i i i i i i i i i i	

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=	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)
			•						f	LA = Livin	g area ÷ (4) =	0.66	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × 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	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(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. Spa	ace hea	ting requ	uirement											
Set T	i to the i	mean int	ernal ter	mperatur	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	liisalion	Feb	Mar		Mav	lun	lul	Διια	Sen	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains. hm	<u>יקר ן</u> ו:	iviay	Jun	001	Aug		001	1107	Dee		
(94)m=	1	1	1	1	0.99	0.96	0.86	0.89	0.98	1	1	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m	I	1	1			1			
(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)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8		-						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(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		(97)
Space	e heatin	g require	ement fo	or each m	nonth, k	Nh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m	004.00		
(98)m=	832.81	699.91	659.68	471.27	308.96	0	0		0	410.52	619.82	831.32	4004.00	
								lota	i per year	(kvvn/year) = Sum(9	8)15,912 =	4834.29	(90)
Space	e heatin	g require	ement in	kWh/m ²	/year								92.97	(99)
9b. En	ergy rec	quiremer	nts – Cor	mmu <mark>nity</mark>	heating	scheme								
This pa	art is us	ed for sp	ace hea	iting, spa	ace cooli (supplen	ing or wa	ater heat	ting prov	ided by a	a comm	unity scł	neme.	0	(301)
	in or spa	ice near	nom se	conuary/	supplen	lentary	nealing (1) 0 11 10	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30′	1) =						1	(302)
The con	nmunity so	cheme ma	y obtain he	eat from se	everal sour	rces. The p	procedure	allows for	CHP and under C	up to four	other heat	sources; ti	he latter	
Fractio	on of hea	at from C	s, geowen Commun	ity boiler	'S	iom power	า รเลแบกร.	See Appel	iuix C.				1	(303a)
Fractio	n of tot	al snace	heat fro	m Comn	hunity be	hilers				(3	02) x (303	a) –	1	`´´´ (304a)
Factor	for cont		horaina	mothod		4o(2)) fo		unity has	ting over	tom (C	02) x (000	ω) –	1	
					(Table	40(3)) 10 	r commu	unity nea	ung sys	lem			1	(305)
Distrib	ution los	s factor	(Table 1	(2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
	heating	g heating	requirem	hent									kWh/yea	ar
Space	hoot fro		munity h	oilore					$(08) \times (20)$	(20)	5) x (206)		4034.29	(2072)
Space				monton	haating	avetam	in 0/ (fro	m Toble	(90) X (30	54a) X (50	5) X (300)	-	5076.01	
Enicier		econdar	y/supple	mentary	neating	system	III % (IIC		4a 01 A	ppendix	□)		0	(308
Space	neating	require	ment tro	m secon	uary/sup	piemen	tary syst	iem	(98) x (30	דע (דכ) x 100 -	÷ (308) =		0	(309)
Water	heating	j	oquiror	ont								I	4040 50	_
Annua			equirem										1842.53	
	i from c	ommuni	iy schen	ie:										

Water heat from Community boilers	(64) x (303a) x (3	305) x (306) =	1934.66	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	70.11	(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) + (330b)) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			294.24	(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 (3	366) for the second fue	90	(367a)
CO2 from other sources of space and water heating (not CHP)Efficiency of heat source 1 (%)If there is CHP usingCO2 associated with heat source 1[(307b)+(g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x	(366) for the second fue	90 = 1682.56	(367a) (367)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution	g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x	366) for the second fue 0 = 0.52 =	90 = 1682.56 = 36.39	(367a) (367) (372)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution Total CO2 associated with community systems	g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372)	366) for the second fue 0 = 0.52 =	90 90 1682.56 36.39 1718.95	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x	366) for the second fue 0 = 0.52 = 0 =	9 90 = 1682.56 = 36.39 = 1718.95 = 0	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(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 instantane	g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x ous heater (312) x	366) for the second fue 0 0.52 = 0 0 = 0 0 = 0 0 = 0 = 0 = 0 0.22	el <u>90</u> = <u>1682.56</u> = <u>36.39</u> = <u>1718.95</u> = <u>0</u> = <u>0</u>	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(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 instantane Total CO2 associated with space and water heating	g two fuels repeat (363) to (3 (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x ous heater (312) x (373) + (374) + (375) =	366) for the second fue 0 0.52 = 0 0 = 0 0 = 0 0 = 0 0 0 0 0 0.22	el 90 = 1682.56 = 36.39 = 1718.95 = 0 = 0 1718.95	(367a) (367) (372) (373) (374) (375) (376)
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CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)+(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 instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwellin CO2 associated with electricity for lighting Total CO2, kg/year sum of (376)(382) =	g two fuels repeat (363) to (3 (310b)] x 100 \div (367b) x (313) x (363)(366) + (368)(372) (309) x cous heater (312) x (373) + (374) + (375) = ng (331)) x (332))) x	366) for the second fue 0 0.52 = 0 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	el 90 1682.56 36.39 1718.95 0 1718.95 0 1718.95 0 1718.95 0 1718.95 0 1718.95 1	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (383)
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Assessor Name: Stroma FSAP 2012 Stroma Number: Software Varsion: Version: 1.0.3.15 Hortery Address: London Image: Software Varsion: Image: Software Varsion: Version: 1.0.3.15 Image: Software Varsion: Image: Software Varsion: Version: 1.0.3.15 Image: Software Varsion: Image: Software Varsion: Version: 1.0.3.15 Image: Software Varsion: Image: Software Varsion: Version: Image: Software Varsion: Image: Software Varsion:<				User D	etails:						
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Address : , London Coverall divelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Basement 55 (1a) x 2.17 (2a) = (1b) x (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 55 (1a) x 2.17 (2a) = (2a) = (3a) Develing volume main mating heating heating secondary other total x40 = 0 (6b) Number of chinneys 0 + 0 = 0 x40 = 0 (6b) Number of passive vents 0 + 0 = 0 x40 = 0 (7a) Number of passive vents 0 × 0 = 0 x10 = 0 (7a) Number of passive vents 0 × 0 = 0 x10 = 0 0 (7a) Number of states gas fires 0 x10 = 0 0 (7a) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		London	Pí	operty /	Address:	Unit 2					
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Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 0.67(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.67(18)Number of sides sheltered2(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85(20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.57(21)Infiltration rate modified for monthly wind speed0.57(21)Monthly average wind speed from Table 7(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ (22a)m= 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
If based on air permeability value, then $(18) = [(17) + 20]+(8)$, otherwise $(18) = (16)$ 0.67 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 2 (19) Number of sides sheltered 2 (19) Shelter factor (20) = 1 - [0.075 x (19)] = 0.85 (20) Infiltration rate incorporating shelter factor (21) = (18) x (20) = 0.57 (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 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 (22a)m = 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Air permeability value, o	q50, expressed in c	ubic metres	s per ho	ur per so	uare m	etre of e	envelope	area	10	(17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered 2 (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85(20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.57(21)Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJunAugSepOctNovDecMonthly average wind speed from Table 7(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4(22a)m= 1.27 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	If based on air permeabilit	ty value, then (18) =	[(17) ÷ 20]+(8), otherwi	se (18) = (16)				0.67	(18)
Number of sides sheltered 2 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.57 (21) Infiltration rate modified for monthly wind speed $1.8 \times (20) =$ 0.57 (21) Infiltration rate modified for monthly wind speed 0.57 (21) Monthly average wind speed from Table 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ $4.3 4.5 4.7$ Wind Factor (22a)m = (22)m ÷ 4 $(22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18$	Air permeability value applies	if a pressurisation test I	nas been don	e or a deg	ree air per	meability	is being u	sed			_
Sheller factor $(20) = 1 + [0.010 \times (10)] = 1$ 0.85 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 1$ 0.57 (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 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Number of sides sheltered	t			(20) – 1 - [0 075 v (1	Q)] —			2	(19)
Initiation rate incorporating sheller factor $(21)^{-1}(10)^{-1}(20)^{-1}$ 0.57 $(21)^{-1}$ 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 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ (22a)m= 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Infiltration rate incorporati	na chaltar factor			(20) = (18)	x (20) -	5)] –			0.85	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7	Infiltration rate modified for	r monthly wind one	od		(21) = (10)	x (20) -				0.57	(21)
Sain Feb Ivial Apr Ivial Apr Ivial Sain Sain Sep Oct Iviol Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 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 0.92 1 1.08 1.12 1.18				lul	Δυα	Son	Oct	Nov	Dec		
(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 \div 4 (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Monthly overeas wind and	and from Table 7		Jui	Aug	Jeh			Dec	l	
Wind Factor (22a)m = (22)m $\div 4$ 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	$(22)m = \begin{bmatrix} 5 \\ 5 \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \end{bmatrix}$		38	3.8	37	4	4.3	4.5	47		
viino Factor ($\angle 2a$)m = ($\angle 2a$)m = ($\angle 2a$)m + 4 (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18)		5.0	5				L	I	
	(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		

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
<i>.</i>	0.72	0.71	0.7	0.62	0.61	0.54	0.54	0.52	0.57	0.61	0.64	0.67		
Calcula	ate effe	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(220)
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a	i) × Fmv (e	equation (1	N5)) . othe	rwise (23b	o) = (23a)			0	(23b)
lf bala	anced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,			0	(23c)
a) If	balance	ed mech	anical v	entilation	with hea	at recove	erv (MVI	HR) (24a	a)m = (2)	2b)m + ((23b) × [l – (23c)	÷ 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0		0]	(24a)
b) If	balance	ed mech	anical v	entilation	without	heat rec	covery (N	и ЛV) (24t	m = (22)	1 2b)m + (23b)			
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	nouse ex	tract ve	ntilation of	or positiv	re input v	ventilatio	n from o	outside		I			
í	if (22b)r	n < 0.5 >	‹ (23b),	then (24d	c) = (23b); other\	wise (24	c) = (22t	o) m + 0	.5 × (23b	c)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	nole hous	e positiv	e input	ventilatio	on from	oft					
i	if (22b)r	n = 1, th	en (24d)m = (22t	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	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		(240)
Effe	ctive air		rate - e	nter (24a) or (24b	o) or (24)	c) or (24	d) in box	x (25)	0.00	0.7	0.70		(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. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros area	ss (m²)	Openin m	gs 2	Net Ar	rea m²	U-val W/m2	ue K	A X U	K)	k-value) <	A X k kJ/K
Doors			()			1.9	x	1.4		2.66				(26)
Windo		e 1				9.03		/[1/(1.6)+	0.04] =	13.58	F			(27)
Windov	ws Type	e 2				1.82		/[1/(4.8)+	0.04] =	7 33	Ħ			(27)
Windo	ws Type	- 3				0.87		. (/[1/(4.8)+	0.041 -	3.5	5			(27)
Floor						55		0.02		51 15				(28)
Walls ⁻	Tvne1	20	•	10.9		19.05		0.33	$\exists]$	27.0			\dashv	(20)
Walls ⁻	Tvne2	20.	4	10.8	<u></u>	F 04		2.1		10.59			\dashv	(20)
Total a	rea of e		- m ²	2.11		01.74		2.1		10.56				(21)
Dorty			,			91.71								(31)
	vall					27.9		0		0			\dashv	(32)
* for win	vali dowe one	l roof wind	0.000	offoctivo wi	ndowlly	1.13	X		=			naragraph		(32)
** includ	le the are	as on both	sides of i	nternal wal	ls and part	titions	aleu using	nonnula i	/[(1/0-vait	<i>le)</i> +0.04j č	as given in	i paragraph	5.2	
Fabric	heat lo	ss, W/K	= S (A x	: U)				(26)(30)) + (32) =				126.7	1 (33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (3	2) + (32a)	(32e) =	0	(34)
Therm	al mass	parame	eter (TM	P = Cm ÷	- TFA) in	n kJ/m²K			Indica	ative Value	: High		450	(35)
For desi can be u	gn asses Ised inste	sments wh ad of a de	ere the de tailed cald	etails of the culation.	constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	f TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) ca	Iculated u	using Ap	pendix I	<						14.4	(36)
if details	of therm	al bridging	are not ki	nown (36) =	= 0.15 x (3	1)								i``´
Total fa	abric he	at loss							(33) +	- (36) =			141.1	1 (37)
Ventila	tion he	at loss ca	alculate	d monthly	/				(38)m	= 0.33 × ((25)m x (5)	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(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 tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(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		
		motor (L	אי ים ור	/m2k					(40)m	Average = (30) m :	Sum(39)	12 /12=	168.47	(39)
(40)m=	3.11		3.1	3.06	3.06	3.03	3.03	3.02	3.04	= (39)m ÷	3.07	3.08		
(10)	0	0.11		0.00	0.00	0.00	0.00	0.02		Average =	Sum(40)1		3.06	(40)
Numbe	er 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	l	(41)
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum	ed occu	upancy, I	N								1.	.84		(42)
if TF if TF	A > 13. A f 13.	9, N = 1 9 N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13.	9)			
Annua	l averag	je hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		77	'.84		(43)
Reduce	the annua	al average litros por	hot water	usage by	5% if the a	welling is	designed t	to achieve	a water us	se target o	۲			
notmore	, inat 125			day (all w	aler use, r									
Hot wate	Jan Jan	Feb	Mar day for ea	Apr Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
					70.47	70.05			70.00	70.00	00.54	05.00		
(44)m=	85.62	82.51	79.39	76.28	73.17	70.05	70.05	/3.1/	76.28	79.39	82.51	85.62	024.05	
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x C)))))))))))))))))))	kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)	934.05	(44)
(45)m=	126.97	111.05	114.6	99. <mark>9</mark> 1	95.86	82.72	76.65	87.96	89.01	103.74	113.24	122.97		
										Total = Su	m(45) ₁₁₂ =	=	1224.68	(45)
lf instant	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(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)
Storag	e volum	ioss. ie (litres)) includir	na anv so	olar or W	WHRS	storage	within sa	ame ves	sel		160		(47)
If comr	nunitv h	neating a	and no ta	ink in dw	vellina. e	nter 110	litres in	(47)				100		()
Otherw	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:											L	
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	om water	storage	e, kWh/ye sylinder l	ear	or is not	known:	(48) x (49)) =		1	10	I	(50)
Hot wa	iter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	iy)				0.	.02		(51)
If comr	munity h	neating s	ee secti	on 4.3	·									
Volume	e factor	from Ta	ble 2a								1.	.03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
	(OU) Or ((54) IN (5	oulotod ⁽	for acab	month			((56)~ '	55) w (AA)	~	1.	.03	,	(55)
vvaler	Siorage						a	((30)11 = (ວວ) × (41)					
(56)m=	32.01	28.92	d solar sto	30.98	32.01 m = (56)m	30.98 x [(50) - (32.01 H11)1 ∸ (5	32.01	30.98	32.01	30.98 H11) is fro	32.01	ix H	(56)
				aye, (57)	n = (30)m	× [(00) – ([]] ÷ (5		(30) <u>- (</u> 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)

Primar	y circuit	loss (ar	nual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heati	ng and a	cylinde	r thermo	stat)		L	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(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	159.01	166.73	178.24		(62)
Solar DH	IW input o	alculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter							•	•	-		
(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		
								Outp	out from wa	ater heate	r (annual)₁	12	1875.52	(64)
Heat g	ains froi	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	_
(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)
in <mark>clu</mark>	ıde (57)ı	n in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ate <mark>r is fr</mark>	om com	munity h	leating	
5 Int	ernai ga	ins (see	Table 5	and 5a				9			_	, , , , , , , , , , , , , , , , , , ,	3	-
Motab		s (Table	5) Wat	te										
Metab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	9 ^{1.87}	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91,87	91.87	91.87	91.87		(66)
Lightin	a dains	(calcula	ted in Ar	ppendix	. equati	ion L9 o	r 1,9a), a	lso 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)
Annlia		ins (calc	ulated in			uation I	13 or I 1	I 3a) also		L				
(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	l	(68)
Cookir			tod in A	nondiv		ion 15	or 152			5				
(60)m-	19 yan 15	(Calcula 32.10	32 10	32 10	22 10	32 10	32 10	32 10	32 10	32.10	32.10	32.10	l	(69)
(00)III=		02.10	(Table (- 02.10	02.10	02.10	02.10	52.15	02.10	02.10	02.10	52.15		(00)
Pumps				ο 0	0	0	0	0	0	0	0	0		(70)
(70)11=	0	0	0				0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)	70.40	70.40	70.40	70.40	70.40	70.40	I	(71)
(71)m=	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49		(71)
Water	heating	gains (1	able 5)	· · · · ·			1	1				1	I	(70)
(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 i	nternal	gains =	: r	r		(66)	m + (67)m 1	n + (68)m + r	+ (69)m + ((70)m + (7 I	1)m + (72) I)m	I	
(73)m=	306.79	305.06	294.77	278.27	261.74	245.61	235	239.99	248.34	265.02	284.18	298.33		(73)
6. So	lar gains	8:									•			
Solar g	ains are c	alculated	using sola	r flux from	I able 6a a	and assoc	lated equa	itions to co	onvert to th	e applicab	ole orientat	tion.		

Orienta	tion:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.82	×	10.63	x	0.85	x	0.7	=	7.98	(74)
North	0.9x	0.77	x	0.87	×	10.63	x	0.85	x	0.7	=	3.81	(74)

North	0.9x	0.77		x	1.8	2	x	2	0.32	x	0.85	x	0.7	=	15.25	(74)
North	0.9x	0.77		x	0.8	7	x	2	0.32] x	0.85	×	0.7	=	7.29	(74)
North	0.9x	0.77		x	1.8	2	x	3	4.53	X	0.85	×	0.7	=	25.91	(74)
North	0.9x	0.77		x	0.8	7	x	3	4.53] x	0.85	x	0.7	=	12.39	(74)
North	0.9x	0.77		x	1.8	2	x	5	5.46] x [0.85	×	0.7	=	41.62	(74)
North	0.9x	0.77		x	0.8	7	x	5	5.46	x	0.85	×	0.7	=	19.9	(74)
North	0.9x	0.77		x	1.8	2	x	7	4.72	x	0.85	×	0.7	=	56.07	(74)
North	0.9x	0.77		x	0.8	7	x	7	4.72	x	0.85	x	0.7	=	26.8	(74)
North	0.9x	0.77		x	1.8	2	x	7	9.99	x	0.85	x	0.7	=	60.02	(74)
North	0.9x	0.77		x	0.8	7	x	7	9.99	x	0.85	×	0.7	=	28.69	(74)
North	0.9x	0.77		x	1.8	2	x	7	4.68	x	0.85	×	0.7	=	56.04	(74)
North	0.9x	0.77		x	0.8	7	x	7	4.68	x	0.85	×	0.7	=	26.79	(74)
North	0.9x	0.77		x	1.8	2	x	5	9.25	x	0.85	×	0.7	=	44.46	(74)
North	0.9x	0.77		x	0.8	7	x	5	9.25	x	0.85	×	0.7	=	21.25	(74)
North	0.9x	0.77		x	1.8	2	x	4	1.52	x	0.85	×	0.7	=	31.16	(74)
North	0.9x	0.77		x	0.8	7	x	4	1.52	x	0.85	×	0.7	=	14.89	(74)
North	0.9x	0.77		x	1.8	2	x	2	4.19	x	0.85	×	0.7	=	18.15	(74)
North	0.9x	0.77		x	0.8	7	X	2	4.19	x	0.85	×	0.7	=	8.68	(74)
North	0.9x	0.77		x	1.8	2	х	1	3.12] x	0.85	×	0.7	-	9.84	(74)
North	0.9x	0.77		x	0.8	7	х	1	3.12] ×	0.85	x	0.7	=	4.71	(74)
North	0.9x	0.77		x	1.8	2	x	8	8.86] x	0.85	x	0.7	=	6.65	(74)
North	0.9x	0.77		x	0.8	7	x	8	8.86	х	0.85	x	0.7	=	3.18	(74)
South	0.9x	0.77		x	9.0	3	x	4	6.75	x	0.76	x	0.7	=	155.64	(78)
South	0.9x	0.77		x	9.0	3	x	7	6.57	x	0.76	x	0.7	=	2 <mark>54.91</mark>	(78)
South	0.9x	0.77		x	9.0	3	x	9	7.53	x	0.76	x	0.7	=	324.7	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.23	x	0.76	×	0.7	=	366.99	(78)
South	0.9x	0.77		x	9.0	3	x	1	14.87	x	0.76	×	0.7	=	382.42	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.55	x	0.76	×	0.7	=	368.03	(78)
South	0.9x	0.77		x	9.0	3	x	10	08.01	x	0.76	×	0.7	=	359.59	(78)
South	0.9x	0.77		x	9.0	3	x	10	04.89	x	0.76	x	0.7	=	349.21	(78)
South	0.9x	0.77		x	9.0	3	x	10	01.89	x	0.76	×	0.7	=	339.19	(78)
South	0.9x	0.77		x	9.0	3	x	8	2.59	x	0.76	×	0.7	=	274.94	(78)
South	0.9x	0.77		x	9.0	3	x	5	5.42	x	0.76	×	0.7	=	184.49	(78)
South	0.9x	0.77		x	9.0	3	x	4	40.4	×	0.76	x	0.7	=	134.49	(78)
Solar	naine in	watte ca	deulat	hat	for each	mont	h			(83)m	-Sum(74)m	(82)m				
(83)m=	167.44	277.44	363		428.51	465.3	4	456.75	442.42	414	.92 385.24	301.7	7 199.04	144.32]	(83)
Total g	gains – i	nternal a	nd so	lar	(84)m =	(73)m	+ ((83)m	, watts	1					J	
(84)m=	474.23	582.5	657.7	7	706.77	727.04	7	702.36	677.41	654	.91 633.58	566.79	9 483.22	442.65]	(84)
7. Me	an inter	nal temp	eratu	re (heating	seaso	n)									
Temp	perature	during h	eating	g pe	eriods in	the liv	ring	area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilis	ation fac	ctor for ga	ains fo	or li	ving are	<u>a, h1,</u> r	n (s	see Ta	ble 9a)							

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Mar

Jan

Feb

(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	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	durina h	eating p	eriods ir	n rest of	dwelling	from Ta	able 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	ng T2 (f	ollow ste	eps 3 to 3	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	4) =	0.55	(91)
Mean	internal	l temper	ature (fo	or the wh	ole dwe	llina) = f	LA x T1	+ (1 – fl	A) x T2			L		
(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	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(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. Spa	ace hea	ting requ	uirement											
Set Ti	i to the r	nean int	ernal ter	mperatu	re obtain	ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	llisation	Tactor IC	or gains	using Ta	ible 9a	lun		A	Can	Oct	Novi	Dee		
Litilies	Jan tion fac	tor for a	ains hm	Apr	iviay	Jun	Jui	Aug	Sep	Oct	INOV	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)
Usefu	l gains,	hmGm .	, W = (94	1)m x (84	4)m									
$(95)m = \begin{array}{c} 473.09 \\ 579.42 \\ 650.56 \\ 689.72 \\ 685.51 \\ 602.12 \\ 473.11 \\ 482.39 \\ 574.15 \\ 555.11 \\ 480.92 \\ 441.84 \\ \end{array}$														(95)
Mo <mark>nt</mark>	nly avera	age exte	rnal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm,W:	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2294.53	2224.91	2009.32	1665.79	1274.13	849.16	547.18	576.24	916.65	1403.57	1881.75	2286.19		(97)
Space	e heatin	g require	ement fo	r each n	honth, k\	Nh/mon	th = 0.02	24 x [(97])m – (95 I)m] x (4′	1)m			
(98)m=	1355.15	1105.77	1010.92	702.77	437.93	0	0	0	0	631.26	1008.6	1372.2		-
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	7624.6	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								138.63	(99)
9b. En	ergy rec	luiremer	nts – Cor	nmunity	heating	scheme	;							
This pa	art is use	ed for sp	ace hea	iting, spa	ace cooli	ing or wa	ater heat	ting prov	rided by	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	supplen	nentary	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The com	nmunity so	heme mag	y obtain he	eat from se	everal sour	rces. The j	procedure	allows for	CHP and u	up to four o	other heat	sources; th	ne latter	
Fractio	n of hea	eat pumps at from C	s, geotneri Commun	nai and wa ity boiler	iste neat f S	rom powe	r stations.	See Appel	naix C.			[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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating syst	tem		ו [1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heati	ng syste	m	- •			ו [1.05	(306)
Space	heating	3					-					l	kWh/yea	 r
Annua	space	heating	requirem	nent								[7624.6	
												L		

Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	8005.83	(307a)
Efficiency of secondary/supplementary heating system in % (fror	n Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary syste	em (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1875.52	7
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)(307	e) + (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) ÷ (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)			252.32	(332)
12b. CO2 Emissions – Community heating scheme				
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	Energy kWh/year	Emission factor kg CO2/kWh (366) for the second fuel	Emissions kg CO2/year	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0 =	2394.03	(367)
Electrical energy for heat distribution	313) x	0.52 =	51.77	(372)
Total CO2 associated with community systems (3	863)(366) + (368)(372	2) =	2445.8	(373)
CO2 associated with space heating (secondary) (3	309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneous	ous heater (312) x	0.22 =	0	(375)
Total CO2 associated with space and water heating (3	373) + (374) + (375) =		2445.8	(376)
CO2 associated with electricity for pumps and fans within dwellin	ig (331)) x	0.52 =	0	(378)
CO2 associated with electricity for lighting (3	332))) x	0.52 =	130.95	(379)
Total CO2, kg/year sum of (376)(382) =			2576.75	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			46.85	(384)
El rating (section 14)			65.47	(385)

Assessor Name: Stroma FXAP 2012Stroma Number: Software Version:Version: 1.0.3.15Strome FXAP 2012Software Version:Version: 1.0.3.15Address: IAddress:Address:Address:BasementStall floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)Outling volume(3a)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d		
Address :, londonAddress :, londonA. Overall dwelling dimensions:Area(m?)Av. Height(m)Volume(m³)Basement51(1a) x2.17(2a) =110.67Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)51(4)Volume(m³)Dwelling volume(3a)+(3b)+(3c)+(3d)+(3a)+(3n) =110.67(5)C. Ventilation rate:main meating heating heating heating heatingothertotal m³ per hourNumber of chimneys0+0=0x 40 =Number of pan flues0+0=0x 40 =Number of apen flues0+0=0x 40 =Number of flueless gas fires0x 40 =0(6a)Number of flueless gas fires0x 40 =0(7a)Number of storeys in the dwelling (ns) Additional infiltration(1b)+(7a)+(7b)+(7c) =20(a)Additional infiltration0.25 for steel or timber frame or 0.35 for masonry construction(1b)-(1a)(1b)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)(13)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If is suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If or draught lobby, enter 0.05, else enter 00(12)0(14)Percentage of windows and doors draught stripped0.25 - (02 x (14) + 100) =0(15)		
A.Overall dwelling dimensions:Area(m ³)Av. Height(m)Volume(m ³)Basement 51 (1a) x 2.17 (2a) = 110.67 (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 51 (4) $(a)+(3c)+(3d)+(3c)+(3d)+(3e)+(3n)$ = 110.67 (5)Dwelling volume $(a)+(3b)+(3c)+(3d)+(3c)+(3d)+(3e)+(3n)$ = 110.67 (5) 110.67 (5)2. Ventilation rate:main heating		
Area(m2) 51Av. Height(m) (m2)Volume(m3) (m3)Basement 51 $(1a) \times 2.17$ $(2a) = 110.67$ $(3a)$ Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 51 (4) (a) (a) (a) Dwelling volume (a) +(1b)+(1c)+(1d)+(1e)+(1n) 51 (4) (a) +(3c)+(3d)+(3e)+(3n) = 110.67 (5) 2. Ventilation rate: (a) +(3c)+(3d)+(3e)+(3d)+(3e)+(3n) = 10.67 (5) (5) (5) Number of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 $(6b)$ Number of passive vents 0 $x10 =$ 0 $7cb$ Number of flueless gas fires 0 $x40 =$ 0 $7cb$ Number of storeys in the dwelling (ns) $Adtional infiltration(9)(4b)(9)Additional infiltration0.25 \cdot [0.2 \times (14) \pm 100] =(6)(12)If no draught lobby, enter 0.05, else enter 00(12)0(12)If no draught lobby, enter 0.05, else enter 00(12)0(12)If no draught lobby, enter 0.05, else enter 00(14)0(14)Window infiltration0.25 - [0.2 \times (14) \pm 100] =0(15)If no draught lobby, enter 0.05, else enter 00(15)0(16)Percentage of windows and doors draught stripped0.25 - [0.2 \times (14) \pm 100] =0($		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 51 (4) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 110.67 (5) 2. Ventilation rate: Mumber of chimneys 0 + 0 = 0 × 0 = 0 (6a) Number of open flues 0 + 0 = 0 × 0 (6a) Number of intermittent fans 2 × 10 = 0 (7a) Number of flueless gas fires 0 × 0 × 0 = 0 (7a) Number of flueless gas fires 0 × 0 × 0 0 (7c) Air changes per hour 0 × 0 × 0 (7c) Number of flueless gas fires 0 × 0 × 0 (9) Number of storeys in the dwelling (ns) (17) otherwise continue from (9) to (16) 0 (9) (10) Structural infiltration 0.25 for steel or timber frame or 0.35 for masonry construction (11) 0 (12) If our draught lobby, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) 0 (13)		
Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 110.67 (6)(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 110.67 (6)Number of chimneysothertotalnumber of chimneys0+0(6)Number of open flues0+0*0+0*0+0+0*0****0* <th <<="" colspan="2" td=""></th>		
2. Ventilation rate: main heating secondary heating other total m³ per hour Number of chimneys 0 + 0 = 0 ×40 = 0 (6a) Number of open flues 0 + 0 = 0 ×40 = 0 (6b) Number of intermittent fans 2 ×10 = 20 (7a) Number of passive vents 0 ×10 = 0 (7c) Number of flueless gas fires 0 ×40 = 0 (7c) Number of storeys in the dwelling (ns) Air changes per hour (7c) Additional infiltration (9) to (76) 0 (9) (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (9) to (16) 0 (9) If supended wooden floor, enter 0.2 0 0.1 (seled), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 0 (13) 0 (14) Window infiltration 0.25 - [0.2 x (14) + 100] = 0 (15) (14) 0 (15) (14)		
main heating heatingsecondary heatingother ttotalm ^o per nourNumber of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 $(6b)$ Number of intermittent fans 2 $x10 =$ 20 $(7a)$ Number of passive vents 0 $x10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Number of storeys in the dwelling (ns) 0 $x40 =$ 0 (9) Additional infiltration (9) (10) 0 (9) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) <i>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$$0$$(12)$If no draught lobby, enter 0.05, else enter $0$$0$$(12)$$0$$(13)$Percentage of windows and doors draught stripped$0$$(14)$$0$$(14)$Window infiltration$0.25 \cdot [0.2 \times (14) \div 10] =$$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)$</i>		
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 changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b) =$ 20 $+(5) =$ 0.18 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Additional infiltration $(9) to (16)$ 0 (9) Additional infiltration $(9) to (16)$ 0 (9) 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 0 (12) If no draught lobby, 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 $0.25 - [0.2 \times (14) + 100] =$ 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 (77)		
Number of passive vents 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $+(5) =$ 0.18 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Additional infiltration (9) 0 (9) Additional 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 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 $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 10 (17)		
Number of flueless gas fires $ \begin{array}{c} 0 \\ 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ x 40 = \\ 0 \\ (re) \\ \begin{array}{c} 0 \\ (re) \\ \begin{array}{c} 0 \\ (re) \\ \hline 0 \\ (re) \\ \begin{array}{c} 0 \\ (re) \\ \hline 0 \\ \hline 0$		
Number of inderessing of interviewAir changes per hourAir changes per hourInfiltration due to chirnneys, flues and fans = (6e)+(6b)+(7a)+(7b) = $20 \div (5) =$ 0.18 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)Number of storeys in the dwelling (ns) 0 (9) 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 0 (12) If no draught lobby, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) 0 (14) 0 (15) 0 0 (14) 0 (15) 0 0 (14) 0 (15) 0 1 filtration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 (16) 10 (17) 0 (15)		
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) =0.18(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration[(9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(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 0.350(12)If no draught lobby, enter 0.05, else enter 00(13)0(14)Window infiltration0.25 - [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 area10(17)		
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)0Additional infiltration[(9)-1]x0.1 =Structural infiltration:00.25 for steel or timber frame or 0.35 for masonry construction0if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10		
Structural inititation: 0.25 for steel of timber frame of 0.35 for masonry construction 0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 If no draught lobby, enter 0.05, else enter 0 0 Percentage of windows and doors draught stripped 0 Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 10 (17)		
If suspended wooder filter 0.2 (difference) of 0.1 (sealed), erse 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 $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 10 (17)		
In the draught lobby, enter 0.00, encer 0.00, encer 0.00 0 0 0 0 Percentage of windows and doors draught stripped 0 0 (14) Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 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)		
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 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 area10(17)		
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 area10(17)		
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.68 (18)		
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered $3 (19)$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.72 (20)$		
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = $		
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		

Adjust	ed infiltr	ation rat	e (allow	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-		_	
<u> </u>	0.67	0.66	0.65	0.58	0.57	0.5	0.5	0.49	0.53	0.57	0.59	0.62		
Calcula If ma	ate etter	ctive air al ventila	change	rate for t	he appli	cable ca	se							(220)
lf exh	aust air h	eat pump i	usina App	endix N. (2	3b) = (23a	i) x Fmv (e	equation (I	N5)) . othei	wise (23b) = (23a)			0	(23a)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, (,			0	(23c)
a) If	balance	ed mech:	, anical ve	ntilation	with he	at recove	erv (MVI	HR) (24a	n)m = (22)	2b)m + (23b) x [′	1 – (23c)	1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	ntilation	without	heat rec	coverv (N	MV) (24b)m = (22	1 2b)m + ()	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside	!			1	
, i	if (22b)n	n < 0.5 ×	(23b), t	hen (24a	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft					
i	if (22b)n	n = 1, th	en (24d)	m = (22t	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)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	J	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (240	c) or (24	d) in boy	(25)	0.00	0.00	0.00	1	(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		(25)
3. He	at l <mark>osse</mark>	s and he	at loss	oaramete	er:									
ELEN	/IENT	Gros	SS (m ²)	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	3	A X k
Doors		area	(111-)	11		A ,I				2.66		NJ/111-1	x -	NJ/ N (26)
Windo		<u>1</u>				1.9		/[1/(1 6)+	0.041	2.00	H			(20)
Windo						9.03		/[1/(1.0)]	0.041	13.58	8			(27)
Floor	ws type	32				2.89		/[1/(4.0)+	0.04] =	11.64	╘┤┍			(27)
	T					51	×	0.99		50.49	╡╞		\dashv	(28)
vvalis	Type1	16.1	4	9.03		7.11	×	2.1		14.93			\dashv	(29)
vvalis	Type2	16.	1	4.79		11.31	×	2.1	= [23.75				(29)
l otal a	area of e	elements	, m²			83.24								(31)
Party v	wall					33.3	X	0	=	0				(32)
* for win ** inclua	dows and le the area	l roof winde as on both	ows, use e sides of ii	effective wi Internal wall	ndow U-va Is and part	alue calcul titions	ated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				117.05	5 (33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi	ign assess	sments wh	ere the de	tails of the	construct	ion are not	t known pi	recisely the	indicative	values of	TMP in Ta	able 1f		
can be ι —.	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.8	(36)
it details Total fa	abric he	al bridging at loss	are not kr	iown (36) =	= 0.15 x (3	1)			(33) +	(36) =			120.84	5 (37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		129.00	<u> </u>
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(38)m=	26.52	26.2	25.89	24.41	24.13	22.85	22.85	22.61	23.34	24.13	24.69	25.28		(38)
Heat tr	ransfer o	coefficier	nt. W/K				1		(39)m	= (37) + (3	38)m		I	
(39)m=	156.37	156.05	155.74	154.26	153.98	152.7	152.7	152.46	153.19	153.98	, 154.54	155.13	l	
	L							1	·,	Average =	Sum(39)₁	₁₂ /12=	154.26	3 (39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.07	3.06	3.05	3.02	3.02	2.99	2.99	2.99	3	3.02	3.03	3.04]	
	(.] .		L		<u> </u>	<u> </u>			,	Average =	Sum(40)1.	12 /12=	3.02	(40)
edmuri	r of day	/s in moi Feb	ntn (Tab Mar	Apr	May	Jun	Jul	Aug	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(41)11-	01	20			01		01	01	00	01	00	01		()
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ıpancy, l 9, N = 1 9, N = 1	N + 1.76 x	:[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	FFA -13	1. .9)	72]	(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by r day (all w	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04		(43)
]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot wate	r usage ii	n litres per	r day for ea I	ach month I	Vd,m = fa I	ctor from	Table 1c x I	(43) I			1		1	
(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	000.48	
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600) kWh/mor	$\frac{10 \text{ cm}}{10 \text{ cm}} = \frac{30}{10}$	ables 1b, 1	c, 1d)	900.48	(++)
(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		-
lf instanta	aneous w	ater heatii	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)	Fotal = Su	m(45) ₁₁₂ =	•	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	e volum	e (litres)	includir	ng any so	olar or M	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comm	nunity h	eating a	and no ta	ink in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss: urer's de	aclarad I	oss facti	or is kno	wn (k\//	n/dav).					0	1	(49)
Tempe	rature f	actor fro	m Table	2h			vuay).					0		(40)
Energy	lost fro	m water	storage	kWh/ve	ar			(48) x (49)) =			10		(43)
b) If ma	anufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:	(10) x (10)	, –			10		(30)
Hot wat	ter stora	age loss leating s	factor fr	om Tabl on 4 3	e 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	factor	from Ta	ble 2a								1.	03		(52)
Tempe	rature f	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 s	storage	loss cal	culated	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 cylinde	r contains	s dedicate	d solar sto	rage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix 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	nnual) fro	om Table	93	>	()					0		(58)
Primary	/ CIRCUIT	loss cal	culated	tor each	month (59)m = ((58) ÷ 36	55 x (41)	m cylinder	r tharma	stat)			
(1100 (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)
(<i>)</i>						,							l	. /

Combi los	ss cale	culated	for each	n month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat	t requ	ired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 17	77.69	156.99	165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82		(62)
Solar DHW i	input c	alculated	using App	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add addit	tional	lines if I	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output fro	om wa	iter heat	ter											
(64)m= 17	77.69	156.99	165.75	149.81	147.69	133.24	129.18	140.08	139.31	155.28	162.66	173.82		
				-				Outp	out from wa	ater heate	r (annual)₁	12	1831.51	(64)
Heat gain	s fron	n water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	‹ [(46)m	+ (57)m	+ (59)m]	
(65)m= 59	9.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
include	(57)n	n in calc	ulation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fi	rom com	munity h	eating	
5. Intern	nal ga	ins (see	Table :	5 and 5a):									
Metabolic	: gains	s (Table	5). Wa	tts	/									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 85	5.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lighting g	ains (calculat	ed in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 1	3.36	11.86	9.65	7.3	5.46	4.61	4.98	6.47	8.69	11.03	12.88	13.73		(67)
	es daii	ns (calci	ulated i	n Appene	dix L. ea	uation L	13 or L1	3a), also	see Ta	ble 5	1			
(68)m= 14	19.83	151.39	147.47	139.13	128.6	118.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)
	nains	(calcula	ted in A	ppendix	L equat	ion I 15	or L 15a)	also se	e Table	5				
(69)m= 3	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 an	nd fan	s dains	(Table	5a)										
(70)m=	0	0	0		0	0	0	0	0	0	0	0		(70)
		anoratio	n (nega	tive valu	es) (Tab	l	_							
(71)m= -6	38.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78	-68.78		(71)
Water bea	ating	T) aniar	able 5)											
(72)m= 79	9.72	77.99	74.39	69 49	66.32	61 84	58.04	62 91	64 64	69 71	75 43	77 99		(72)
		naine –			00.02	(66)	m + (67)m	+ (68)m -	- (69)m + ((70)m + (7)	(1)m + (72)	m		()
(73)m = 20	91 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	gains	230.00	200.0	204.72	245.17	200.00	220.01	220.12	230.30	202.00	210.42	200.14		()
Solar gains	s are ca	alculated u	using sola	ar flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	e applicat	ole orientat	ion.		
Orientatio	on: A	ccess F	actor	Area		Flu	x		q		FF		Gains	
	T	able 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	
North (0.9x	0.77	x	2.8	39	x 1	0.63	x	0.85	☐ x [0.7	=	12.67	(74)
North (0.9x	0.77	×	2.8	39	x 2	20.32	x	0.85	╡ <u> </u>	0.7		24.22	(74)
North (0.9x	0.77	×	2.8	39	x 3	34.53	x	0.85	╡╷┝	0.7		41.15	(74)
North	0.9x	0.77	×	2.8	39	x .	5.46	×	0.85	╡╷╞	0.7	=	66.09] (74)
														1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

North	0.9x	0.77		x	2.8	9	x	7	9.99	x	0.85	;	×	0.7		= [95.31	(74)
North	0.9x	0.77		x	2.8	9	x	7	4.68	x	0.85	;	x	0.7		= [88.99	(74)
North	0.9x	0.77		x	2.8	9	x	5	9.25	x	0.85	;	x	0.7		= [70.6	(74)
North	0.9x	0.77		x	2.8	9	x	4	1.52	x	0.85	;	x	0.7		= [49.47	(74)
North	0.9x	0.77		x	2.8	9	x	2	4.19	x	0.85	;	x	0.7		= [28.83	(74)
North	0.9x	0.77		x	2.8	9	x	1	3.12	x	0.85	;	x	0.7		= [15.63	(74)
North	0.9x	0.77		x	2.8	9	x		8.86	×	0.85	;	x	0.7		= [10.56	(74)
South	0.9x	0.77		x	9.0	3	x	4	6.75	x	0.76	;	x	0.7		=	155.64	(78)
South	0.9x	0.77		x	9.0	3	x	7	6.57	x	0.76	;	x	0.7		= [254.91	(78)
South	0.9x	0.77		x	9.0	3	x	g	7.53	x	0.76	;	x	0.7		=	324.7	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.23	x	0.76	;	x	0.7		= [366.99	(78)
South	0.9x	0.77		x	9.0	3	x	1	14.87	x	0.76	;	x	0.7		= [382.42	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.55	x	0.76	;	x	0.7		=	368.03	(78)
South	0.9x	0.77		x	9.0	3	x	1	08.01	x	0.76	;	x	0.7		= [359.59	(78)
South	0.9x	0.77		x	9.0	3	x	1	04.89	x	0.76	;	x	0.7		=	349.21	(78)
South	0.9x	0.77		x	9.0	3	x	1	01.89	x	0.76	i	x	0.7		= [339.19	(78)
South	0.9x	0.77		x	9.0	3	x	8	2.59	x	0.76	i	x	0.7		=	274.94	(78)
South	0.9x	0.77		x	9.0	3	×	5	5.42	х	0.76	i	х	0.7		=	184.49	(78)
South	0.9x	0.77		x	9.0	3	x	4	40.4	x	0.76	i	x	0.7		=	134.49	(78)
Solar (<mark>gain</mark> s in	watts, <mark>ca</mark>	alculat	ed	for eacl	n mon	th			(83)m	n = Sum(74)m(8	<mark>8</mark> 2)m					
(83)m=	168.32	279.12	365.8	5	433.08	471.4	³ 4	63.34	448.58	419	.81 388.	.67 3	303.76	200.12	145.0	05		(83)
l otal g	jains – i	nternal a	nd so	lar	(84)m =	= (73)n	1 + (83)m	, watts	i				_	i			(5.1)
(84)m=	460.02	569.15	646.1	5	697.8	720.6	2 6	97.29	672.48	648	.53 625.	.25	556.1	470.55	428.	79		(84)
7. Me	ean inter	nal temp	eratu	e (heating	seaso	on)									_		
Temp	perature	during h	eating	g pe	eriods ir	n the li	ving	area	from Tab	ole 9	, Th1 (°C	;)					21	(85)
Utilis	ation fac	tor for g	ains fo	or li	ving are	ea, h1,	m (s	ee Ta	ble 9a)									
	Jan	Feb	Ма	r	Apr	Ma	y 📃	Jun	Jul	A	ug Se	эр	Oct	Nov	De	ec		
(86)m=	1	1	0.99		0.98	0.96		0.9	0.79	0.8	32 0.9	4	0.99	1	1			(86)
Mear	n interna	l temper	ature i	in li	iving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	19	19.19	19.5		19.9	20.31	2	20.67	20.87	20.	84 20.5	56 2	20.02	19.43	18.9	97		(87)
Temp	perature	during h	eating	j pe	eriods ir	n rest o	of dw	elling	from Ta	able 9	9, Th2 (°(C)						
(88)m=	18.72	18.72	18.72	2	18.74	18.74	. 1	18.75	18.75	18.	76 18.7	75 '	18.74	18.73	18.7	'3		(88)
Utilis	ation fac	tor for a	ains fo	or re	est of d	velling	ı. h2	.m (se	e Table	9a)				•				
(89)m=	1	0.99	0.99	T	0.97	0.92		0.75	0.47	0.5	53 0.8	4	0.97	1	1			(89)
Moor			atura i		ho roct	of dwo		T2 (f			to 7 in T		00)	1				
(90)m=	16.27	16.55	17		17.59	18.16		12 (II 18.6	18.74	18.	73 18.4	49	90) 17.77	16.92	16.2	94		(90)
(00)11-		10.00				10.10				L '0.		··· fLA	= Liv	ing area ÷ (4	1) =		0.55	(91)
												-		U 1 1 1 1	·	L	0.00	
Mear	interna	I tempera	ature	(tor	the wh	ole dw	ellin	g) = f	LA × T1	+ (1	– †LA) ×	12	40.05	10.51				(00)
(92)m=	17.79	18.02	18.38	5	18.87	19.35		19.75	19.92	19	.9 19.6	⁵⁴ 1	19.02	18.31	17.7	6		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	nperatui using Ta	re obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:			• • • •							
(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)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	k [(93)m-	– (96)m]				
(97)m=	2108.88	2046.99	1850.88	1538.12	1178.44	786.6	506.95	533.92	848.6	1295.9	1733.15	2102.73		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	1227.68	995.47	902.55	619.48	376.88	0	0	0	0	560.4	910.94	1246.08		-
								Tota	l per year	(kWh/yeai) = Sum(9	8)15,912 =	6839.48	(98)
Space	e heatin	g require	ement in	kWh/m²	/year]	134.11	(99)
9b. En	erav rea	uiremer	nts – Cor	nmunitv	heating	scheme	2					L		-
This pa	art is use	ed for sp	ace hea	ting, spa	ace cool	ng or wa	ater heat	ina prov	ided by a	a comm	unitv sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	/supplen	nentary l	heating (Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	y system	1 - (30	1) =					[1	(302)
The com	nmunity so	cheme mag	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four	other heat	sources; th	ne latter	4
includes	boilers, h	eat pumps	s, geothern	nal and wa	aste heat f	rom powel	r stations. S	See Apper	ndix C.					-
Fractio	n of hea	at from C	Commun	ity boiler	s								1	(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting syst	tem		[1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syster	m				[1.05	(306)
Space	heating	9										,	kWh/year	-
Annua	space	heating	requirem	nent									6839.48	
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	- [7181.45	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308
Space	heating	require	ment froi	m secon	dary/sup	oplemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =	[0	(309)
Water Annua	heating I water h	j neating r	equirem	ent								[1831.51	1
If DHW Water	/ from co heat fro	ommunit m Comn	ty schem	ne: pilers					(64) x (30	03a) x (30	5) x (306) =	ا = [1923.08] (310a)
Electric	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(310e)] =	91.05] (313)
Cooling	g Syster	m Energ	y Efficiei	ncy Rati	0							ו [0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =		L [0	(315)
Electric mecha	city for p nical ve	oumps aintilation	nd fans v - balanc	within dv æd, extra	velling (1 act or po	Fable 4f) 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)			235.9	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor 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	two fuels repeat (363) to (366) for the second fu	iel 90	(367a)
CO2 associated with heat source 1 [(307b)+(3	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 (3	363)(366) + (368)(372)		= 2232.34	(373)
CO2 associated with space heating (secondary) (3	309) 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) =		2232.34	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	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 201	2		Stroma Softwa	a Num Ire Ver	ber: sion:		Versio	n: 1.0.3.15	
Addross :	london	Pr	operty A	Address:	Unit 4					
1. Overall dwelling dimer	sions:									
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) .18	(2a) =	Volume(m³ 111.18) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n))	51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	111.18	(5)
2. Ventilation rate:		_							<u> </u>	
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{se} \\ \text{heating} & \text{h} \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array} $	econdary eating 0 0	/ +] +	0 0 0] = [total 0 0	x 2	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	IS					2	x 1	10 =	20	(7a)
Number of passive vents					Ē	0	x 1	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	0.18 0 0 0 0 0	(8) (9) (10) (11)								
If suspended wooden flo	oor, enter 0.2 (unseal	ed) 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 st	ripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00	()		0	(15)
Infiltration rate	50	• • • • • • • •		(8) + (10) ·	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, o	150, expressed in cub	NC metres 7) \div 201+(8)	s per no	ur per so se (18) = (quare m 16)	etre of e	envelope	area	10	$-\frac{(17)}{(10)}$
Air permeability value applies	if a pressurisation test has	s been done	e or a deg	iree air pei	meability	is being u	sed		0.68	
Number of sides sheltered	k		0			Ū			2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.58	(21)
Infiltration rate modified fo	r monthly wind speed	1							I	
Jan Feb I	vlar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								I	
(22)m= 5.1 5 4	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	, ,					1		I	
(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		

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-	-	_	
	0.74	0.72	0.71	0.64	0.62	0.55	0.55	0.53	0.58	0.62	0.65	0.68		
If m	ate effe	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), othei	rwise (23b) = (23a)				(23b)
If bala	anced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,				(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MV	HR) (24a	a)m = (22	2b)m + (23b) x [′	1 – (23c)	÷ 100]	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	overv (ľ	MV) (24b	m = (22)	1 2b)m + (;	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside	!			1	
,	if (22b)r	n < 0.5 ×	(23b) , t	then (24o	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilati	on from I	oft	_				
(2.1.1)	if (22b)r	n = 1, th	en (24d)	m = (22k	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(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	J	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24)	c) or (24	d) in boy	(25)	0.00	0.74	0.70	1	(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		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r	ea n²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²·l) K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	=	2.66				(26)
Windo	<mark>ws</mark> Type	e 1				9.03	x1	/[1/(1.6)+	0.04] =	13.58				(27)
Win <mark>do</mark>	ws Type	e 2				0.39	x1	/[1/(4.8)+	0.04] =	1.57				(27)
Floor						51	×	0.97	=	49.47				(28)
Walls ⁻	Type1	39.	2	0.39		38.81	x	2.1		81.5				(29)
Walls ⁻	Type2	10.9	9	10.93	3	0.06	×	2.1		0.13			$\exists \square$	(29)
Total a	area of e	elements	, m²			101.1	9							(31)
Party v	wall					16.1	×	0	=	0				(32)
* for win ** includ	idows and le the area	l roof wind as on both	ows, use e sides of ii	effective wi	ndow U-va Is and par	alue calcul titions	ated using	g formula 1,	/[(1/U-valı	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				148.91	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TM	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be ι	ign asses: used inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.2	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			164.11	(37)
Ventila	ation hea	at loss ca	alculateo	d monthly	/			I 1	(38)m	= 0.33 × (25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	
(38)m=	28.3	27.92	27.54	25.76	25.42	23.87	23.87	23.59	24.47	25.42	26.1	26.8	l	(38)
Heat ti	ransfer o	coefficie	nt, W/K	1 1		r	r	r	(39)m	= (37) + (3	38)m		1	
(39)m=	192.41	192.02	191.64	189.86	189.53	187.98	187.98	187.69	188.58	189.53	190.21	190.91		
										average =	Sum(39)1	12 /12=	189.86	o (39)

Heat lo	ss para	meter (H	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)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		
L	r of day		uth (Tab					1	,	Average =	Sum(40)1	12 /12=	3.72	(40)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
ΎΓ														
4. Wa	ter heat	ing enei	rgy requ	irement:								kWh/ye	ear:	
Assum if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ipancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.	1. .9)	72		(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by s ^r day (all w	es per da 5% if the a vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r 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		_
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	900.48	(44)
(45)m=	122.41	107.06	110.48	96. <mark>3</mark> 2	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =		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)
Water a	storage	loss:	in al valia											
Storage	e volum	e (litres)		ig any so		ntor 110	storage		ame ves	sei		160		(47)
Otherw	ise if no	eating a stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:		,					,	,				
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature 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 ma	anufact	urer's de	eclared (cylinder l	oss fact	or is not b/litro/da	known:					00		(51)
If comn	nunitv h	eating s	ee secti	on 4.3		1/1110/02	iy)				0.	02		(51)
Volume	factor	from Ta	ble 2a								1.	03		(52)
Tempe	rature 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 s	storage	loss cal	culated	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 cylinde	r 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	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m	_				
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	t cylinde	r thermo	stat)		I	(==)
(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 ca	alculated	for eacl	h month	(61)m =	(60) ÷ 3	365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	for ea	ch month	(62)m =	• 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	IW input	calculated	using Ap	pendix G o	r Appendix	H (nega	tive quantity	/) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applie	s, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
							-	Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	m water	heating	j, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	ulation	of (65)m	only if c	ylinder	is in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic daii	ns (Table	5). Wa	tts	,									
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso see	Table 5					
(67)m=	1 <mark>3.58</mark>	12.06	9.81	7.43	5.55	4.69	5.06	6.58	8.83	11.22	13.09	13.96		(67)
Appliar	nces aa	ains (calc	ulated i	n Appen	dix L. ea	uation		3a), also	see Ta	ble 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)
Cookin	a dains	s (calcula	ited in A	ppendix	L equat	ion I 1	5 or 15a	also se	ee Table	5			1	
(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	1	(69)
Pumps	and fa	ns gains	(Table	5a)										
(70)m=					0	0	0	0	0	0	0	0]	(70)
		Vanoratio	n (neas	l ative valu	L es) (Tab	le 5)					_		I	
(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]	(71)
Water	heating		able 5)										I	. ,
(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 i	ntorna	Lasine –				(6)	6)m + (67)m	1 + (68)m	+ (69)m +	(70)m + (7	(1)m + (72)	m	I	. ,
(73)m-	291 92	290.23	280.46	264 84	249.26	234.02	223.99	228.82	236.72	252 51	270.64	283.96]	(73)
6 Sol	ar gain	S.	200.10	201101	210.20	201.02	220.00	LEGIGE	200.12	202.01	210.01	200.00		(- /
Solar g	ains are	calculated	using sola	ar flux from	Table 6a	and asso	ciated equa	itions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area	l	FI	ux		q		FF		Gains	
		Table 6d		m²		Та	able 6a	Т	able 6b	Т	able 6c		(VV)	
North	0.9x	0.77	×	0.3	39	x	10.63	x	0.85	☐ x [0.7	=	1.71	(74)
North	0.9x	0.77	×	. 0.:	39	x	20.32	j x 🗖	0.85	╡ <u> </u>	0.7		3.27	(74)
North	0.9x	0.77	×	0.;	39	x	34.53	;	0.85	=	0.7		5.55	(74)
North	0.9x	0.77	×	0.:	39	x	55.46	;	0.85	╡╷╞	0.7		8.92	(74)
North	0.9x	0.77	×	. 0.:	39	x	74.72	j × [0.85	╡ <u> </u>	0.7	=	12.02	(74)

North	0.9x	0.77		x	0.3	9	x	7	9.99	x	0.85	x		0.7		= [12.86	(74)
North	0.9x	0.77		x	0.3	9	x	7	4.68	x	0.85	×		0.7		=	12.01	(74)
North	0.9x	0.77		x	0.3	9	x	5	9.25	x	0.85	×		0.7		= [9.53	(74)
North	0.9x	0.77		x	0.3	9	x	4	1.52	x	0.85	×		0.7		= [6.68	(74)
North	0.9x	0.77		x	0.3	9	x	2	4.19	x	0.85	×		0.7		=	3.89	(74)
North	0.9x	0.77		x	0.3	9	x	1	3.12	x	0.85	×		0.7		= [2.11	(74)
North	0.9x	0.77		x	0.3	9	x		8.86	x	0.85	×		0.7		= [1.43	(74)
South	0.9x	0.77		x	9.0	3	x	4	6.75	x	0.76	×		0.7		= [155.64	(78)
South	0.9x	0.77		x	9.0	3	x	7	6.57	x	0.76	x		0.7		= [254.91	(78)
South	0.9x	0.77		x	9.0	3	x	g	7.53	x	0.76	x		0.7		=	324.7	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.23	x	0.76	×		0.7		= [366.99	(78)
South	0.9x	0.77		x	9.0	3	x	1	14.87	x	0.76	×		0.7		= [382.42	(78)
South	0.9x	0.77		x	9.0	3	x	1	10.55	x	0.76	x		0.7		= [368.03	(78)
South	0.9x	0.77		x	9.0	3	x	1	08.01	x	0.76	×		0.7		= [359.59	(78)
South	0.9x	0.77		x	9.0	3	x	1	04.89	x	0.76	×		0.7		= [349.21	(78)
South	0.9x	0.77		x	9.0	3	×	1	01.89	x	0.76	×		0.7		=	339.19	(78)
South	0.9x	0.77		x	9.0	3	x	8	2.59	x	0.76	x		0.7		=	274.94	(78)
South	0.9x	0.77		x	9.0	3	x	5	5.42	х	0.76	x		0.7		=	184.49	(78)
Sout <mark>h</mark>	0.9x	0.77		x	9.0	3	x		40.4	x	0.76	x		0.7		=	134.49	(78)
																_		
Sola <mark>r</mark> (<mark>gain</mark> s in	watts, <mark>ca</mark>	alculat	ted	for each	n mon	th			(83)m	n = Sum(74)n	m(82)r	n					
(83)m=	157.35	258.17	330.2	26	375.91	394.44	4 3	80.89	371.6	358	.74 345.87	7 278.	83 1	86.6	135.	92		(83)
Total g	gains – i	nternal a	nd so	lar	(84)m =	: (73)n	1 + (83)m	, watts	i								
(84)m=	449.28	548.4	610.7	'1	640.74	643.7	6	14.92	595.58	587	.56 582.59	9 531.	34 4	57.24	419.	88		(84)
7. Me	ean inter	nal temp	eratu	re (heating	seaso	on)											
Temp	perature	during h	eating	g pe	eriods ir	the li	ving	area	from Tab	ole 9	, Th1 (°C)						21	(85)
Utilis	ation fac	tor for g	ains fo	or li	ving are	a, h1,	m (s	ee Ta	ble 9a)									
	Jan	Feb	Ma	r	Apr	Ma	y	Jun	Jul	A	ug Sep	00	t	Nov	De	ec		
(86)m=	1	1	0.99		0.99	0.98		0.94	0.87	0.8	39 0.96	0.9	Э	1	1			(86)
Mear	n interna	l tempera	ature	in li	iving are	a T1	(follo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	18.59	18.78	19.1		19.54	20	2	20.45	20.73	20	.7 20.35	19.7	3 1	9.08	18.5	6		(87)
Tem	berature	durina h	eating		eriods ir	resto	of dw	/ellina	from Ta	able 9	9. Th2 (°C)						
(88)m=	18.41	18.42	18.42	2	18.43	18.43		18.45	18.45	18.	45 18.44	, 18.4	3 1	8.43	18.4	2		(88)
l Itilie	L	tor for a	aine fa		est of du	velling	 1 h2	m (se	L Do Tablo	(0a)		_!						
(89)m=		0.99	0.99		0.98	0.94	, nz	0.82	0.54	0.5	59 0.88	0.9	3	0.99	1			(89)
NA		1.4.5.5.5.5.5.5	- 4					TO (6										
		1 temperative	ature	$\frac{\ln t}{7}$		17 57		12 (T		eps 3				6.25	15 /	0		(90)
(30)11=	10.02	10.79	10.2	<u>'</u>	10.91	17.57		10.17	10.41	10	10.04	fLA = 1	iving a	rea - (4	(1) =		0 47	
													y a	(-	., –	L	0.47	(91)
Mear	interna	l temper	ature	(for	the wh	ole dw	ellin	g) = fl	LA × T1	+ (1	- fLA) × T	2						
(92)m=	16.97	17.2	17.6′	1	18.15	18.72		9.25	19.51	19.	48 19.13	18.3	9 1	7.59	16.9	94		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(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)
Usefu	ıl 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)
Month	nly avera	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	e for mea	an intern	al tempe	erature,	_m , W =	=[(39)m >	x [(93)m-	– (96)m]				
(97)m=	2437.25	2362.67	2128.76	1757.19	1331.1	873.45	546.37	579.02	949.06	1477.12	1994.9	2431.55		(97)
Space	e heating	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97)	m – (95)m] x (4	1)m			
(98)m=	1480.25	1221.79	1135.28	815.17	536.01	0	0	0	0	712.98	1109.28	1497.58		-
								Tota	l per year	(kWh/year	[•]) = Sum(9	8)15,912 =	8508.34	(98)
Space	e heating	g require	ement in	kWh/m²	/year							[166.83	(99)
9b. En	erav rea	uiremer	nts – Cor	nmunitv	heating	scheme	1					L		7
This pa	art is use	ed for sp	ace hea	ting, spa	ice cooli	ng or wa	ater heat	ing prov	ided by a	a c <mark>omm</mark>	unity sch	neme.		
Fractio	on of spa	ice heat	from se	condary/	supplen	nentary I	neating (Table 1	1) '0' if n	one			0	(301)
Fractio	on of spa	ce heat	from co	mmunity	system	1 - (301	1) =						1	(302)
The con	munitv.sc	heme may	v obtain he	eat from se	veral sour	ces The r	, procedure ;	allows for	CHP and i	in to four i	other heat	sources: th	ne latter	J
includes	boilers, h	eat pumps	s, geothern	nal and wa	aste heat f	rom powei	r stations. S	See Apper	ndix C.			0001000, 0		
Fractio	on of hea	at from C	Commun	<mark>ity b</mark> oiler	s								1	(303a)
Fractio	on of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting syst	tem		[1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng systei	m				[1.05	(306)
Space	heating	9											kWh/year	-
Annua	I space	heating	requirem	nent									8508.34	
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (309	5) x (306) =	=	8933.76	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment froi	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =	[0	(309)
Water Annua	heating I water h	l heating r	equirem	ent								ſ	1831.51	1
If DHW Water	/ from co	ommunit m Comn	ty schem	ne: Dilers					(64) x (3()3a) x (30)	5) x (306) :	ו 	1923 08] (310a)
Electric		l for boa	nanity be	ution				0.01	× [(307a)	(307e) +	(3102) (- 310e)] -	100.57	
Coolin	a Sveter		v Efficier	ncy Rati	h			0.01			ιστοα)([0.01](314)
Space	cooling			d cooling	- n evetor	, if not a	onter (1)		- (107) ·	(314) -		l	0] ⁽³¹⁵⁾
	cooling attacks				y system				- (107) -	(314) =		l	U](313)
mecha	nical ve	ntilation	- balanc	within dw ed, extra	act or po	able 4f) sitive inj	: 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)			239.8	(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	two fuels repeat (363) to (366) for the second fue	el 90	(367a)
CO2 associated with heat source 1 [(307b)+(3	810b)] 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 (3	363)(366) + (368)(372)	:	2661.99	(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) =		2661.99	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	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)

Assessor Name: Stom FSAP 2012 Stom Average Stom Stom Stom Stom Stom Stom Stom Stom				User D	etails:						
Address : , london Address : , london Address : , london Basement Iz8 (ii) X Volume(m?) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+((1n) Iz8 (ii) Volume(m?) Owelling volume G22.24 (is) Vumber of chinneys 0 + 0 = 0 (iii) Number of chinneys 0 + 0 = 0 x40 = 0 (iii) Number of pansive vents 0 + 0 = 0 x40 = 0 (iii) Number of fueless gas fires 0 x10 = 0 70 0 x40 = 0 (iii) Number of fueless gas fires 0 x10 = 0 70 0 70 0 70 0 70 0 70 0 70 0 70 0 70 0 70 0 70 0 70 70 70 70 70	Assessor Name: Software Name:	Stroma FSAP	2012	roportic	Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
Autress - 1,00000000000000000000000000000000000		london	F	roperty /	Audress.	Unit 5					
Area(m ²) Area(m ²) Av. Height(m) Volume(m ²) Basement 128 (a) 522.24 (a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 128 (a) 522.24 (a) Dwelling volume (ba)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	1 Overall dwelling dimer	sions:									
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 128 (4) Dwelling volume (3a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(9n) = 522.24 (5) 2. Ventilation rate: main meating + 0 + 0 + 0 (a) Number of chimneys 0 + 0 = 0 × 40 = 0 (ca) Number of open flues 0 + 0 = 0 × 40 = 0 (ca) Number of intermittent fans 3 × 10 = 30 (7a) 0 × 40 = 0 (7a) Number of flueless gas fires 0 × 40 = 0 (7a) 0 × 40 = 0 (7a) Number of storeys in the dwelling (ns) × 10 = 0 × 60 = (6b) (7b) 0 × 40 = 0 (7a) Additional infiltration (a) (b)+(b)+(b)+(b) = 0 -(5b) = 0.06 (6b) (7b) 0 × 40 = 0 (7a) 0 × 40 = 0 (7b) 0 × 40 = 0 (7b) 0 × 40 =	Basement			Area	a(m²) 128	(1a) x	Av. He	ight(m) .08	(2a) =	Volume(m³ 522.24) (3a)
Detelling volume (3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a) = (5a) = (5a) 2. Ventilation rate: main heating between the secondary of the se	Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)	+(1e)+(1n	ı) <i>·</i>	128	(4)					
2. Ventilation rate: main heating 0 secondary heating 0 other total m³ per hour Number of ohmeys 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 (6b) Number of open flues 0 + 0 = 0 x40 = 0 (7a) Number of passive vents 0 x40 = 0 (7b) 0 x40 = 0 (7c) Number of flueless gas fires 0 x40 = 0 (7c) (7c) (7c) If a presurfusion test has been carried out or is intentied, proceed to (17), otherwise contrue form (01 to (16) (0) (0) (10) Number of storeys in the dwelling (ns) (9c) (2f) 0 (10) (10) (10) (10) (10) (10) (10) (10) (10) (10) (10) (10) (10) (10) (10) (11) (11) (11) (12) (13) (14) (10) (11) (11) (11) (12) (13) (13) <td>Dwelling volume</td> <td></td> <td></td> <td></td> <td></td> <td>(3a)+(3b)</td> <td>+(3c)+(3c</td> <td>d)+(3e)+</td> <td>.(3n) =</td> <td>522.24</td> <td>(5)</td>	Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	522.24	(5)
main heating heatingsecondary heatingothertotalm² per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40$ $=$ 0 $(6a)$ Number of pon flues 0 $+$ 0 $=$ 0 $x20$ 0 $(6b)$ Number of intermittent fans 3 $x10$ $=$ 0 $x20$ 0 $(6b)$ Number of passive vents 0 $x10$ 0 $x10$ 0 770 Number of flueless gas fires 0 $x40$ 0 770 Number of storeys in the dwelling (ns) 4 0 -60 0.06 (8) Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) ib of the gresurisation test has been camed dut or is intended, proceed to (17) , otherwise contrave from (2) to (16) 0 (19) Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction 0 (12) ib of the gas of waining $2i$ equal was 1.35 if suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) $Percentage of windows and doors draught stripped0(14)0(14)if based on air permeability value, q60, expressed in cubic metres per hour esquare metre of envelope area10(17)if based on air permeability value, q60, expressed in cubic metres per hour esquare metre of envelope area10(12)if based on air permeability value, q60, expressed in cubic metres per hour e$	2. Ventilation rate:										
Number of intermittent fans3x 10 =30(7a)Number of passive vents0x 10 =0(7b)Number of flueless gas fires0x 40 =0(7c)Number of flueless gas fires0x 40 =0(7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =30 x (5) =0.06(8)I' a pressurisation test has been carried out or is interlided, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(10)0(10)Additional infiltration0.25 for steel or timber frame or 0.35 for masonry construction(9)-1]a0.1 =0(10)Structural infiltration0.25 for steel or timber frame or 0.35 for masonry construction0(12)(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 0.350(12)If no draught lobby, enter 0.05, else enter 00(12)(14)Percentage of windows and doors draught stripped0(14)Window infiltration rate(20) = 1 (0.075 x (19) =0(15)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10(17)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.56(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.56(19)Air permeability value appli	Number of chimneys Number of open flues	main heating	secondar heating	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of passive vents0 $x10 =$ 0(7c)Number of flueless gas fires0 $x40 =$ 0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = (%e)+(%b)+(7e)+(7c) =0+(6) =0.06(%)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)0(10)Number of storeys in the dwelling (ns)00(9)0(10)0(11)Additional infiltration:0.25 for steel or timber frame or 0.35 for masonry construction0(11)0(11)if both ypes of wall are present, use the value corresponding to the greater wall area (after deucting); if equal user 0.350(12)0(12)If no draught lobby, enter 0.05, else enter 00(12)0(14)Window infiltration0.25 - [0.2 x (14) + 100] =0(15)Infiltration rate(6) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10(17)Aber of sides sheltered(20) = 1 - [0.075 x (19)] =0.85(20)Number of sides sheltered(21) = (16) x (20) =0.47(21)Number of sides sheltered(21) = (15) x (20) =0.47(21)Infiltration rate incorporating shelter factor(21) = (15) x (20) =0.47(21)Infiltration rate incorporating shelter factor(21) = (15) x (20) =0.47(21)	Number of intermittent far	าร				Γ	3	x ′	10 =	30	(7a)
Number of flueless gas fires0x40 =0Air changes per hourInfiltration due to chimneys, flues and fans = $(66)+(6b)+(7a)+(7a)+(7c) =$ 30 \pm (5) =0.06(8)If a pressurisation test has been carred out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)Additional infiltration((9)-1):0.1 =00O (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0000.11find flueless gas fires00000000000000000000000<	Number of passive vents					Ē	0	x ′	10 =	0	 (7b)
Air changes per hourInfiltration due to chimneys, flues and fans = $(60)+(7a)+(7b)+(7c) = 30 + (5b) = 0.06$ (6)It a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (7b)Number of storeys in the dwelling (ns)Additional infiltrationStructural infiltration: 0.25 for steel or timber frame or 0.35 for masony constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) + 100] =Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10Induction rate incorporating shelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate modified for monthly wind speedJan Feb Mar Apr May Jun Jul Aug Sep Oct Nov DecMonthy average wind speed from Table 7(22) m 5 1 5 4.3 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7Wind 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	Number of flueless gas fir	es				Ľ	0	X 4	40 =	0	(7c)
Infiltration due to chimneys, flues and fans = $(60)+(70)+(70) = 30 + (5) = 0.06$ (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (76) Number of storeys in the dwelling (ns) Additional infiltration (9) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masony construction if both types of well 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 for of araught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration ate (8) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) $\pm 20+(8)$, otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 \times (19)] = Infiltration rate incorporating shelter factor (21) = (18) \times (20) = 0.47 (21) Infiltration rate modified for monthly wind speed Uan 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 $\div 4$ (22)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18									Air ch	anges <mark>per</mark> ho	ur
Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>i'</i> both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); <i>if</i> equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) \pm 100] =$ Infiltration rate $(8) \pm (10) + (11) + (12) \pm (13) \pm (15) =$ 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 $(18) = [(17) \pm 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $1 - [0.47] (21) = (18) \times (20) =$ 1 - [0.47] (22) = 2 - (19) 0.43 (20) = 2 - (19) Nonthly average wind speed from Table 7 (22)m = 5.1 - 5 - 4.9 - 4.4 - 4.3 - 3.8 - 3.7 - 4 - 4.3 - 4.5 - 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m = 1.27 - 1.25 - 1.23 - 1.1 - 1.08 - 0.95 - 0.92 - 1 - 1.08 - 1.12 - 1.18	Infiltration due to chimney	rs, flues and fans een carried out or is in	= (6a)+(6b)+(7 tended, proceed	a)+(7b)+(7 d to (17), c	7c) = otherwise c	ontinue fro	30 om (9) to ((16)	÷ (5) =	0.06	(8)
Structural infiltration: 0.25 for steel of timber frame of 0.35 for masonry construction0(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 0.350(12)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) ÷ 100] =0If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [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 area10(17)If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)0.56(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2(19)Number of sides sheltered2(19)0.85(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.47(21)Infiltration rate modified for monthly wind speed00.47(21)Infiltration rate modified for monthly wind speed01.083.744.34.54.7Wind Factor (22a)m = (22)m ÷ 4(22)m ÷ 41.081.121.181.121.18<	Additional infiltration							[(9)	-1]x0.1 =	0	(9) (10)
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In the draught housy, enter or out, ease enter of0Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then (18) = [(17) $\div 20]$ +(8), otherwise (18) = (16)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides shelteredShelter factor(20) = 1 - [0.075 \times (19)] =Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJunState of (22a)m = (22)m $\div 4$ (22a)m =1.271.251.231.11.080.950.9511.081.121.18	If no draught lobby, ent	ool, enter 0.2 (un	sealeu) 01 0. r 0	i (Seale	iu), eise					0	$= \frac{(12)}{(12)}$
Under the collect and give on the give of the distribution of the distributication of the distribution of the distrib	Percentage of windows	and doors draud	nt stripped							0	$-1^{(13)}_{(14)}$
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ (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 $(18) = (16)$ 0.56 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0.56 (18) Number of sides sheltered 2 (19) 0.85 (20) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.47 (21) Infiltration rate modified for monthly wind speed 10 0.47 (21) Monthly average wind speed from Table 7 $(22)m = 5.1$ 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = $(22)m \div 4$ $(22a)m = 1.27$ 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Window infiltration		n on ppou		0.25 - [0.2	x (14) ÷ 1	00] =			0	$-1^{(11)}_{(15)}$
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If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 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 $(22a)m = (22)m \div 4$ $(22a)m = 1.27 \ 1.25 \ 1.23 \ 1.1 \ 1.08 \ 0.95 \ 0.95 \ 0.92 \ 1 \ 1.08 \ 1.12 \ 1.18$	Air permeability value, o	q50, expressed in	cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	10	(17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered 2 (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed 0.47 (21)Infiltration rate modified for monthly wind speed 0.47 (21)Infiltration rate modified for monthly wind speed 0.47 (21)Monthly average wind speed from Table 7 $0.2 \times 10^{-1} \times 10^{-1$	If based on air permeabili	ty value, then ⁽¹⁸⁾	= [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.56	(18)
Number of sides sheltered 2 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.47 (21) Infiltration rate modified for monthly wind speed $18 \times (20) =$ 0.47 (21) Infiltration rate modified for monthly wind speed 0.47 (21) Monthly average wind speed from Table 7 $(22)m = 5.1$ 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ $(22a)m = 1.27$ 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Air permeability value applies	s if a pressurisation tes	st has been don	e or a deg	gree air pei	meability	is being u	sed			_
Sheller factor (20) = 1 + [0.010 \times (10)] = 1 +	Number of sides sheltered	d			(20) – 1 - 1	0 075 v (1	Q)] —			2	(19)
Initiation rate incorporating sheller factor $(21)^{-1}(10)^{-1}(20)^{-1}$ 0.47 $(21)^{-1}$ 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 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ (22a)m= 1.27 1.23 1.1 1.08 1.12 1.18	Infiltration rate incorporati	ng chaltar factor			(20) = (18)	x (20) -	5)] –			0.85	
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 3.7 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 0.92 1 1.08 1.12 1.18	Infiltration rate modified for	r monthly wind or	hood		(21) = (10)	x (20) -				0.47	(21)
Sain Feb Main Apr May Sain Adg Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 (22a)m= 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18		Mar Apr M		hul	Διια	Sen	Oct	Nov	Dec		
Working average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 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 0.92 1 1.08 1.12 1.18	Monthly over go wind on	ad from Table 7		501	Aug	Oep	001		Dec		
Wind Factor (22a)m = (22)m $\div 4$ (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	$(22)m = \begin{bmatrix} 5 \\ 5 \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \end{bmatrix}$		3 38	38	37	4	4.3	4.5	47		
VVING Factor (22a)m = (22)m ÷ 4 (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18		···· / ··· / ···	- 0.0	5.0					I	l	
	vvind Factor (22a)m = (22 (22a)m = 1.27 1.25	.)m ÷ 4 1.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	d infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.6	0.59	0.58	0.52	0.51	0.45	0.45	0.44	0.47	0.51	0.53	0.56		
Calculā	ite effec	tive air	change	rate for t	he appli	cable ca	se	-		-		-	- 	
li me				andix NL (2	26) (00	а) Г ран (с	austica (muiaa (22h	·) (22a)			0	(23a)
				$\frac{1}{2}$	(23a) = (23a)	a) × FIIIV (e	equation (i	n Toblo 4b)) = (23a)			0	(23b)
			· ·			,) =		001.) [4 (00)	0	(23c)
a) if t			anical ve			at recove		HR) (24a T	a)m = (22)	2b)m + (T	23b) × [*	1 - (23c)) ÷ 100]]	(245)
(24a)m=					0		0					0	J	(24d)
			anical ve		without	neat rec	covery (i	VIV) (240 T	m = (22)	2b)m + (i T	230)		1	(24b)
(240)m=		0	0		0					0	0	0	J	(240)
C) If V if	vhole ho (22b)m	ouse ex	tract ver	tilation o	or positiv	/e input \	ventilatio	c) = (22)	outside $n + 0$	5 v (23h	N)			
(24c)m=	0	0.0			(200) = (200)		0	$\frac{0}{0} = \frac{221}{0}$) iii + 0.			0	1	(24c)
		vontilativ					vontilati	on from l	oft	L °	Ů	L ů	J	
u) if	ⁱ (22b)m	n = 1, the	en (24d)	m = (22k)	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0.68	0.68	0.67	0.64	0.63	0.6	0.6	0.6	0.61	0.63	0.64	0.65]	(24d)
Effec	tive air	change	rate - er	nter (24a) or (24) or (24	c) or (24	d) in bo	k (25)		<u>.</u>			
(25)m=	0.68	0.68	0.67	0.64	0.63	0.6	0.6	0.6	0.61	0.63	0.64	0.65		(25)
2 1 1 2 2									1				,	
3. Hea					ər.	Not Ar	~~					kyolu		
ELEIVI		area	(m^2)	Openin	gs	Net Ar	ea	U-van	ue	AXU		K-value	-	АЛК
		aica		III	14	A,r	n²	W/m2	2K	(VV/I	K)	kJ/m²-	K	KJ/K
Doo <mark>rs</mark> 7	Гуре 1	arca	(111-)			A ,r	n²	W/m2	2K	(VV/I 3.92	K)	kJ/m²•	ĸ	KJ/K (26)
Doors T Doors T	Гуре 1 Гуре 2	arca	(11-)		12	A ,r 2.8	n² X	W/m2	2K = = =	(VV/ 3.92 2.1	K)	kJ/m²-	ĸ	KJ/K (26) (26)
Doors 1 Doors 1 Window	Гуре 1 Гуре 2 vs Type	1	(11-)		14	A ,r 2.8 1.5	m ² x	W/m2 1.4 1.4 /[1/(4.8)+	2K = = 0.04] =	(W/I 3.92 2.1 69.87	K)	kJ/m²·	ĸ	KJ/K (26) (26) (27)
Doors 1 Doors 1 Window Windov	Гуре 1 Гуре 2 vs Type vs Type	1	(111-)			A ,r 2.8 1.5 17.35	m ² x x x x x1	W/m2 1.4 /[1/(4.8)+ /[1/(1.6)+	2K = [- 0.04] = [- 0.04] = [(W// 3.92 2.1 69.87	K)	kJ/m²-	ĸ	kJ/K (26) (26) (27)
Doors 1 Doors 1 Window Window Window	Гуре 1 Гуре 2 vs Type vs Type vs Type	1			14	A ,r 2.8 1.5 17.35 2.48	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(4.8)+ /[1/(1.6)+ /[1/(4.8)+	: : <td::< td=""> <td::< td=""> <td::< td=""></td::<></td::<></td::<>	(W/I 3.92 2.1 69.87 3.73	K)	kJ/m²+	K	kJ/K (26) (26) (27) (27)
Doors 1 Doors 1 Window Window Window	Гуре 1 Гуре 2 vs Type vs Type vs Type	1 2 3			12	A ,r 2.8 1.5 17.35 2.48 1.5	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+	!! = 0.04] = 0.04] = 0.04] =	(W// 3.92 2.1 69.87 3.73 6.04	K)	kJ/m²+		kJ/K (26) (26) (27) (27) (27)
Doors 1 Doors 1 Window Window Window Floor	Type 1 Type 2 vs Type vs Type vs Type	1 2 3				A ,r 2.8 1.5 17.35 2.48 1.5 128	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79	!! =	(W// 3.92 2.1 69.87 3.73 6.04 101.12		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28)
Doors 1 Doors 1 Window Window Floor Walls T	Type 1 Type 2 vs Type vs Type vs Type Type1	1 2 3 74.2	26	18.85	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1	!: = 0.04] = 0.04] = 0.04] = 0.04] = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 =	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28) (29)
Doors 1 Doors 1 Window Window Window Floor Walls T Walls T	Type 1 Type 2 vs Type vs Type vs Type Type1 Type2	1 2 3 74.2 46.	26	18.84	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28	:K = :0.04]	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28) (29) (29)
Doors 1 Doors 1 Window Window Floor Walls T Walls T Walls T	Type 1 Type 2 vs Type vs Type vs Type ype1 ype2 ype3	1 2 3 74.2 46. 71.1	26 4 6	18.84 5.28 1.5	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1	!! = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28) (29) (29) (29)
Doors T Doors T Window Window Floor Walls T Walls T Walls T Walls T	Type 1 Type 2 vs Type vs Type vs Type ype1 type2 type3 type4	1 2 3 74.2 46. 71.1 5.3	26 4 6 4	18.8 5.28 1.5 0	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.3	!K = 0.04] 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = <td>(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6</td> <td></td> <td>kJ/m².</td> <td></td> <td>kJ/K (26) (27) (27) (27) (28) (29) (29) (29) (29)</td>	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6		kJ/m².		kJ/K (26) (27) (27) (27) (28) (29) (29) (29) (29)
Doors T Doors T Window Window Floor Walls T Walls T Walls T Walls T Roof	Type 1 Type 2 vs Type vs Type vs Type ype1 type2 type3 type4	1 2 3 74.2 46. 71.1 5.3 17	26 4 6 4	18.84 5.28 1.5 0 0	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34 17	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.3 2.3	!K = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 39.1		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (29) (30)
Doors 1 Doors 1 Window Window Floor Walls T Walls T Walls T Roof Total ar	Type 1 Type 2 vs Type vs Type vs Type ype1 type2 type3 type4 rea of el	1 2 3 74.2 46. 71.1 5.3 17 lements	26 4 6 4	18.84 5.28 1.5 0 0	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34 17 342.10	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.3 2.3	!! =	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 39.1		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (30) (31)
Doors T Doors T Window Window Floor Walls T Walls T Walls T Walls T Roof Total an Party w	Type 1 Type 2 vs Type vs Type vs Type type1 type2 type3 type3 type4 rea of el	1 2 3 74.2 46. 71.1 5.3 17 lements	26 4 6 4 , m ²	18.8 5.28 1.5 0	5	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34 17 342.11 22.1	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.3 2.3	!K = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 39.1		kJ/m².		kJ/K (26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (30) (31) (32)
Doors 1 Doors 1 Window Window Floor Walls T Walls T Walls T Walls T Roof Total ar Party w	Type 1 Type 2 vs Type vs Type vs Type vs Type ype1 ype3 ype3 ype4 rea of el vall dows and e the area	$\begin{bmatrix} 1 \\ 2 \\ 3 \\ \hline 74.2 \\ \hline 46. \\ \hline 71.1 \\ \hline 5.3 \\ \hline 17 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	26 4 6 4 , m ² ows, use e sides of ir	18.84 5.28 1.5 0 0 0 0 0 0 0 0 0 0 0	5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34 17 342.11 22.1 alue calculations	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.28 2.1 0.3 2.3 0 0 formula 1	$\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 39.1 0 <i>u</i> e)+0.04] <i>e</i>	K)	paragraph		kJ/K (26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (30) (31) (32)
Doors T Doors T Window Window Floor Walls T Walls T Walls T Walls T Roof Total an Party w * for wind ** include Fabric I	Type 1 Type 2 vs Type vs Type vs Type type1 type2 type3 type3 type4 rea of el vall dows and the area neat los	1 2 3 74.2 46. 71.1 5.3 17 lements roof wind s on both s, W/K	26 4 6 4 , m ² ows, use e sides of ir = S (A x	18.83 5.28 1.5 0 0 effective with thermal walk U)	5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34 17 342.11 22.1 alue calculations	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 (1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.28 2.1 0.3 2.3 0 0 formula 1 (26)(30)	$\begin{array}{c} 2 \\ 2 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 39.1 0 <i>ue)+0.04] e</i>	K)	paragraph	K	 kJ/K (26) (27) (27) (27) (27) (29) (29) (29) (29) (29) (30) (31) (32)
Doors T Doors T Window Window Floor Walls T Walls T Walls T Walls T Walls T Roof Total an Party w * for wind ** include Fabric F Heat ca	Type 1 Type 2 vs Type vs Type vs Type vs Type ype1 ype2 ype3 ype3 ype4 rea of el all dows and e the area neat los apacity (1 2 3 74.2 $46.$ 71.1 5.3 17 lements roof windens on both s, W/K = Cm = S($\frac{26}{4}$ $\frac{6}{4}$ $\frac{4}{5}$ $\frac{6}{5}$ $\frac{4}{5}$ $\frac{6}{5}$ $\frac{4}{5}$ $\frac{6}{5}$ $\frac{1}{5}$	18.84 5.28 1.5 0 0 effective winternal walk	5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 2.8 1.5 17.35 2.48 1.5 128 55.41 41.12 69.66 5.34 17 342.11 22.1 alue calculations	m ² x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 (1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.79 2.1 0.28 2.1 0.3 2.3 0 0 formula 1 (26)(30)	$\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W// 3.92 2.1 69.87 3.73 6.04 101.12 116.36 11.51 146.29 1.6 39.1 0 <i>u</i> e)+0.04] <i>e</i>	K)	paragraph (32e) =	K	 kJ/K (26) (27) (27) (27) (27) (29) (29) (29) (29) (29) (30) (31) (32)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

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if detail	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)			(22)	(20)				
	abric ne	atioss							(33) +	(36) =			553.64	(37)
Ventila	ation hea		alculated	monthl	y L Ma				(38)m	= 0.33 × (25)m x (5)	Du	1	
(38)m=	Jan 117.62	116.4	115.2	Apr 109.58	108.53	103.63	103.63	Aug 102 72	Sep	108.53	110.65	112 88		(38)
				100.00	100.00	100.00	100.00	102.72	(20)m	- (27) + (28)m	112.00	J	()
			11, W/K	662.22	662.16	657.27	657.27	656.26	(39)m	= (37) + (.)	664 20	666 52	1	
(39)11=	071.20	070.04	000.04	003.22	002.10	057.27	037.27	030.30	039.13	Average -	Sum(30)		663.21	(39)
Heat I	oss para	meter (H	HLP), W	/m²K					, (40)m	= (39)m ÷	· (4)	12712-	000.21	
(40)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		
Numb	er of day	/s in mo	nth (Tab	le 1a)	-		•	•	/	Average =	Sum(40)1	12 /12=	5.18	(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. W	ater hea	ting ene	rgy requ	irement:								kWh/y	ear:	
A			N 1										1	
Assun if TF	ned occi FA > 13.9	ipancy, 9. N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.()013 x (⁻	TFA -13.	2.	89	J	(42)
if TF	-A £ 13.	9, N = 1			(,_,]			-)			
Annua	al averag	e hot wa	ater usa	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		10	2.83		(43)
not mor	e the annua re that 125	litres per	person pe	r day (all w	o% ir the d ater use, l	hot and co	aesignea (ld)	to achieve	a water us	se target o	T			
	lan	Eeb	Mar	Apr	May	lup		Αυσ	Sen	Oct	Nov	Dec	1	
Hot wat	ter usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from 1	Table 1c x	(43)	Dep	001		Dec	J	
(44)m=	113.11	109	104.88	100.77	96.66	92.55	92.55	96.66	100.77	104.88	109	113.11		
			<u> </u>						-	Total = Su	m(44) ₁₁₂ =	=	1 <mark>2</mark> 33.94	(44)
Energy	content of	hot water	used - cal	lculated mo	onthly = 4.	190 x Vd,r	m x nm x C	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
16 1				- f				h	-	Total = Su	m(45) ₁₁₂ =	=	1617.89	(45)
If Instar	ntaneous w	ater neati. I	ng at point T	t of use (no	not water	r storage), I	enter 0 in I	boxes (46)) to (61)	1			1	
(46)m= Water	25.16 storage	22.01	22.71	19.8	19	16.39	15.19	17.43	17.64	20.56	22.44	24.37		(46)
Storad	be volum	e (litres)) includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160]	(47)
If com	munitv h	eating a	and no ta	ank in dw	vellina. e	nter 110) litres in	(47)				100	J	
Other	wise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:											_	
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b								0		(49)
Energ	y lost fro	m watei	r storage	e, kWh/ye	ear			(48) x (49)	=		1	10]	(50)
b) If n Hot w	nanufact	urer's de	eclared (cylinder l rom Tabl	loss fact le 2 (kW	or is not h/litre/da	known:					02	1	(51)
If com	munity h	eating s	see secti	on 4.3		, in 0/ 00	^J /				0.	02	J	(31)
Volum	ne factor	from Ta	ble 2a	-							1.	.03]	(52)
Temp	erature f	actor fro	m Table	2b							0	.6]	(53)
Energ	y lost fro	m watei	r storage	e, 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	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 cylind	er 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 Append	lix 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)
Prima	ry circuit	loss (ar	nnual) fro	om Table	93	-	-		-		-	0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)	-	_	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l 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 DI	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	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 wa	ater heate	r (annual)₁	12	2268.73	(64)
Hea <mark>t g</mark>	jains fro	m water	heating	kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	ı + (61)n	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m=	74.38	65.59	68.95	<mark>61.</mark> 89	60.72	54.35	52.28	57.25	57.11	6 <mark>4.18</mark>	67.75	72.62		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	neating	
5. In	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	ns (Table	<u>5), Wat</u>	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48	144.48		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	26.77	23.78	19.34	14.64	10.94	9.24	9.98	12.98	17.42	22.12	25.81	27.52		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
(68)m=	205 20	000.00												
Cookir	235.23	298.36	290.64	274.2	253.45	233.94	220.91	217.85	225.57	242.01	262.76	282.26		(68)
COOKI	ng gains	calcula	^{290.64} ated in A	274.2 ppendix	253.45 L, equat	233.94 tion L15	220.91 or L15a)	217.85), also se	225.57 ee Table	242.01 5	262.76	282.26		(68)
(69)m=	1g gains 37.45	298.36 (calcula 37.45	290.64 ated in A 37.45	274.2 ppendix 37.45	253.45 L, equat 37.45	233.94 tion L15 37.45	220.91 or L15a) 37.45	217.85), also se 37.45	225.57 ee Table 37.45	242.01 5 37.45	262.76 37.45	282.26 37.45]	(68)
(69)m= Pumps	ng gains 37.45 s and fai	(calcula 37.45 ns gains	290.64 ated in A 37.45 (Table \$	274.2 ppendix 37.45 5a)	253.45 L, equat 37.45	233.94 tion L15 37.45	220.91 or L15a) 37.45	217.85), also se 37.45	225.57 ee Table 37.45	242.01 5 37.45	262.76 37.45	282.26 37.45]	(68)
(69)m= Pumps (70)m=	g gains 37.45 and fai	298.36 (calcula 37.45 ns gains 0	290.64 ated in A 37.45 (Table \$	274.2 ppendix 37.45 5a) 0	253.45 L, equat 37.45 0	233.94 tion L15 37.45 0	220.91 or L15a) 37.45 0	217.85), also se 37.45 0	225.57 ee Table 37.45 0	242.01 5 37.45 0	262.76 37.45 0	282.26 37.45 0	 	(68) (69) (70)
(69)m= Pumps (70)m= Losses	235.23 ng gains 37.45 s and fa 0 s e.g. ev	298.36 (calcula 37.45 ns gains 0 vaporatic	290.64 ated in A 37.45 (Table \$ 0 on (nega	274.2 ppendix 37.45 5a) 0 tive valu	253.45 L, equat 37.45 0 es) (Tab	233.94 tion L15 37.45 0 ole 5)	220.91 or L15a) 37.45 0	217.85), also se 37.45 0	225.57 ee Table 37.45 0	242.01 5 37.45 0	262.76 37.45 0	282.26 37.45 0]]	(68) (69) (70)
(69)m= Pumps (70)m= Losses (71)m=	233.23 ng gains 37.45 s and fai 0 s e.g. ev -115.58	298.36 (calcula 37.45 ns gains 0 vaporatic -115.58	290.64 ated in A 37.45 (Table 9 0 on (nega -115.58	274.2 ppendix 37.45 5a) 0 tive valu -115.58	253.45 L, equat 37.45 0 es) (Tab -115.58	233.94 tion L15 37.45 0 le 5) -115.58	220.91 or L15a) 37.45 0 -115.58	217.85), also se 37.45 0 -115.58	225.57 ee Table 37.45 0 -115.58	242.01 5 37.45 0 -115.58	262.76 37.45 0 -115.58	282.26 37.45 0 -115.58	 	(68) (69) (70) (71)
(69)m= Pumps (70)m= Losses (71)m= Water	233.23 ng gains 37.45 s and fai 0 s e.g. ev -115.58 heating	298.36 (calcula 37.45 ns gains 0 vaporatic -115.58 gains (1	290.64 ated in A 37.45 (Table 9 0 on (nega -115.58 Table 5)	274.2 ppendix 37.45 5a) 0 tive valu -115.58	253.45 L, equat 37.45 0 es) (Tab -115.58	233.94 tion L15 37.45 0 le 5) -115.58	220.91 or L15a) 37.45 0 -115.58	217.85), also se 37.45 0 -115.58	225.57 ee Table 37.45 0 -115.58	242.01 5 37.45 0 -115.58	262.76 37.45 0 -115.58	282.26 37.45 0 -115.58	 	(68) (69) (70) (71)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	233.23 ng gains 37.45 s and fa 0 s e.g. ev -115.58 heating 99.98	298.36 (calcula 37.45 ns gains 0 vaporatic -115.58 gains (T 97.6	290.64 ated in A 37.45 (Table 8 0 on (nega -115.58 Table 5) 92.67	274.2 ppendix 37.45 5a) 0 tive valu -115.58 85.96	253.45 L, equat 37.45 0 es) (Tab -115.58 81.61	233.94 tion L15 37.45 0 ole 5) -115.58 75.48	220.91 or L15a) 37.45 0 -115.58 70.27	217.85), also se 37.45 0 -115.58 76.95	225.57 ee Table 37.45 0 -115.58 79.32	242.01 5 37.45 0 -115.58 86.26	262.76 37.45 0 -115.58 94.1	282.26 37.45 0 -115.58 97.61	 	 (68) (69) (70) (71) (72)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	ang gains 37.45 s and fa 0 s e.g. ev -115.58 heating 99.98 internal	298.36 (calcula 37.45 ns gains 0 vaporatic -115.58 gains (1 97.6 gains =	290.64 ated in A 37.45 (Table 9 0 on (nega -115.58 Table 5) 92.67	274.2 ppendix 37.45 5a) 0 tive valu -115.58 85.96	253.45 L, equat 37.45 0 es) (Tab -115.58 81.61	233.94 tion L15 37.45 0 le 5) -115.58 75.48 (66)	220.91 or L15a) 37.45 0 -115.58 70.27 m + (67)m	217.85), also se 37.45 0 -115.58 76.95 n + (68)m -	225.57 ee Table 37.45 0 -115.58 79.32 + (69)m + (242.01 5 37.45 0 -115.58 86.26 (70)m + (7	262.76 37.45 0 -115.58 94.1 1)m + (72)	282.26 37.45 0 -115.58 97.61 m	 	(68) (69) (70) (71) (72)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	233.23 ng gains 37.45 s and fai 0 s e.g. ev -115.58 heating 99.98 internal 488.39	298.36 (calcula 37.45 ns gains 0 vaporatic -115.58 gains (1 97.6 gains = 486.08	290.64 ated in A 37.45 (Table 9 0 on (nega -115.58 Table 5) 92.67 	274.2 ppendix 37.45 5a) 0 tive valu -115.58 85.96	253.45 L, equat 37.45 0 es) (Tab -115.58 81.61 412.35	233.94 tion L15 37.45 0 ole 5) -115.58 75.48 (66) 385.01	220.91 or L15a) 37.45 0 -115.58 70.27 m + (67)m 367.51	217.85), also se 37.45 0 -115.58 76.95 n + (68)m - 374.12	225.57 ee Table 37.45 0 -115.58 79.32 + (69)m + (388.65	242.01 5 37.45 0 -115.58 86.26 (70)m + (7 416.73	262.76 37.45 0 -115.58 94.1 1)m + (72) 449.01	282.26 37.45 0 -115.58 97.61 m 473.74	 	 (68) (69) (70) (71) (72) (73)

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

Orienta	ition:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.48	×	10.63) ×	0.76	×	0.7] =	9.72	(74)
North	0.9x	0.77	x	2.48	×	20.32	x	0.76	×	0.7] =	18.58	(74)
North	0.9×	0.77	x	2.48	×	34.53	x	0.76	×	0.7] =	31.57	(74)
North	0.9x	0.77	x	2.48	×	55.46	x	0.76	×	0.7] =	50.71	(74)
North	0.9x	0.77	x	2.48	×	74.72	x	0.76	×	0.7] =	68.31	(74)
North	0.9x	0.77	x	2.48	×	79.99	x	0.76	×	0.7] =	73.13	(74)
North	0.9x	0.77	x	2.48	×	74.68	x	0.76	×	0.7] =	68.28	(74)
North	0.9x	0.77	x	2.48	×	59.25	x	0.76	×	0.7] =	54.17	(74)
North	0.9x	0.77	x	2.48	×	41.52	x	0.76	×	0.7	j =	37.96	(74)
North	0.9x	0.77	x	2.48	×	24.19	x	0.76	×	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	j =	8.1	– (74)
South	0.9x	0.77	x	17.35	x	46.75	x	0.85	×	0.7	1 =	334.46	(78)
South	0.9x	0.77	x	17.35	x	76.57	x	0.85	x	0.7	1 =	547.77	(78)
South	0.9x	0.77	x	17.35	x	97.53	x	0.85	×	0.7	1 =	697.76	– (78)
South	0.9x	0.77	x	17.35	×	110.23	x	0.85	х	0.7	1 =	788.62	(78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	114.87	x	0.85	x	0.7	i -	821.79	(78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	110.55	i 🖌	0.85	x	0.7	j =	790.86	– (78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	108.01	x	0.85	x	0.7	1 =	772.72	(78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	×	104.89	x	0.85	x	0.7	1 =	750.42	(78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	101.89	×	0.85	x	0.7	1 =	728.89	– (78)
Sout <mark>h</mark>	0.9x	0.77	x	17.35	x	82.59	x	0.85	x	0.7] =	590.82	(78)
South	0.9×	0.77	x	17.35	×	55.42	x	0.85	×	0.7] =	396.45	(78)
South	0.9x	0.77	x	17.35	x	40.4	x	0.85	x	0.7	i =	289.01	– (78)
West	0.9x	0.77	x	1.5	×	19.64	x	0.85	×	0.7] =	12.15	(80)
West	0.9×	0.77	x	1.5	×	38.42	x	0.85	×	0.7] =	23.76	(80)
West	0.9x	0.77	x	1.5	×	63.27	x	0.85	×	0.7	=	39.13	(80)
West	0.9x	0.77	x	1.5	×	92.28	x	0.85	×	0.7] =	57.08	(80)
West	0.9x	0.77	x	1.5	×	113.09	x	0.85	×	0.7] =	69.95	(80)
West	0.9x	0.77	x	1.5	x	115.77	x	0.85	×	0.7	1 =	71.6	(80)
West	0.9x	0.77	x	1.5	×	110.22	x	0.85	×	0.7	1 =	68.17	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.85	×	0.7] =	58.56	(80)
West	0.9x	0.77	x	1.5	×	73.59	×	0.85	×	0.7] =	45.52	(80)
West	0.9x	0.77	x	1.5	×	45.59	×	0.85	×	0.7] =	28.2	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.85	×	0.7	j =	15.15	- (80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.85	×	0.7	i =	9.99	– (80)

Solar gains in watts, calculated for each month(83)m = Sum(74)m (82)m													
(83)m=	356.33	590.11	768.46	896.41	960.05	935.6	909.17	863.14	812.37	641.13	423.6	307.1	(83)
Total g	ains – ir	nternal a	ind solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts						
(84)m=	844.72	1076.2	1237.45	1337.55	1372.4	1320.6	1276.68	1237.26	1201.02	1057.86	872.61	780.84	(84)

7. Me	an inter	nal temp	berature	(heating	season)								
Temperature during heating periods in the living area from Table 9, Th1 (°C)											21	(85)		
Utilisation factor for gains for living area, h1,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.98	0.97	0.93	0.94	0.98	0.99	1	1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)														
(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)
Temp	erature	durina h	neating p	eriods ir	n rest of	dwellina	from Ta	ble 9 T	h2 (°C)					
(88)m=	18.05	18.05	18.05	18.06	18.06	18.06	18.06	18.06	18.06	18.06	18.05	18.05		(88)
Utilisation factor for gains for rest of dwelling, h2.m (see Table 9a)														
(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	na T2 (f	nllow ste	$\frac{1}{2}$ s $\frac{1}{2}$ s $\frac{1}{2}$	7 in Tahl	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 internal temperature (for the whole dwelling) = $f(A \times T_1 + (1 - f(A) \times T_2)$														
(92)m-	15 54	15.8	16 29	16 99	17 74	18 47	18.88	+ (1 – 1L 	A) X 12	17 33	16 32	15.5		(92)
		nent to t		internal	temper	ature fro	m Table	A whe			10.02	10.0		(0-)
(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)
	aca haa	ting requ	uirement	10.00	17.74	10.41	10.00	10.04	10.01	17.00	10.02	10.0		(
Set Ti to the mean interrol temperature obtained at step 11 of Table 0b, so that Time (76)m and re calculate														
the ut	ilisation	factor fo	or gains	using Ta	ble 9a				5, 30 tha	u i i , i i i – (/ 0)111 a11		ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	ation fac	tor for g	ains, hm	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)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	842.13	1069.77	1224.12	1310.56	1316.04	1195.18	994.79	1002.17	1120.99	1038.9	867.95	778.91		(95)
Month	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)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	7543.21	7300.23	6549.17	5364.93	4001.2	2543.96	1498.73	1602.18	2772.76	4459.64	6127.76	7534.9		(97)
Space	e heatin	g require	ement fo	r each n	honth, k\	Nh/mont	h = 0.02	24 x [(97)m – (95)m] x (4′	1)m			
(98)m=	4985.6	4186.87	3961.84	2919.14	1997.76	0	0	0	0	2545.03	3787.07	5026.45		-
Total per year (kWh/year) = Sum(98) _{15,912} =									29409.76	(98)				
Space heating requirement in kWh/m²/year									229.76	(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								ļ	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; the latter														

includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community boilers

1 (3	03a)
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Fraction of total space heat from Community boilers	(3	02) x (303a) =	1	(304a)								
Factor for control and charging method (Table 4c(3)) for communi	1	(305)										
Distribution loss factor (Table 12c) for community heating system	1.05	(306)										
Space heating			kWh/year] ,								
Annual space heating requirement			29409.76									
Space heat from Community boilers	(98) x (304a) x (30	5) x (306) =	30880.24	(307a)								
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appendix	E)	0	(308								
Space heating requirement from secondary/supplementary system	n (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) =											
Electricity used for heat distribution	0.01 × [(307a)(307e) +	(310a)(310e)] =	332.62	(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 ou	itside		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)			472.83	(332)								
12b. CO2 Emissions – Community heating scheme												
	Energy E kWh/year k	mission factor g 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 tw	vo fuels repeat (363) to (366	 for the second full 	uel 90	(367a)								
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	0	= 7982.98	(367)								
Electrical energy for heat distribution [(3	13) x	0.52	= 172.63	(372)								
Total CO2 associated with community systems (36	3)(366) + (368)(372)		= 8155.61	(373)								
CO2 associated with space heating (secondary) (30	9) x	0	= 0	(374)								
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.22	= 0	(375)								
Total CO2 associated with space and water heating (37	8155.61	(376)										
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	= 0	(378)								
CO2 associated with electricity for lighting (33	2))) x	0.52	= 245.4	(379)								
Total CO2, kg/year sum of (376)(382) =			8401.01	(383)								
Dwelling CO2 Emission Rate (383) ÷ (4) =			65.63	(384)								
El rating (section 14)			39.8	(385)								
User Details:												
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Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa	a Num Ire Ver	ber: sion:		Versio	on: 1.0.3.15			
		Pi	roperty A	Address:	Unit 6							
Address :												
1. Overall dwelling dime	nsions:											
			Area	a(m²)		Av. He	ight(m)	1	Volume(m ³)		
Basement			2	247	(1a) x	4	.09	(2a) =	1010.23	(3a)		
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n) 2	247	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	1010.23	(5)		
2. Ventilation rate:												
	main so heating h	econdar <u>y</u> leating	у	other		total			m ³ per hou	r		
Number of chimneys		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				Ē	4	x ′	10 =	40	(7a)		
Number of passive vents					Ē	0	x ′	10 =	0	(7b)		
Number of flueless gas fir	res				Γ	0	X 4	40 =	0	(7c)		
Air changes per hour												
Infiltration due to chimney	/s, flues and fans = (6	a)+(6b)+(7	a)+(7b)+(7	7c) =	Ę	40		÷ (5) =	0.04	(8)		
If a pressurisation test has be	een carried out or is intende	ed, proceed	d to (17), c	otherwise c	ontinue fre	om (9) to ((16)					
Additional infiltration	ie dweining (iis)						[(9)	-11x0.1 =	0	-(10)		
Structural infiltration: 0.	25 for steel or timber	frame or	0.35 for	masonr	y constr	uction			0			
if both types of wall are pr	esent, use the value corres	ponding to	the greate	er wall area	a (after							
deducting areas of openin	igs); if equal user 0.35 loor_enter 0.2 (unseal	ed) or 0	1 (seale	d) alsa	enter ()				0			
If no draught lobby ent	rer 0.05 else enter 0		1 (00010	u), 0100					0	$-1^{(12)}_{(13)}$		
Percentage of windows	and doors draught st	ripped							0	$= \frac{(10)}{(14)}$		
Window infiltration	0	••		0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)		
Air permeability value,	q50, expressed in cub	oic metres	s per ho	ur per so	quare m	etre of e	envelope	area	10	(17)		
If based on air permeabili	ty value, then (18) = [(1	7) ÷ 20]+(8	8), otherwis	se (18) = (16)				0.54	(18)		
Air permeability value applies	s if a pressurisation test has	s been don	e or a deg	ıree air per	meability	is being u	sed			_		
Number of sides sheltered	d			(20) – 1 - [0 075 v (1	Q)] —			1	(19)		
Infiltration rate incorporati	ing chalter factor			(20) - 1 [x (20) -	0)] –			0.92			
Infiltration rate modified for	ar monthly wind apoor	J		(21) = (10)	x (20) -				0.5	_(21)		
	Mar Apr May		hul	Διια	Sen	Oct	Nov	Dec				
	and from Table 7	Jun	Jui	Aug	Seb	001		Dec				
$(22)_{m=}$		3.8	2.8	37	Δ	43	15	A 7				
(<u>)</u>	7.0 7.7 7.7 4.0	5.0	5.0	5.7	7	т.5	4.5	-+ ./	l			
Wind Factor $(22a)m = (22a)m$	2)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 infilt	tration rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.64	0.62	0.61	0.55	0.54	0.47	0.47	0.46	0.5	0.54	0.56	0.59		
Calculate effe	ective air	change	rate for t	he appli	cable ca	se					-	-	
If exhaust air	beat numn i	using App	andix N (2	3h) - (23a	a) v Emv (e	austion (1	N5)) othe	rwise (23h) - (23a)			0	(238)
If balanced wi	ith heat reco	overv: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) –) – (20a)			0	(23D)
a) If balance			ntilation	with hor	of in doo in			$y^{-} = (2)^{+}$	2b)m i (22h) v [1 (22a)	· 1001	(230)
(24a)m = 0								a = (2)			$\frac{1-(230)}{1-0}$	 	(24a)
b) If balance		anical ve		without	heat rec		1 (1)/) (2/F	$\int_{-\infty}^{-\infty} (2')$	$1 \sim \frac{1}{2}$	23h)	Ů	J	
(24b)m = 0				0						200)	0]	(24b)
c) If whole		tract ver				ventilatio	n from (Ů	Ů	Ů	J	
if (22b)	$m < 0.5 \times$	(23b), t	then (24	c) = (23b)); other	vermand vise (24	c) = (22)	m + 0.	.5 × (23b))			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natura	l ventilatio	n or wh	ole hous	e positiv	/e input '	ventilatio	n from l	oft	Į	!	Į	1	
, if (22b)	m = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			_	
(24d)m= 0.7	0.69	0.69	0.65	0.64	0.61	0.61	0.61	0.62	0.64	0.66	0.67		(24d)
Effective ai	Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)												
(25)m= 0.7	0.69	0.69	0.65	0.64	0.61	0.61	0.61	0.62	0.64	0.66	0.67		(25)
3. Heat loss	es and he	eat loss i	oaramete	er:							_		
	Gros	ss	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value	e	A X k
	area	(m²)	m	12	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²·l	K	kJ/K
Doo <mark>rs Type 1</mark>					13.1	x	3	=	39.3				(26)
Doo <mark>rs Ty</mark> pe 2	2				13.1	x	3	_ =	39.3				(26)
Doors Type 3	3				13.1	x	3		39.3				(26)
Doors Type 4	ł	'			2.5	x	1.4	=	3.5				(26)
Windows Typ	be 1				17.22	<u>x</u> 1	/[1/(4.8)+	0.04] =	69.34				(27)
Windows Typ	be 2				0.6	x1	/[1/(4.8)+	0.04] =	2.42				(27)
Windows Typ	be 3				6	x1	/[1/(4.8)+	0.04] =	24.16	=			(27)
Walls Type1	102	.6	63.1	2	39.48	3 X	2.1	=	82.91				(29)
Walls Type2	54.8	8	0		54.8	x	0.28	-	15.34	i F		- -	(29)
Walls Type3	43.5	56	2.5		41.06	x	2.1		86.23			╡╞	(29)
Walls Type4	15.0)5			15.05			 	4 52				(29)
Roof	95.0	<u>~</u>			85.24		0.0		105 00				(20)
Total area of		 			204.0		L2.3		190.90				(31)
* for windows an	ad roof wind	0WS 1150 6	offective wi	ndow H-ve		ated using	n formula 1	/[(1/ __)]	µe)+0 041 e	as aiven in	naraarank	132	(31)
		sides of i				aica usiriy	, ionnuia 1	/I(1/0-vail	,o)+0.0 +] c	o given III	ραιαγιαρι	, 0.2	

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

((28)...(30) + (32) + (32a)...(32e) =

Indicative Value: High

** include the areas on both sides of internal	walls and partitions
Fabric heat loss, $W/K = S (A \times U)$	

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter	(TMP = Cm)	÷ TFA)	in kJ/m²k
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For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

0	(34)
450	(35)

(33)

602.3

if details	of therma	al bridging	are not kr	10wn (36) =	= 0.15 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			648.7	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	у	-			(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	234.19	231.57	229	216.93	214.68	204.17	204.17	202.22	208.21	214.68	219.24	224.02		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	882.89	880.27	877.7	865.63	863.37	852.86	852.86	850.91	856.91	863.37	867.94	872.72		
									(10)	Average =	Sum(39)1	12 /12=	865.62	(39)
Heat l	oss para	Imeter (H	HLP), W/	/m²K		0.15	0.45		(40)m	= (39)m ÷	(4)	0.50		
(40)m=	3.57	3.56	3.55	3.5	3.5	3.45	3.45	3.44	3.47	3.5	3.51	3.53	0.5	
Numb	Number of days in month (Table 1a)												3.5	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting enei	rgy requ	irement:								kWh/ye	ear:	
A		un on ou d	NI										I	(10)
if TF	A > 13.	1pancy, 1 9, N = 1	n + 1.76 x	(1 - exp	(-0.0003	849 x (TF)2)] + 0.() 2013 x (TFA -13.	<u>3.</u> 9)	06		(42)
if TF	A £ 13.	9, N = 1				,			,		,			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36	a target o	100	6.95		(43)
not mor	e that 125	litres per j	person pe	r day (all w	ater use, l	hot and co	ld)	lo acriieve	a water us	se largel o	1			
	lan	Eab	Mar	Apr	May	lup		Αυσ	Sen	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	U Dep		INOV	Dec		
(44)m=	117.64	113.36	109.09	104.81	100.53	96.25	96.25	100.53	104.81	109.09	113.36	117.64		
										Total = Su	m(44) ₁₁₂ =		1283.36	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D)))))))))))))))))))) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	174.46	152.58	157.45	137.27	131.71	113.66	105.32	120.86	122.3	142.53	155.58	168.95		
16 1				• • f · · · • · / • ·		(h		Total = Su	m(45) ₁₁₂ =	=	1682.69	(45)
ii instan	taneous v	ater neatil I	ng at point I	r or use (no T) not water I	r storage), I	enter 0 in 1	Doxes (40) to (61)	1	1	1	I	
(46)m=	26.17	22.89	23.62	20.59	19.76	17.05	15.8	18.13	18.35	21.38	23.34	25.34		(46)
Storac	ie volum	e (litres)	includir	na anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If com	, munitv h	neating a	ind no ta	ank in dw	vellina. e	nter 110) litres in	(47)				100		~ /
Other	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energ	y lost fro	om water	· storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If n	hanufact	urer's de	eclared (cylinder	loss fact	or is not	known:							(5.4)
If com	ater Stor munity k	aye 1088 Neating s	ee secti	on 4 3	ie ∠ (KVV	1/11119/02	ay)				0.	02		(51)
Volum	e factor	from Ta	ble 2a	UI 7.U				1.03						(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energ	y 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 cal	culated	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 cylinde	er 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 Append	lix 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)
Primar	ry circuit	loss (an	nual) fro	om Table	93	-		-			-	0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	229.74	202.51	212.73	190.76	186.99	167.15	160.6	176.14	175.8	197.81	209.08	224.23		(62)
Solar DI	HW input	calculated	using App	endix G o	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter										_	
(64)m=	229.74	202.51	212.73	190.76	186.99	167.15	160.6	176.14	175.8	197.81	209.08	224.23		_
								Outp	out from wa	ater heate	r (annual)₁	12	2333.53	(64)
Hea <mark>t g</mark>	jains fro	m water	heating	, kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	+ (61)n	n] + 0.8 >	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m=	76.62	67.5 <mark>4</mark>	70.96	63.65	62.4	55.8	53.6 <mark>3</mark>	58.8	58.68	66	69.74	74.79		(65)
inclu	ude (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in t <mark>he</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	neating	
5. Int	ternal ga	ains (see	Table 5	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	ts										
	Jan	E . L						_						
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	153.15	Feb 153.15	Mar 153.15	Apr 153.15	May 153.15	Jun 153.15	Jul 153.15	Aug 153.15	Sep 153.15	Oct 153.15	Nov 153.15	Dec 153.15		(66)
(66)m= Lightin	153.15 Ig gains	153.15 (calcula	Mar 153.15 ted in Ap	Apr 153.15 opendix	May 153.15 L, equat	Jun 153.15 ion L9 o	Jul 153.15 r L9a), a	Aug 153.15 Iso see	Sep 153.15 Table 5	Oct 153.15	Nov 153.15	Dec 153.15		(66)
(66)m= Lightin (67)m=	153.15 ng gains 41.86	Feb 153.15 (calculat 37.18	Mar 153.15 ted in Aj 30.24	Apr 153.15 opendix 22.89	May 153.15 L, equat 17.11	Jun 153.15 ion L9 of 14.45	Jul 153.15 r L9a), a 15.61	Aug 153.15 Iso see 20.29	Sep 153.15 Table 5 27.23	Oct 153.15 34.58	Nov 153.15 40.36	Dec 153.15 43.02		(66)
(66)m= Lightin (67)m= Applia	153.15 ng gains 41.86 nces ga	153.15 (calcula 37.18 ins (calc	Mar 153.15 ted in Ar 30.24 ulated ir	Apr 153.15 opendix 22.89	May 153.15 L, equat 17.11 dix L, eq	Jun 153.15 ion L9 of 14.45 uation L	Jul 153.15 r L9a), a 15.61 13 or L1	Aug 153.15 Iso see 20.29 3a), also	Sep 153.15 Table 5 27.23 see Ta	Oct 153.15 34.58 ble 5	Nov 153.15 40.36	Dec 153.15 43.02		(66) (67)
(66)m= Lightin (67)m= Applia (68)m=	153.15 ng gains 41.86 nces ga 413.78	153.15 (calcula 37.18 ins (calc 418.07	Mar 153.15 ted in Ap 30.24 ulated ir 407.25	Apr 153.15 22.89 Appendix 384.21	May 153.15 L, equat 17.11 dix L, eq 355.14	Jun 153.15 ion L9 o 14.45 uation L 327.81	Jul 153.15 r L9a), a 15.61 13 or L1 309.55	Aug 153.15 Iso see 20.29 3a), also 305.26	Sep 153.15 Table 5 27.23 see Ta 316.08	Oct 153.15 34.58 ble 5 339.11	Nov 153.15 40.36 368.19	Dec 153.15 43.02 395.52		(66) (67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookir	153.15 ng gains 41.86 nces ga 413.78 ng gains	Feb 153.15 (calcula: 37.18 ins (calc 418.07 (calcula:	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 ted in A	Apr 153.15 opendix 22.89 Append 384.21 ppendix	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a	Aug 153.15 Iso see 20.29 3a), also 305.26), also se	Sep 153.15 Table 5 27.23 see Ta 316.08 ee Table	Oct 153.15 34.58 ble 5 339.11 5	Nov 153.15 40.36 368.19	Dec 153.15 43.02 395.52		(66) (67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32	Feb 153.15 (calcula 37.18 ins (calc 418.07 (calcula 38.32	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 ted in A 38.32	Apr 153.15 opendix 22.89 Append 384.21 ppendix 38.32	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a) 38.32	Aug 153.15 lso see 20.29 3a), also 305.26), also se 38.32	Sep 153.15 Table 5 27.23 See Ta 316.08 ee Table 38.32	Oct 153.15 34.58 ble 5 339.11 5 38.32	Nov 153.15 40.36 368.19 38.32	Dec 153.15 43.02 395.52 38.32		(66) (67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fa	rep 153.15 (calcula 37.18 ins (calc 418.07 (calcula 38.32 ns gains	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 tted in A 38.32 (Table \$	Apr 153.15 opendix 22.89 Append 384.21 ppendix 38.32 5a)	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32	Jun 153.15 ion L9 o 14.45 uation L 327.81 tion L15 38.32	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a 38.32	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32	Sep 153.15 Table 5 27.23 5 see Ta 316.08 5 e Table 38.32	Oct 153.15 34.58 ble 5 339.11 5 38.32	Nov 153.15 40.36 368.19 38.32	Dec 153.15 43.02 395.52 38.32		(66) (67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fat	Feb 153.15 (calcula: 37.18 ins (calc 418.07 (calcula: 38.32 ns gains 0	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 ted in A 38.32 (Table 8 0	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a) 38.32 0	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32	Sep 153.15 Table 5 27.23 5 see Ta 316.08 5 Table 38.32 0	Oct 153.15 34.58 ble 5 339.11 5 38.32 0	Nov 153.15 40.36 368.19 38.32 0	Dec 153.15 43.02 395.52 38.32 0		(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev	rep 153.15 (calcula 37.18 ins (calc 418.07 (calcula 38.32 ns gains 0 vaporatio	Mar 153.15 ted in Ap 30.24 ulated in 407.25 ted in A 38.32 (Table \$ 0 on (nega	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0 tive valu	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32 0 es) (Tab	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32 0 le 5)	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a 38.32	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32	Sep 153.15 Table 5 27.23 5 see Ta 316.08 38.32 0	Oct 153.15 34.58 ble 5 339.11 5 38.32 0	Nov 153.15 40.36 368.19 38.32 0	Dec 153.15 43.02 395.52 38.32 0		(66)(67)(68)(69)(70)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fai 0 s e.g. ev -122.52	Feb 153.15 (calcular 37.18 ins (calc 418.07 (calcular 38.32 ns gains 0 raporation -122.52	Mar 153.15 ted in Ap 30.24 ulated in 407.25 ted in A 38.32 (Table 9 0 n (nega -122.52	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0 tive valu -122.52	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32 0 le 5) -122.52	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a 38.32 0	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32 0	Sep 153.15 Table 5 27.23 5 see Ta 316.08 26 Table 38.32 0 -122.52	Oct 153.15 34.58 ble 5 339.11 5 38.32 0 -122.52	Nov 153.15 40.36 368.19 38.32 0	Dec 153.15 43.02 395.52 38.32 0 -122.52		 (66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52 heating	rep 153.15 (calcula 37.18 ins (calc 418.07 (calcula 38.32 ns gains 0 raporatio -122.52 gains (T	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 ited in A 38.32 (Table 5 0 on (nega -122.52 Table 5)	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0 tive valu -122.52	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32 0 ole 5) -122.52	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a) 38.32 0	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32 0 -122.52	Sep 153.15 Table 5 27.23 5 see Ta 316.08 20 Table 38.32 0 -122.52	Oct 153.15 34.58 ble 5 339.11 5 38.32 0 -122.52	Nov 153.15 40.36 368.19 38.32 0 -122.52	Dec 153.15 43.02 395.52 38.32 0 -122.52		 (66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fa 0 s e.g. ev -122.52 heating 102.98	Feb 153.15 (calcular 37.18 ins (calc 418.07 (calcular 38.32 ns gains 0 -122.52 gains (T 100.51	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 ted in A 38.32 (Table 9 0 on (nega -122.52 Table 5) 95.38	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0 tive valu -122.52 88.41	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52 83.88	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32 0 le 5) -122.52 77.5	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a 38.32 0 -122.52 72.08	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32 0 -122.52 79.03	Sep 153.15 Table 5 27.23 5 see Ta 316.08 26 Table 38.32 0 -122.52 81.49	Oct 153.15 34.58 ble 5 339.11 5 38.32 0 -122.52 88.71	Nov 153.15 40.36 368.19 38.32 0 -122.52 96.86	Dec 153.15 43.02 395.52 38.32 0 -122.52 100.52		 (66) (67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	153.15 ng gains 41.86 nces ga 413.78 ng gains 38.32 s and fai 0 s e.g. ev -122.52 heating 102.98	Feb 153.15 (calcular 37.18 ins (calc 418.07 (calcular 38.32 ns gains 0 raporation -122.52 gains (T 100.51	Mar 153.15 ted in Ap 30.24 ulated in 407.25 ted in A 38.32 (Table 9 0 n (nega -122.52 Table 5) 95.38	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0 tive valu -122.52 88.41	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52 83.88	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32 0 le 5) -122.52 77.5 (66)	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a 38.32 0 -122.52 72.08 m + (67)m	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32 0 -122.52 79.03 n + (68)m -	Sep 153.15 Table 5 27.23 5 see Ta 316.08 38.32 0 -122.52 81.49 + (69)m + (Oct 153.15 34.58 ble 5 339.11 5 38.32 0 -122.52 88.71 (70)m + (7	Nov 153.15 40.36 368.19 38.32 0 -122.52 96.86 1)m + (72)	Dec 153.15 43.02 395.52 38.32 0 -122.52 100.52 m		 (66) (67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	153.15 ag gains 41.86 nces ga 413.78 ag gains 38.32 a and fai 0 s e.g. ev -122.52 heating 102.98 internal 627.56	Feb 153.15 (calcula: 37.18 ins (calc 418.07 (calcula: 38.32 ns gains 0 raporatio -122.52 gains (T 100.51 gains = 624.7	Mar 153.15 ted in Ap 30.24 ulated ir 407.25 ited in A 38.32 (Table 8 0 on (nega -122.52 Table 5) 95.38 601.81	Apr 153.15 ppendix 22.89 Append 384.21 ppendix 38.32 5a) 0 tive valu -122.52 88.41 564.46	May 153.15 L, equat 17.11 dix L, eq 355.14 L, equat 38.32 0 es) (Tab -122.52 83.88	Jun 153.15 ion L9 of 14.45 uation L 327.81 tion L15 38.32 0 le 5) -122.52 77.5 (66) 488.7	Jul 153.15 r L9a), a 15.61 13 or L1 309.55 or L15a) 38.32 0 -122.52 72.08 m + (67)m 466.19	Aug 153.15 Iso see 20.29 3a), also 305.26), also se 38.32 0 -122.52 79.03 n + (68)m - 473.52	Sep 153.15 Table 5 27.23 5 see Ta 316.08 2e Table 38.32 0 -122.52 81.49 + (69)m + 0 493.75	Oct 153.15 34.58 ble 5 339.11 5 38.32 0 -122.52 88.71 (70)m + (7 531.35	Nov 153.15 40.36 368.19 38.32 0 -122.52 96.86 1)m + (72) 574.36	Dec 153.15 43.02 395.52 38.32 0 -122.52 100.52 m 608.01		 (66) (67) (68) (69) (70) (71) (72) (73)

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

Orienta	ation:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.6	×	10.63	×	0.85	x	0.7] =	2.63	(74)
North	0.9x	0.77	x	0.6	x	20.32	x	0.85	x	0.7] =	5.03	(74)
North	0.9x	0.77	x	0.6	x	34.53	×	0.85	x	0.7] =	8.54	(74)
North	0.9x	0.77	x	0.6	x	55.46	×	0.85	x	0.7	=	13.72	(74)
North	0.9x	0.77	x	0.6	x	74.72	x	0.85	x	0.7] =	18.48	(74)
North	0.9x	0.77	x	0.6	x	79.99	×	0.85	x	0.7] =	19.79	(74)
North	0.9x	0.77	x	0.6	x	74.68	×	0.85	x	0.7	=	18.48	(74)
North	0.9x	0.77	x	0.6	x	59.25	x	0.85	x	0.7	=	14.66	(74)
North	0.9x	0.77	x	0.6	x	41.52	×	0.85	x	0.7] =	10.27	(74)
North	0.9x	0.77	x	0.6	x	24.19	x	0.85	x	0.7] =	5.98	(74)
North	0.9x	0.77	x	0.6	x	13.12	x	0.85	x	0.7] =	3.25	(74)
North	0.9x	0.77	x	0.6	x	8.86	x	0.85	x	0.7	j =	2.19	(74)
East	0.9x	1	x	17.22	x	19.64	x	0.85	x	0.7	1 =	139.45	– (76)
East	0.9x	1	x	17.22	x	38.42	x	0.85	x	0.7	1 =	272.8	(76)
East	0.9x	1	x	17.22	x	63.27	x	0.85	x	0.7	j =	449.27	– (76)
East	0.9x	1	x	17.22	×	92.28	x	0.85	x	0.7		655.23	(76)
East	0.9x	1	x	17.22	x	113.09	x	0.85	x	0.7	i -	803	– (76)
East	0.9x	1	x	17.22	x	115.77	×	0.85	x	0.7	i =	822.02	(76)
East	0.9x	1	x	17.22	x	110.22	x	0.85	x	0.7	i =	782.59	(76)
East	0.9x	1	x	17.22	x	94.68	x	0.85	x	0.7	1 =	672.24	(76)
East	0.9x	1	x	17.22	x	73.59	×	0.85	x	0.7	1 =	522.51	(76)
East	0.9x	1	x	17.22	x	45.59	x	0.85	x	0.7] =	323.7	(76)
East	0.9x	1	х	17.22	×	24.49	x	0.85	x	0.7] =	173.88	(76)
East	0.9x	1	x	17.22	x	16.15	x	0.85	x	0.7] =	114.68	(76)
West	0.9x	0.77	x	6	x	19.64	x	0.85	x	0.7] =	48.59	(80)
West	0.9x	0.77	x	6	x	38.42	×	0.85	x	0.7] =	95.05	(80)
West	0.9x	0.77	x	6	x	63.27	x	0.85	x	0.7] =	156.54	(80)
West	0.9x	0.77	x	6	x	92.28	x	0.85	x	0.7] =	228.3	(80)
West	0.9x	0.77	x	6	x	113.09	x	0.85	x	0.7] =	279.79	(80)
West	0.9x	0.77	x	6	x	115.77	x	0.85	x	0.7] =	286.42	(80)
West	0.9x	0.77	x	6	x	110.22	x	0.85	x	0.7] =	272.68	(80)
West	0.9x	0.77	x	6	x	94.68	x	0.85	x	0.7] =	234.23	(80)
West	0.9x	0.77	x	6	x	73.59	x	0.85	x	0.7] =	182.06	(80)
West	0.9x	0.77	x	6	x	45.59	×	0.85	x	0.7] =	112.79	(80)
West	0.9x	0.77	x	6	x	24.49	×	0.85	×	0.7] =	60.59	(80)
West	0.9x	0.77	x	6	x	16.15	x	0.85	x	0.7	j =	39.96	(80)

Solar g	Solar gains in watts, calculated for each month $(83)m = Sum(74)m \dots (82)m$												
(83)m=	190.67	372.88	614.35	897.25	1101.28	1128.22	1073.75	921.12	714.85	442.47	237.71	156.83	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts													
(84)m=	818.24	997.59	1216.16	1461.71	1626.35	1616.93	1539.94	1394.64	1208.6	973.82	812.07	764.84	(84)

7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	1	1	1	0.99	0.97	0.98	1	1	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=	18.45	18.58	18.89	19.34	19.82	20.28	20.58	20.53	, 20.13	19.52	18.93	18.44	1	(87)
Temp	erature	durina h	eating p	eriods ir	n rest of	dwellina	from Ta	uble 9. Ti	h2 (°C)					
(88)m=	18.49	18.49	18.5	18.52	18.52	18.54	18.54	18.54	18.53	18.52	18.52	18.51		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	1	1	0.99	0.96	0.8	, 0.86	0.99	1	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	15.35	15.55	15.99	16.66	17.37	18.05	18.43	18.38	17.83	, 16.94	16.06	15.35	1	(90)
									f	LA = Livin	g area ÷ (4	4) =	0.55	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	llina) = fl	A x T1	+ (1 – fL	A) x T2			I		
(92)m=	17.04	17.21	17.57	18.12	18.71	19.27	19.6	19.55	19.09	1 <mark>8.35</mark>	17.63	17.04		(92)
Apply	adjustn	nent to t	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.04	17.21	17.57	18.12	18.71	1 <mark>9.27</mark>	19.6	19.55	19.09	18.35	17.63	17.04		(93)
8. Space heating requirement														
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate														
the ut	ilisation	factor fo	or gains	<mark>using</mark> Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	1	1	1	1	0.99	0.97	0.92	0.95	0.99	1	1	1	ı.	(94)
Usefu	I gains,	hmGm .	, W = (94	4)m x (84	4)m								1	
(95)m=	818.11	997.27	1215.14	1457.85	1612.35	1571.83	1419.1	1318.87	1196.74	972.6	811.86	764.75	ı.	(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8							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	e for mea	an intern I	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m I	– (96)m]			1	
(97)m=	11248.74	10832.37	9719.62	7985.28	6048.25	3983.27	2562.21	2682.19	4271.75	6690.73	9136.25	11205.5		(97)
Space	e heatin	g require	ement fo	r each m	honth, k\	Nh/mont	:h = 0.02	24 x [(97])m – (95)m] x (41	I)m		1	
(98)m=	7760.39	6609.19	6327.33	4699.75	3300.31	0	0	0	0	4254.29	5993.56	7767.91		
								Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	46712.73	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								189.12	(99)
9b. En	ergy rec	quiremer	nts – Cor	mmunity	heating	scheme								
This part is used for space heating, space cooling or water heating provided by a community scheme.														
Fractio	n of spa	ace heat	from se	condary/	supplen/	nentary h	neating (Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301) =						1	(302)
The com includes	The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter 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 commun	ity heating system		1] (305)
Distribution loss factor (Table 12c) for community heating system	, , , , , , , , , , , , , , , , , , , ,		1.05	(306)
Space heating			kWh/year	J
Annual space heating requirement		2	16712.73]
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	4	19048.37	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 100 ÷ (308) =		0	(309)
Water heating Annual water heating requirement			2333.53]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =		2450.21	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e	e)] =	514.99	(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 or	utside		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)			739.27	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy Emission fac kWh/year kg CO2/kWh	tor Emis kg C	ssions 02/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to (366) for the secon	d fuel	90	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x 0	=	12359.66	(367)
Electrical energy for heat distribution [(3	13) x 0.52	=	267.28	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372)	=	12626.94	(373)
CO2 associated with space heating (secondary) (3	09) x 0	=	0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x 0.22	=	0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		12626.94	(376)
CO2 associated with electricity for pumps and fans within dwelling	J (331)) x 0.52	=	0	(378)
CO2 associated with electricity for lighting (3	32))) x 0.52	=	383.68	(379)
Total CO2, kg/year sum of (376)(382) =			13010.62	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			52.67	(384)
El rating (section 14)			43.35	(385)

		l	User D	etails:								
Assessor Name: Software Name:	Ssessor Name: Stroma Number: oftware Name: Stroma FSAP 2012 Software Version: Version Property Address: Unit 7											
	london	PIC	репу ғ	Address:	Unit 7							
1 Overall dwelling dimen	sions:											
Basement			Area	1 (m²) 82	(1a) x	Av. He	ight(m) .05	(2a) =	Volume(m³ 250.1) (3a)		
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1n)		82	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	250.1	(5)		
2. Ventilation rate:												
Number of chimneys Number of open flues	$\begin{array}{c c} main & s \\ heating & l \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary neating 0	+	0 0 0] = [total 0 0	x 2	40 = 20 =	m ³ per hou	r (6a) (6b)		
Number of intermittent fan	S					2	X ´	0 =	20	(7a)		
Number of passive vents						0	x ′	10 =	0	(7b)		
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)		
								Air ch	anges per ho	our		
Infiltration due to chimneys	Air channel filtration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) = $ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)											
Number of storeys in the Additional infiltration	e dw <mark>elling</mark> (ns)	frame or 0	25 for	maconr	v constr	uction	[(9)	-1]x0.1 =	0	(9) (10)		
if both types of wall are pre deducting areas of opening	sent, use the value corres sent, if equal user 0.35	sponding to the	he greate	masoni er wall area	y constr a (after	ucuon			0	(11)		
If suspended wooden flo	oor, enter 0.2 (unsea	led) 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 s	tripped		0 25 - [0 2	v(14) - 1	001 -			0	(14)		
				(8) + (10) -	~ (14) ÷ 1	2) + (13) -	+ (15) -		0	(15)		
	50 expressed in cut	nic metres	ner ho			etre of e	nvelone	area	0			
If based on air permeabilit	v value, then $(18) = [(1)$	7) ÷ 20]+(8),	, otherwis	se(18) = (18)	16)		invelope	arca	0.58			
Air permeability value applies	if a pressurisation test ha	s been done	or a deg	ree air per	meability i	is being u	sed		0.00			
Number of sides sheltered									2	(19)		
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			0.85	(20)		
Infiltration rate incorporatir	ng shelter factor		((21) = (18)	x (20) =				0.49	(21)		
Infiltration rate modified for	r monthly wind spee	d										
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind spe	ed 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							I				
(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	d infiltrat	tion rate	e (allowir	ng for sh	elter an	nd wind s	speed) =	= (21a) x	(22a)m					
	0.63	0.62	0.6	0.54	0.53	0.47	0.47	0.46	0.49	0.53	0.55	0.58]	
Calculat	e effect	ive air c	change r	ate for t	he appli	cable ca	ise							(220)
lf exhau	ist air hea	t pump u	lion. Ising Anne	ndix N (2	3b) = (23;	a) x Emv (e	equation (N5)) othe	erwise (23h	(23a) = (23a)			0	(234)
lf balan	ced with h	neat reco	verv: effici	encv in %	allowing f	for in-use f	factor (fro	m Table 4h	n) =) = (200)			0	(230)
a) If b		moobo			with ho	ot room			n)m - (2	2h)m i (226) v [1 (220)		(230)
(24a)m-									a = (2	$\frac{20}{1}$		$\frac{1 - (230)}{1 - 0}$] - 100j]	(24a)
(2-10) b) If b:		mocha		ntilation	without				$\int_{-\infty}^{\infty}$	2b)m (22h)	Ů]	()
(24b)m-					without			101 V) (241	$\frac{1}{1}$	$\frac{20}{1}$	230)	0	1	(24b)
				tilation			Vontilati	on from		Ů	Ů	<u> </u>]	(=)
c) n w	(22b)m	$< 0.5 \times$	(23b), th	nen (240	r = (23t)	b): other	wise (24	lc) = (22)	b) m + 0	.5 x (23h))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If n	atural ve	entilatio	n or who	ole hous	e positi	ve input	ı ventilati	on from	loft	<u>I</u>			1	
if	(22b)m	= 1, the	en (24d)r	n = (22k)	o)m othe	erwise (2	24d)m =	0.5 + [(2	22b)m² x	0.5]				
(24d)m=	0.7	0.69	0.68	0.65	0.64	0.61	0.61	0.6	0.62	0.64	0.65	0.67]	(24d)
Effecti	ive air c	hange	rate - en	ter (24a) or (24l	o) or (24	c) or (24	4d) in bo	x (25)					
(25)m=	0.7	0.69	0.68	0.65	0.64	0.61	0.61	0.6	0.62	0.64	0.65	0.67		(25)
3 Heat	OSSAS	and he	at loss n	aramete	٥r.									_
ELEME	NT	Gros area	s (m²)	Openin m	gs 2	Net Ar A .r	rea m²	U-val W/m2	ue 2K	A X U (W/	K)	k-value kJ/m²·	ə K	A X k kJ/K
Doors T	ype 1		Ì			1.8	×	3	=	5.4	,			(26)
Doors T	vpe 2					16		14	=	2 24	Ħ			(26)
Window	s Type	1				5.56		1/[1/(4.8)+	+ 0.04] =	22.39	Ħ			(27)
Windows	s Type 2	2				4		1/[1/(4.8)+	+ 0.04] =	16 11	H			(27)
Windows	s Type (3				1 21	×	1/[1/(4.8)+	+ 0.04] =	4 87	=			(27)
Floor	- 71 -	_				82		1 25		102.5	ı ۲			(28)
Walls Ty	ne1	70.9	5	12.5	7	67.20		2.1		1/1 20			ᅴ	(29)
Walls Ty	/ne2	20.2	2	12.0		19.63		2.1	\exists	20.42			ᅴ	(20)
Roof	,poz	20.2	3	1.0		10.03	<u> </u>			59.12	╡╏		╡ ┝	(20)
Total are	a of ele	ments	/ m²	0		201.9	<u>^</u> ^	0.20		5.54	L			(31)
Dorty wa		incino,				201.0					—		—	(31)
Party wa	211 211					16.8		0	=	0	╡╏		\dashv	(32)
* for windo	ows and ro	oof windo	ows, use el	fective wi	ndow U-va	alue calcul	lated usin	g formula	= 1/[(1/U-valu	ue)+0.04] a	as given in	paragraph	∟ h 3.2	(32)
Fabric b	eat loss	\\//K -			s anu par	uuons		(26)(30)) + (32) =				220	46 (33)
Heat car	pacity C	m = S0	Axk)	-,					((28)	(30) + (3)	(32a)	(32e) =		(34)
Thermal	mass	arame	ter (TMP	' = Cm -	- TFA) ir	ר k.l/m²k			Indica	ative Value	-, . (020). : High	(020) -		(34)
For desiar	assessm	nents whe	ere the det	ails of the	construct	tion are not	t known n	reciselv th	e indicative	e values of	TMP in T	able 1f	450	J(33)
can be use	ed instead	l of a det	ailed calcu	lation.			P							
Thermal	bridges	s : S (L	x Y) calo	culated u	using Ap	opendix I	K						18.	4 (36)

if details of thermal bridging are not known $(36) = 0.15 \times (31)$

Total fa	abric hea	at loss							(33) +	(36) =			357.86	(37)
Ventila	tion hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	57.57	56.94	56.32	53.4	52.86	50.32	50.32	49.85	51.3	52.86	53.96	55.11		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	415.43	414.79	414.17	411.26	410.71	408.17	408.17	407.7	409.15	410.71	411.81	412.97		
Heat lo	ss para	meter (H	ILP), W/	′m²K					(40)m	Average = = (39)m ÷	Sum(39) _{1.}	12 /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]	
Numbe	un of dov	in mor	oth (Toh						,	Average =	Sum(40) ₁ .	12 /12=	5.02	(40)
NUMDE	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)
ļ													1	
4. Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
Assum		nancy I	N.									_	1	(40)
if TF	A > 13.9	9, N = 1	ҹ + 1.76 х	[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	9) <u>2</u>	.5	J	(42)
if TF	A £ 13.9	9, N = 1												
Annual Reduce	averag	e hot wa l average	ater usac	ge in litre usage by :	s per da 5% if the a	iy Vd,av welling is	erage = designed	(25 x N) to achieve	+ 36 a water us	se target o	93 g	.57		(43)
not more	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)			<u> </u>				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres p <mark>er</mark>	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					,	
(44)m=	1 <mark>0</mark> 2.93	99.18	<mark>9</mark> 5.44	91.7	87.95	84.21	84.21	87.95	91.7	95.44	99.18	102.93		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)))))))))))))))))))	- kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	1122.82	(44)
(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		
								1 1		I Total = Su	m(45) ₁₁₂ =		1472.19	(45)
lf instant	aneous w	ater heatii	ng 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)
Storag	storage e volum	ioss. e (litres)	includin	na anv so	olar or M	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comr	nunity h	eating a	nd no ta	nk in dw	ellina e	nter 110	litres in	(47)		001		100]	(-1)
Otherw	ise if no	stored	hot wate	er (this in	cludes i	nstantar	neous co	ombi boile	ers) ente	er '0' in (47)			
Water	storage	loss:											_	
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)
Energy	lost fro	m water	storage	, kWh/ye	ear		1	(48) x (49)	=		1	10		(50)
Hot wa	anufacti ter stora	urer's de age loss	factor fr	om Tabl	oss facto e 2 (kW	or is not h/litre/da	known: v)				0	02	1	(51)
If comr	nunity h	eating s	ee secti	on 4.3	(<i>.</i> ,				0.	02	1	(0.)
Volum	e factor	from Tal	ble 2a								1.	03]	(52)
Tempe	rature 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	5)								1.	03	J	(55)

Water	storage	loss cal	culated	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 cylind	er 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 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)
Prima	ry circuit	loss (ar	nual) fro	om Table	93							0		(58)
Prima	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	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	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((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 D	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(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		-
								Outp	out from wa	ater heate	r (annual)₁	12	2123.03	(64)
Heat g	jains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)n	n] + 0.8 >	(<mark>46)m</mark>	+ (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)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is fr</mark>	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	Table {	5 and 5a):									
Metab	olic gair	ns (Table	5), Wat	ts										
	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)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	21.14	18.77	15.27	11.56	8.64	7.29	7.88	10.24	13.75	17.46	20.38	21.72		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	i	i		
(68)m=	223.57	225.89	220.04	207.6	191.89	177.12	167.26	164.94	170.78	183.23	198.94	213.71		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)), also se	ee Table	5	-			
(69)m=	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5		(69)
Pumps	s and fa	ns gains	(Table \$	5a)										
(70)m=								-	-	-				(70)
	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	0 s e.g. ev	0 vaporatic	0 n (nega	0 tive valu	0 es) (Tab	0 ole 5)	0	0	0	0	0	0		(70)
Losse: (71)m=	0 s e.g. ev -99.99	0 vaporatic -99.99	0 n (nega -99.99	0 tive valu -99.99	0 es) (Tab -99.99	0 ole 5) -99.99	0 -99.99	0 -99.99	0 -99.99	0 -99.99	0 -99.99	0 -99.99		(70)
Losses (71)m= Water	0 s e.g. ev -99.99 heating	0 vaporatic -99.99 gains (T	0 n (nega -99.99 able 5)	0 tive valu -99.99	0 es) (Tab -99.99	0 ole 5) -99.99	0 -99.99	0 -99.99	0 -99.99	0 -99.99	0 -99.99	0 -99.99		(70)
Losse: (71)m= Water (72)m=	0 s e.g. ev -99.99 heating 93.23	0 /aporatic -99.99 gains (T 91.07	0 n (nega -99.99 āble 5) 86.58	0 tive valu -99.99 80.48	0 es) (Tab -99.99 76.51	0 ole 5) -99.99 70.94	0 -99.99 66.19	0 -99.99 72.27	0 -99.99 74.43	0 -99.99 80.74	0 -99.99 87.87	0 -99.99 91.07		(70) (71) (72)
Losses (71)m= Water (72)m= Total i	0 s e.g. ev -99.99 heating 93.23 internal	0 /aporatic -99.99 gains (T 91.07 gains =	0 n (nega -99.99 āble 5) 86.58	0 tive valu -99.99 80.48	0 es) (Tab -99.99 76.51	0 ble 5) -99.99 70.94 (66)	0 -99.99 66.19 m + (67)m	0 -99.99 72.27 n + (68)m -	0 -99.99 74.43 + (69)m + (0 -99.99 80.74 (70)m + (7	0 -99.99 87.87 1)m + (72)	0 -99.99 91.07 m		(70) (71) (72)
Losses (71)m= Water (72)m= Total i (73)m=	0 s e.g. ev -99.99 heating 93.23 internal 398.43	0 /aporatic -99.99 gains (T 91.07 gains = 396.22	0 n (nega -99.99 āble 5) 86.58 382.38	0 tive valu -99.99 80.48 360.13	0 es) (Tab -99.99 76.51 337.54	0 ole 5) -99.99 70.94 (66) 315.85	0 -99.99 66.19 m + (67)m 301.83	0 -99.99 72.27 + (68)m - 307.95	0 -99.99 74.43 + (69)m + (319.46	0 -99.99 80.74 (70)m + (7 341.93	0 -99.99 87.87 1)m + (72) 367.69	0 -99.99 91.07 m 387		(70)(71)(72)(73)

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

Orientation: Access Fa Table 6d		Access Factor Table 6d	r	Area m²	Flux Table 6a			g_ Table 6b	FF b Table 6c		Gains (W)		
North	0.9x	0.77	x	4	x	10.63	x	0.85	x	0.7] =	17.54	(74)
North	0.9x	0.77	x	4	x	20.32	x	0.85	x	0.7] =	33.52	(74)
North	0.9x	0.77	x	4	x	34.53	×	0.85	x	0.7] =	56.95	(74)
North	0.9x	0.77	x	4	x	55.46	x	0.85	x	0.7] =	91.48	(74)
North	0.9x	0.77	x	4	x	74.72	x	0.85	x	0.7	=	123.23	(74)
North	0.9x	0.77	x	4	x	79.99	x	0.85	x	0.7] =	131.92	(74)
North	0.9x	0.77	x	4	x	74.68	x	0.85	x	0.7] =	123.17	(74)
North	0.9x	0.77	x	4	x	59.25	x	0.85	x	0.7	=	97.72	(74)
North	0.9x	0.77	x	4	x	41.52	x	0.85	x	0.7	=	68.47	(74)
North	0.9x	0.77	x	4	x	24.19	×	0.85	x	0.7] =	39.9	(74)
North	0.9x	0.77	x	4	x	13.12	×	0.85	x	0.7] =	21.64	(74)
North	0.9x	0.77	x	4	x	8.86	×	0.85	x	0.7] =	14.62	(74)
East	0.9x	1	x	5.56	x	19.64	×	0.85	x	0.7] =	45.03	(76)
East	0.9x	1	x	5.56	x	38.42	x	0.85	x	0.7] =	88.08	(76)
East	0.9x	1	x	5.56	x	63.27	×	0.85	x	0.7	=	145.06	(76)
East	0.9x	1	x	5.56	×	92.28	x	0.85	х	0.7		211.56	(76)
East	0.9x	1	x	5.56	x	113.09	x	0.85	x	0.7] =	259.27	(76)
East	0.9x	1	x	5.56	x	115.77	×	0.85	x	0.7] =	265.41	(76)
East	0.9x	1	x	5.56	x	110.22	x	0.85	x	0.7	=	252.68	(76)
East	0.9x	1	x	5.56	x	94.68	x	0.85	x	0.7	=	217.05	(76)
East	0.9x	1	x	5.56	x	73.59	×	0.85	x	0.7] =	168.71	(76)
East	0.9x	1	x	5.56	x	45.59	x	0.85	x	0.7	=	104.52	(76)
East	0.9x	1	x	5.56	x	24.49	x	0.85	x	0.7] =	56.14	(76)
East	0.9x	1	x	5.56	x	16.15	×	0.85	x	0.7] =	37.03	(76)
West	0.9x	0.77	x	1.21	x	19.64	x	0.85	x	0.7] =	9.8	(80)
West	0.9x	0.77	x	1.21	x	38.42	x	0.85	x	0.7	=	19.17	(80)
West	0.9x	0.77	x	1.21	x	63.27	x	0.85	x	0.7] =	31.57	(80)
West	0.9x	0.77	x	1.21	x	92.28	x	0.85	x	0.7	=	46.04	(80)
West	0.9x	0.77	x	1.21	x	113.09	x	0.85	x	0.7	=	56.42	(80)
West	0.9x	0.77	x	1.21	x	115.77	x	0.85	x	0.7] =	57.76	(80)
West	0.9x	0.77	x	1.21	x	110.22	x	0.85	x	0.7] =	54.99	(80)
West	0.9x	0.77	x	1.21	x	94.68	x	0.85	x	0.7	=	47.24	(80)
West	0.9x	0.77	x	1.21	x	73.59	×	0.85	×	0.7] =	36.72	(80)
West	0.9x	0.77	x	1.21	×	45.59	×	0.85	x	0.7	=	22.75	(80)
West	0.9x	0.77	x	1.21	×	24.49	x	0.85	x	0.7	=	12.22	(80)
West	0.9x	0.77	x	1.21	x	16.15	x	0.85	x	0.7] =	8.06	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m=	72.36	140.77	233.58	349.08	438.93	455.1	430.84	362.01	273.9	167.16	90	59.71	(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	+ (83)m	, watts						
(84)m=	470.79	536.99	615.96	709.21	776.47	770.94	732.67	669.95	593.36	509.09	457.68	446.71	(84)

7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	a, h1,m	(see Ta	ble 9a)					I	<u>.</u>	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	1	0.99	0.97	0.94	0.96	0.99	1	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	r in Tabl	e 9c)					
(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	durina h	eating p	eriods ir	rest of	dwellina	from Ta	able 9. T	h2 (°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	ation fac	tor for g	ains for	rest of d	welling, l	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)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	14.32	14.55	15.08	15.87	16.74	17.56	18	17.95	17.32	, 16.24	15.16	14.29		(90)
									f	LA = Livin	g area ÷ (4	ł) =	0.53	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	llina) = fl	_A x T1	+ (1 – fL	A) x T2			ľ		
(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)
ا Apply	adjustn	nent to tl	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	opri <mark>ate</mark>				
(93)m=	16.19	16.38	16.83	17. <mark>4</mark> 9	18.21	18.9	19.3	19.25	18.69	17.79	16.89	16.17		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	i to the i	mean i <mark>nt</mark>	ernal ter	nperatur	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	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										(0.4)
(94)m=	1	1	0.99	0.99	0.97	0.93	0.86	0.89	0.97	0.99	1	1	l	(94)
Usetu	Il gains,	hmGm .	, W = (94)	4)m x (84	1)m						1.50.11			(05)
(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	l	(95)
Montr	nly avera	age exte	ernal tem	perature	e from Ta		40.0	46.4	444	10.0	74	4.0	l	(06)
(90)m=	4.3	4.9		0.9	11.7	14.0	10.0	10.4	(00)	10.6	7.1	4.2	l	(30)
	1055 rate			ai tempe		Lm, vv =	=[(39)m2	x [(93)m	- (96)m	2052.22	4022.40	4042 52		(97)
Space	4940.07	4702.90	$\frac{4277.34}{2}$	r oach m	2075.04	1/50.47 Mb/mont	h = 0.02	1101.27	m = (95)	2952.55	4055.49	4942.32	1	(01)
(98)m-	3325 78	2840 86	2726 37	2037 63	1426 88		11 = 0.02		0	1820 68	2575.48	3345.4		
(00)11-	0020.10	2010.00	2720.07	2001.00	1120.00	Ŭ		Tota		(k)\/b/year) = Sum(9)	8)	20099.07	(98)
•								TOLA	i pei yeai	(KWII/year) – Sum(30	J) 15,912 -	20099.07	
Space	e heatin	g require	ement in	kWh/m ²	/year								245.11	(99)
9b. En	ergy rec	quiremer	nts – Cor	mmunity	heating	scheme								
This pa	art is us	ed for sp	ace hea	iting, spa	ace cooli	ng or wa	ater heat	ting prov	ided by	a commi	unity sch	ieme.		(201)
	n or spa		nom se		supplet		ieauiiy (Table I	1) U II N	Ulle		l	0	
Fractio	n of spa	ace heat	trom co	mmunity	system	1 – (301) =						1	(302)
The com includes	nmunity so boilers, h	cheme mag leat pumps	y obtain he s, geotheri	eat from se mal and wa	everal sour aste heat fi	rces. The p rom power	orocedure stations.	allows for See Appel	CHP and เ ndix C.	up to four o	other heat	sources; tl	he latter	

Fraction of heat from Community boilers

1 (303a)

Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commu	unity heating system	1] (305)
Distribution loss factor (Table 12c) for community heating system	m	1.05	(306)
Space heating		kWh/year	J
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 % (fro	om Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary syst	em (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)(307e) + (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 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) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)		373.27	(332)
12b. CO2 Emissions – Community heating scheme			-
	Energy Emission factor kWh/year 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	el 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)(372)	5721.07	(373)
CO2 associated with space heating (secondary)	(309) x 0	= 0	(374)
CO2 associated with water from immersion heater or instantane	eous 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 within dwelli	ing (331)) x 0.52	= 0	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	= 193.73	(379)
Total CO2, kg/year sum of (376)(382) =		5914.8	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		72.13	(384)
El rating (section 14)		41.53	(385)

			User D	etails:								
Assessor Name: Software Name:	Stroma FSAP 20)12	concrete	Stroma Softwa	a Num are Ver	ber: sion:		Versio	on: 1.0.3.15			
Addross :	london	FI	openy /	Audress.	Unito							
1 Overall dwelling dimer	sions:											
Basement			Area	a(m²) 70	(1a) x	Av. He	ight(m) 3.5	(2a) =	Volume(m ³ 245) (3a)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	1e)+(1n)	70	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	245	(5)		
2. Ventilation rate:	-											
Number of chimneys Number of open flues	main heating 0 + 0 +	secondary heating	y] + [_] + [_	0 0] = [total 0 0	x 2	40 = 20 =	m ³ per hou	r (6a) (6b)		
Number of intermittent fan	s					2	x ´	10 =	20	(7a)		
Number of passive vents					Г	0	x ′	10 =	0	(7b)		
Number of flueless gas fire	es				Ē	0	X 4	40 =	0	(7c)		
								Air ch	anges <mark>per</mark> ho	our		
Infiltration due to chimney If a pressurisation test has be Number of storeys in the	Air cha Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) = $ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)											
Additional infiltration	3.						[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	25 for steel or timbe sent, use the value corru (s); if equal user 0.35	er frame or esponding to	0.35 for	masonr er wall area	y constr a (after	uction			0	(11)		
If no draught lobby, enter	or 0.05 else enter 0		i (seale	u), eise					0	(12)		
Percentage of windows	and doors draught	, stripped							0	(13)		
Window infiltration	and deere aradyin	omppou		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)		
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)		
Air permeability value, c	50, expressed in cu	ubic metres	s per ho	ur per so	quare m	etre of e	envelope	area	10	(17)		
If based on air permeabilit	y value, then (18) = [[(17) ÷ 20]+(8), otherwi	se (18) = (16)				0.58	(18)		
Air permeability value applies	if a pressurisation test h	nas been done	e or a deg	ree air per	meability	is being u	sed			_		
Number of sides sheltered				(20) = 1 - [0 075 x (1	9)] =			1	(19)		
Infiltration rate incorporation	a shelter factor			(20) = (18)	x(20) =	0)] –			0.92	(20)		
Infiltration rate modified fo	r monthly wind spec	ed		() ()					0.54	(21)		
Jan Feb	Mar Apr May	v Jun	Jul	Aua	Sep	Oct	Nov	Dec				
Monthly average wind spe	ed from Table 7	, , , , , , , , , , , , , , , , , , , ,		,9	000	•••		200				
(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	_1 _1				L	1	1	I			
(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				

Adjuste	ed infilti	ation rat	e (allow	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
<u> </u>	0.69	0.67	0.66	0.59	0.58	0.51	0.51	0.5	0.54	0.58	0.61	0.63]	
Calcula If me	ate ette echanic	<i>ctive air</i> al ventila	<i>change</i> ition:	rate for t	he applic	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
lf bala	anced wit	h heat reco	overy: effic	ciency in %	allowing for	or in-use f	actor (from	n Table 4h) =	, , ,			0	(23c)
a) If	balance	ed mech	anical v	entilation	with hea	at recove	erv (MVI	HR) (24a	a)m = (2)	2b)m + ((23b) x [[•]	1 – (23c)	÷ 1001	(100)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	ed mech	anical v	entilation	without	heat rec	overv (N	и ЛV) (24b	m = (22)	1 2b)m + (23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	nouse ex	tract ve	ntilation c	or positiv	e input v	ventilatic	n from o	outside		!		1	
í	f (22b)r	n < 0.5 >	(23b),	then (24c	c) = (23b); otherv	vise (24	c) = (22k	o) m + 0.	.5 × (23k	c)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft					
i	f (22b)r	n = 1, th	en (24d)m = (22t	o)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]	1	1	1	
(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	J	(240)
Effec	ctive air	change	rate - e	nter (24a) or (24b	o) or (240	c) or (24	d) in box	(25)	0.07	0.00	0.7	1	(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. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN	1ENT	Gros	SS (m 2)	Openin	gs	Net Ar	ea	U-valu	ue	AXU		k-value	e la la la la la la la la la la la la la	A X k
Doore		area	(m²)	m	2	A,r	n²	vv/m2	.ĸ	(/ / /	K)	KJ/M ² ·I	ĸ	KJ/K
Minde		. 1				1.9		3	=	5.7	H			(20)
VVIndov	ws Type					8.7		/[1/(4.8)+	0.04] =	35.03				(27)
vvindov	ws Type	e 2				6.5	x1/	/[1/(4.8)+	0.04] =	26.17	Ц.			(27)
Window	ws Type	e 3				2.2	x1,	/[1/(4.8)+	0.04] =	8.86				(27)
Floor						70	x	1.25	=	87.5				(28)
Walls		116	.5	19.3		97.2	X	2.1	=	204.12	2			(29)
Roof		26.	7	0		26.7	x	0.28	=	7.48				(30)
Total a	rea of e	elements	, m²			213.2	2							(31)
Party v	vall					24.2	x	0	=	0				(32)
Party v	vall					8.6	x	0	=	0				(32)
* for win ** includ	dows and le the are	l roof wind as on both	ows, use sides of i	effective wi nternal wall	ndow U-va 's and part	alue calcul itions	ated using	formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	n 3.2	
Fabric	heat lo	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				374.8	36 (33)
Heat c	apacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TM	P = Cm ÷	- TFA) in	ı kJ/m²K			Indica	tive Value	e: High		450	(35)
For desig can be u	gn asses ised inste	sments wh ad of a de	ere the de tailed cald	etails of the culation.	constructi	on are not	t known pr	ecisely the	e indicative	e values of	f TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) ca	lculated u	using Ap	pendix ł	<						31.9	8 (36)
if details	of therm	al bridging	are not ki	nown (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			406.8	34 (37)
Ventila	tion he	at loss ca	alculate	d monthly	/				(38)m	= 0.33 ×	(25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(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		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	- 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		
Heatle	ee nara	motor (F		/m2k					(40)m	Average =	Sum(39)1	12 /12=	461.42	(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)1	12 /12=	6.59	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)				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	I	(41)
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum	ed occu	ipancy,	N	•.		· · · · · · · · · · · · · · · · · · ·					2.	.25		(42)
if TF if TF	A > 13.9 A £ 13.9	9, N = 1 9. N = 1	+ 1.76 x	: [1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.0	0013 x (IFA -13.	9)			
Annua	averag	je hot wa	ater usa	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		87	.55		(43)
Reduce	the annua e that 125	al average litres per l	hot water person pe	usage by r dav (all w	5% if the a ater use. I	lwelling is hot and co	designed i Id)	to achieve	a water us	se target o	f			
	lan	Eeb	Mar	Apr	May	lun		Aug	Sen	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Sep		NUV	Dec		
(44)m=	<mark>9</mark> 6.3	92.8	8 <mark>9.3</mark>	85.79	82.29	78.79	78.79	82.29	85.79	8 <mark>9.3</mark>	92.8	<mark>9</mark> 6.3		
		L								L Total = Su	l m(44) ₁₁₂ =	-	1050.55	(44)
Energy o	content of	hot water	used - cal	lculated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	bles 1b, 1	c, 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		—
lf instant	aneous w	vater heati	ng at point	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	=	1377.43	(45)
(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:												
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160		(47)
If comr	nunity h	neating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)	ara) ant	or (0) in (47)			
Water	storage	loss:	not wate	er (unis ir	iciudes i	nstantar	leous co	ווסם ומחז	ers) ente	er U In (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/ye	ear		_	(48) x (49)) =		1	10		(50)
b) If m Hot wa	anufact	urer's de age loss	eclared (cylinder l rom Tabl	oss fact	or is not h/litre/da	known:					02		(51)
If comr	nunity h	neating s	ee secti	on 4.3	0 2 (100	n, na o, ac	·y/				0.	.02		(01)
Volume	e factor	from Ta	ble 2a								1.	.03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter	(OU) OF ((54) IN (5	oulotod ⁽	for anot	month			((56)m - 4)	55) - (44)	m	1.	.03		(55)
vvaler	suraye					00.00	00.01		00) × (41)		00.00	00.01		
(56)m=	32.01 er containe	28.92 s dedicate	d solar sto	30.98 prage. (57)	32.01 m = (56)m	30.98 x [(50) – (32.01 H11)] ÷ (5	0), else (5	30.98 7)m = (56)	32.01 m where (30.98 H11) is fro	32.01 m Append	ix H	(96)
(57)-	32.01	28.02	32.01	30.09	32.01	30.09	32.01	32.01	30.09	32.01	30.09	32.04		(57)
(57)11=	52.01	20.92	J	50.90	52.01	50.90	52.01	J JZ.01	50.90	52.01	50.90	52.01	I	(01)

Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0]	(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor fi	rom Tab I	le H5 if t r	here is s r	solar wat	er heatii	ng and a	t cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	h 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 DH	IW input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter					-		-	-			
(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		
								Outp	out from wa	ater heate	r (annual)	12	2028.27	(64)
Heat g	ains froi	n water	heating	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)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)
in <mark>clu</mark>	ıde (57)ı	n in calo	culation	of (65)m	only if c	vlinder is	s in the o	dwelling	or hot w	ate <mark>r is fr</mark>	om com	munity h	eating	
5. Int	ernai da	ains (see	Table {	5 and 5a):									
Motab	olic gain	e (Table	5) Wat	te										
Metab	Jan	Feb	Mar	Apr	Mav	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)
Lightin	a dains	(calcula	ted in Ar	pendix	L equat	ion 1.9 or	r (9a) a	l Iso 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	1	(67)
Annlia		ins (calc	L	Annen	l iv l ea	uation L	13 or I 1	I 3a) also	see Ta	L ble 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	1	(68)
Cookir		(calcula	I ded in A	nnendiv		ion 15	or 15a		A Table	5			I	
(69)m-	34.23	34 23	34.23	34.23	24 23	34.23	34.23	34 23	34.23	34.23	34.23	34.23]	(69)
Dump	ond for		(Toble /	<u> </u>	04.20	04.20	04.20	04.20	04.20	04.20	04.20	04.20	l	()
(70)m-					0	0	0	0	0	0	0	0	1	(70)
							0	0	0	0	0	0	l	(10)
Losses	s e.g. ev		n (nega				00.04	00.04	00.04	00.04	00.04	00.04	1	(71)
(71)m=	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04	-09.04		(71)
Water	heating	gains (I	able 5)			07.00	00.54						1	(70)
(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 i	nternal	gains =	: 			(66)	m + (67)m I	n + (68)m + T	+ (69)m + (T	(70)m + (7 I	1)m + (72) I	m	1	
(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. So	lar gains	S.		n fl f	Table O			4		a and the st	المعاملة الم	•		
Solar g	ains are d		using sola		I adie 6a a	and associ	iateo equa	itions to co	onvert to th	ie applicat	ne orientat	ion.	Coinc	
orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	

North	0.9x	0.77	×	[8.7] ×	к <u>з</u>	34.53	x	0.85	x	0.7		=	123.87	(74)
North	0.9x	0.77	×	ĺ	8.7	j ×	ـــــــــــــــــــــــــــــــــــــ	5.46] x	0.85	×	0.7	-	=	198.97] (74)
North	0.9x	0.77	×	ĺ	8.7	j ×	: 7	4.72	x	0.85	×	0.7	-	=	268.03] (74)
North	0.9x	0.77	×	Ē	8.7	j ×	× 7	9.99	x	0.85	×	0.7	-	=	286.93] (74)
North	0.9x	0.77	×	ן י	8.7	j ×	: 7	4.68] x	0.85	×	0.7	=	=	267.89] (74)
North	0.9x	0.77	×	ĺ	8.7	j ×	5	59.25	x	0.85	×	0.7	-	=	212.54	- (74)
North	0.9x	0.77	×	[8.7	j ×	4	1.52	×	0.85	×	0.7	-	=	148.93] (74)
North	0.9x	0.77	×	ן י	8.7	j ×	2	24.19	x	0.85	×	0.7	-	=	86.78	- (74)
North	0.9x	0.77	×	Ī	8.7	j ×	· 1	3.12	x	0.85	x	0.7	-	=	47.06	(74)
North	0.9x	0.77	×	ן י	8.7	j ×	: ;	8.86	x	0.85	×	0.7	-	=	31.8	_ (74)
South	0.9x	0.77	×	Ī	2.2	j ×	4	6.75	x	0.85	×	0.7	-	=	42.41	(78)
South	0.9x	0.77	x	Ī	2.2	j ×	. 7	6.57	x	0.85	×	0.7	-	=	69.46	(78)
South	0.9x	0.77	×	Ī	2.2	j ×	(g	97.53	x	0.85	×	0.7	-	=	88.48	_ (78)
South	0.9x	0.77	×	Ī	2.2] ×	: 1	10.23	x	0.85	x	0.7	<u> </u>	=	100	(78)
South	0.9x	0.77	×	Ī	2.2	Ī×	: 1	14.87	x	0.85	x	0.7	<u> </u>	=	104.2	(78)
South	0.9x	0.77	×	[2.2] ×	1	10.55	x	0.85	x	0.7	-	=	100.28	(78)
South	0.9x	0.77	x	[2.2] ×	1	08.01	x	0.85	x	0.7		=	97.98	(78)
South	0.9x	0.77	x		2.2] ×	1	04.89	х	0.85	x	0.7		=	95.15	(78)
South	0.9x	0.77	×	[2.2] ×	1	01.89) x	0.85	x	0.7		-	92.42	(78)
South	0.9x	0.77	×	[2.2	×	8	32.59] ×	0.85	x	0.7		=	74.92	(78)
South	0.9x	0.77	x	[2.2] ×	5	5.42	x	0.85	x	0.7	-	=	5 <mark>0.27</mark>	(78)
South	0.9x	0.77	×	[2.2] ×		40.4	x	0.85	x	0.7		=	36.65	(78)
West	0.9x	0.77	×	[6.5] ×	1	9.64] x	0.85	x	0.7	-	=	52.64	(80)
West	0.9x	0.77	x		6.5	×	3	88.42	x	0.85	x	0.7	-	=	102.97	(80)
West	0.9x	0.77	x	[6.5] ×	6	3.27	x	0.85	x	0.7	-	=	169.58	(80)
West	0.9x	0.77	×	[6.5) ×	4 <u>9</u>	2.28	x	0.85	x	0.7		=	247.33	(80)
West	0.9x	0.77	×		6.5] ×	1	13.09	x	0.85	x	0.7		=	303.11	(80)
West	0.9x	0.77	x	[6.5] ×	1	15.77	x	0.85	x	0.7		=	310.29	(80)
West	0.9x	0.77	×		6.5	x	1	10.22	x	0.85	x	0.7		=	295.4	(80)
West	0.9x	0.77	×		6.5] ×	<u>د</u> و	94.68	x	0.85	x	0.7		=	253.75	(80)
West	0.9x	0.77	×		6.5] ×	۲ ⁻	'3.59	x	0.85	x	0.7		=	197.23	(80)
West	0.9x	0.77	x	[6.5] ×	4	5.59	x	0.85	x	0.7		=	122.19	(80)
West	0.9x	0.77	×	[6.5] ×	2	24.49	x	0.85	x	0.7		=	65.64	(80)
West	0.9x	0.77	x		6.5] ×	1	6.15	x	0.85	x	0.7	=	=	43.29	(80)
Solar	gains in	watts, ca	lculate		for each mon	th	007.5	004.07	(83)m	i = Sum(74)m.	(82)m		444 7			(02)
(83)m=	133.2 nains — i	nternal a	381.93		$\frac{546.29}{(84)m} = (73)n$	4 n +	(83)m	061.27	561	.44 438.59	283.8	8 162.96	111.7	3	I	(63)
(84)m-	493.61		728 13	Т	872 71 981 7	6 T	984 55	935.67	841	44 728 68	593.9	5 496	461.9	2		(84)
			0. 10			~	557.00	1 000.07			1 000.9	~	L 101.9			()
7. Me	ean inter	nal temp	erature		neating seaso	on) vic	a orea i	from Tol							01	
		tor for a	eaung vinc for	he I::		ving	y area i (ooo T-		Jie 9	(°C)					21	_(85)
Utilis		LOI IOF BE	Mor	T		T v						Nov		٦		
	Juli		ivial	1	The line	y	Juli		I 4	ug l och				-		

(86)m=	1	1	0.99	0.99	0.97	0.94	0.9	0.92	0.97	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 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)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
=m(88)	18	18	18	18	18	18	18	18	18	18	18	18		(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	0.94	0.83	0.56	0.64	0.92	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 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		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.81	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA x T1	+ (1 – fL	A) × T2					
(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		(92)
Apply	adjustn	nent to t	he mear	n interna	temper	ature fro	m Table	e 4e, whe	ere appro	opriate				
(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. Sp	ace hea	ting requ	uirement					Table O		· T ' · · · /·	70)		1	
the ut	i to the r	factor fo	ernal ter or gains	mperatur using Ta	re obtain Ible 9a	ied at st	ер 11 от	Table 9	o, so tha	t II,m=(76)m an	d re-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	ation fac	tor for g	ains, hm	1:										
(94)m=	1	0.99	0.99	0.98	0.95	0.91	0.84	0.87	0.95	0.99	0.99	1		(94)
Us <mark>ef</mark> u	I <mark>l g</mark> ains,	hmGm ,	, W = (94	4)m x (84	4)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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8	40.0	40.4	444	10.0	74	4.0		(06)
(96)m=	4.3	4.9	0.5	8.9		14.0	-[(20)m	y [(02)m	(06)m	10.6	7.1	4.2		(90)
(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		(97)
Space	e heatin	a reauire	ement fo	r each n	nonth. k	Nh/mon	1 = 0.02	24 x [(97)m – (95)ml x (4'	1)m	0.20101		
(98)m=	3895.43	3320.36	3194.41	2407.18	1725.71	0	0	0	0	2198.04	, 3046.78	3917.06		
							I	Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	23704.96	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year							[338.64	(99)
9b. En	erav rec	uiremer	nts – Cor	mmunitv	heating	scheme	9					L		
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ing or wa	ater heat	ting prov	vided by a	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary,	/supplen	nentary	heating	(Table 1	1) '0' if n	one	,		0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =					[1	(302)
The con	nmunity so	cheme mag	y obtain he	eat from se	everal sour	rces. The j	orocedure	allows for	CHP and u	up to four o	other heat	sources; th	ne latter	
includes Fractio	boilers, h n of hea	eat pumps at from C	s, geotherr Commun	<i>nal and wa</i> ity boiler	aste heat f 'S	rom powe	r stations.	See Appel	ndix C.			[1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunitv bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	or commu	unity hea	ating svs	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heati	ng syste	m	5-9-			l [1.05	(306)
Space	heating	a		,		-						L	kWh/ve	ear
Annua	l space	heating	requiren	nent								[23704.96	
												-		

Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	24890.21	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary sy	/stem (98) x (301) x 1	00 ÷ (308) =	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)(307	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 dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fro	m 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 Appendix L)			310.63	(332)
12b. CO2 Emissions – Community heating scheme				-
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%)	Energy kWh/year 2) sing two fuels repeat (363) to	Emission factor kg CO2/kWh (366) for the second fue	Emissions kg CO2/year	(367a)
CO2 associated with heat source 1 [(307t	b)+(310b)] x 100 ÷ (367b) x	0 =	6484.77	(367)
Electrical energy for heat distribution	[(313) x	0.52 =	140.23	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372) =	6625.01	(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) =		6625.01	(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 =	161.22	(379)
Total CO2, kg/year sum of (376)(382) =			6786.22	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			96.95	(384)
El rating (section 14)			31.76	(385)

			User D	etails:									
Assessor Name: Software Name:	Stroma FSAP 2	2012	roperty	Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.3.15				
Address :	london		roperty /	1001033.	Onit 5								
1. Overall dwelling dimer	isions:												
Basement			Area	a(m²) 124	(1a) x	Av. He	ight(m) .37	(2a) =	Volume(m ³ 293.88) (3a)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+	(1e)+(1r	n)	124	(4)			_					
Dwelling volume					(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3n) =	293.88	(5)			
2. Ventilation rate:									<u> </u>				
Number of chimneys Number of open flues	main heating 0 +	secondar heating	y] + [] + [0 0] = [] = [total 0 0		40 = 20 =	0 0	r (6a) (6b)			
Number of intermittent fan	s				- -	2	x ′	10 =	20	(7a)			
Number of passive vents						0	x ^	10 =	0	 (7b)			
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)			
Number of passive vents 0 $x \ 10 =$ Number of flueless gas fires 0 $x \ 40 =$ Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 $\div (5) =$													
Infiltration due to chimney If a pressurisation test has be	0.07	(8)											
Number of storeys in the Additional infiltration	e dwelling (ns)						[(9)	-1]x0.1 =	0	(9) (10)			
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	25 for steel or timb sent, use the value co gs); if equal user 0.35	er frame or	0.35 for	masonr er wall are	y constr a (after	uction			0	(11)			
If suspended wooden flo	oor, enter 0.2 (uns	ealed) or 0.	.1 (seale	d), else	enter 0				0	(12)			
If no draught lobby, ente	er 0.05, else enter	0							0	(13)			
Window infiltration	and doors draugh	tstripped		0 25 - [0 2	$x(14) \div 1$	001 -			0				
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(15)			
Air permeability value, o	50, expressed in	cubic metre	s per ho	our per so	ouare m	etre of e	envelope	area	10	= (17)			
If based on air permeabilit	y value, then (18) =	= [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.57	(18)			
Air permeability value applies	if a pressurisation test	has been dor	ne or a deg	gree air pei	meability	is being u	sed						
Number of sides sheltered	I								1	(19)			
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.92	(20)			
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.53	(21)			
Infiltration rate modified fo	r monthly wind sp	eed			-		<u> </u>	_	I				
Jan Feb I	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind spe	ed from Table 7					1.6			I				
(22)m= 5.1 5 2	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7					
Wind Factor (22a)m = (22)m ÷ 4		0.05	0.00		4.00	4.40	4.40	I				
(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					

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-			
	0.67	0.66	0.64	0.58	0.56	0.5	0.5	0.49	0.53	0.56	0.59	0.62		
Calcul If ma	ate etter	ctive air al ventila	change	rate for t	he appli	cable ca	se							(220)
lf exh	aust air h	eat pump i	usina App	endix N. (2	3b) = (23a	i) x Fmv (e	equation (I	N5)) . othei	rwise (23b) = (23a)			0	(23a)
If bala	anced with	heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, (,			0	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	⊃rv (M\/I	HR) (24a) m = (22	2h)m + (23h) x [′	l – (23c)	0 ∸ 100]	(200)
(24a)m=				0	0	0			0			0]	(24a)
b) If	balance	l d mech:	I anical ve	Intilation	without	heat rec	L coverv (N	L MV) (24b	l = (22)	I 2b)m + ()	L 23b)		l	
(24b)m=	0	0		0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	ract ver	tilation o	or positiv	re input v	ı ventilatio	on from c	utside				I	
•)	if (22b)n	n < 0.5 ×	(23b), 1	hen (240	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft		•			
	if (22b)n	n = 1, th	en (24d)	m = (22k	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		r	1	
(24d)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		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)	i		i	1	
(25)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		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramete	er:									
ELEN	/IENT	Gros	s	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	e l	AXk
_		area	(m²)	m	2	A ,r	n²	W/m2	K	(VV/I	K)	kJ/m ² ·l	K	kJ/K
Doors						1.6	×	1.4	= [2.24				(26)
Windo	ws Type	e 1				5.49	x1	/[1/(4.8)+	0.04] =	22.11				(27)
Windo	ws Type	e 2				4.7	x1	/[1/(4.8)+	0.04] =	18.93				(27)
Walls	Type1	11.8	85	1.6		10.25	5 X	2.1	=	21.52				(29)
Walls	Type2	122	2	10.19	Э	111.8	1 X	1.27	=	142.22				(29)
Roof		68.	1	0		68.1	x	0.28	=	19.07				(30)
Total a	area of e	elements	, m²			201.9	5							(31)
Party v	wall					4.8	x	0	=	0				(32)
* for win	idows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
** incluc	le the area	as on both	sides of in	nternal wal	ls and par	titions		(00) (00)	(22)				r	
Fabric	heat los	SS, W/K =	= S (A x	U)				(26)(30)	(32) =	(00) (0)			226.08	(33)
Heat c	apacity	Cm = S((A X K)			1 1/ 21/			((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
I nerm	al mass	parame) = Cm ÷	- IFA) Ir	i KJ/M²K			Indica	tive Value	: High	- h l = 15	450	(35)
ror desi can be ι	ign assess used inste	sments wn ad of a dei	ere the de tailed calc	talis of the ulation.	CONSTRUCT	on are not	t known pr	recisely the	e indicative	e values of	TMPINT	adie 11		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						30.4	(36)
if details	of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			256.48	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	70.25	69.41	68.58	64.69	63.96	60.57	60.57	59.95	61.88	63.96	65.43	66.97		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	326.74	325.89	325.06	321.17	320.45	317.06	317.06	316.43	318.36	320.45	321.92	323.46		
										Average =	Sum(39)1	12 /12=	321.17	(39)

Heat lo	ss para	meter (H	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	r of day	re in mor	u oth (Tab	le 12)			1	1	,	Average =	Sum(40)1.	12 /12=	2.59	(40)
	Jan	Feb	Mar	Anr	May	Jun	Jul	Aug	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(, L	0.		0.							0.		0.		
4. Wat	ter hea	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	ΓFA -13.	2. .9)	88		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person per	ge in litre usage by s ^r day (all w	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	102 f	2.54		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	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		_
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1230.5	(44)
(45)m=	1 <mark>6</mark> 7.27	146.3	150.97	131.62	126.29	108.98	100.98	115.88	117.26	13 <mark>6.66</mark>	149.18	161.99		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	<mark>⊺ota</mark> l = Su	m(45) ₁₁₂ =		1613.38	(45)
(46)m=	<mark>2</mark> 5.09	21.94	22.64	19. <mark>7</mark> 4	18.94	16.35	15.15	17.38	17.59	20.5	22.38	24.3		(46)
Water s	storage	loss: e (litres)	includir	ng any so	olar or M	/WHRS	storage	within sa	ame ves	ما		160		(47)
lf com	nunity h	eating a	nd no te	ink in dw	velling e	nter 110	litres in	(47)		501	L	160		(47)
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:											L	
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	om water	storage	, kWh/y∉	ear	on : o mot	lun numu	(48) x (49)) =		1	10		(50)
Hot wat	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	whown. ay)				0.	02		(51)
If comn	nunity r	from Ta	ee secti ble 22	on 4.3								00		(50)
Tempe	rature f	actor fro	m Table	2b							1.	03 6		(52) (53)
Energy	lost fro	m water	storage		oor			(47) x (51)) y (52) y (53) -		.0		(50)
Enter (50) or ((54) in (5	55)	, KVVII/yt	sai			(47) X (01)	/ (() ~ ()	55) –	1.	03		(54)
Water s	storage	loss cal	culated 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 cylinde	r 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 Append	l lix 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	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m	. 4	- (- ()			
mod) ר	itied by	tactor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		I	
(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 ca	alculated	for eac	ch n	nonth (61)m =	(60)) ÷ 36	65 × (41)	m							
(61)m=	0	0	0		0	0		0	0	0	(0	0	0	0		(61)
Total h	neat req	uired for	water	hea	ating ca	lculated	l fo	r each	n month	(62)m	= 0.8	5 × ((45)m +	- (46)m +	• (57)m •	+ (59)m + (61)m	
(62)m=	222.55	196.23	206.24	ŀ	185.11	181.57	16	62.47	156.26	171.1	6 170).76	191.94	202.67	217.27		(62)
Solar D	HW input	calculated	using Ap	pen	ndix G or	Appendix	н (negativ	e quantity) (entei	'0' if no	sola	r contribu	ution to wat	er heating))	
(add a	dditiona	al lines if	FGHR	Sa	nd/or V	VWHRS	ap	plies,	see Ap	pendix	(G)		_			_	
(63)m=	0	0	0		0	0		0	0	0	(0	0	0	0		(63)
Outpu	t from w	vater hea	iter														
(64)m=	222.55	196.23	206.24	ŀ	185.11	181.57	16	62.47	156.26	171.1	6 170).76	191.94	202.67	217.27		
			-							0	utput fro	om wa	ater heat	er (annual)	112	2264.22	(64)
Heat g	ains fro	om water	heatin	g, k	Wh/mo	onth 0.2	5 í	[0.85	× (45)m	+ (61)m] + (0.8 ×	(46)n (n + (57)m	n + (59)r	n]	
(65)m=	74.23	65.45	68.81		61.77	60.6	5	4.24	52.19	57.14	L 5	57	64.05	67.61	72.47	7	(65)
inclu	ude (57))m in calo	culatior	n of	(65)m	only if c	ylir	nder is	s in the c	dwellir	g or h	ot w	ater is	from con	nmunity	_ heating	
5. In	ternal g	ains (see	e Table	5 a	and 5a)	1											
Metab	olic gai	ns (Table	•5) Wa	atts	, :												
motab	Jan	Feb	Mar		Apr	May		Jun	Jul	Au	a s	бер	Oct	Nov	Dec	7	
(66)m=	143.88	143.88	143.88	3 1	143.88	143.88	14	43.88	143.88	143.8	8 143	3.88	143.88	143.88	143.88		(66)
Lightir	g gains	(calcula	ted in A	ı qq/	endix l	. equati	ion	L9 or	[.] L9a), a	lso se	e Tabl	e 5				-	
(67)m=	30.38	26.98	21.94	Ť	16. <mark>6</mark> 1	12.42	1	0.48	11.33	14.72	19	.76	25.09	29.29	31.22	1	(67)
Applia	nces da	ains (calc	ulated	in A	Append	lix L. ea	uat	ion L'	13 or L1	3a), al	so see	- Ta	ble 5	-		-	
(68)m=	290.33	293.35	285.75		269.59	249.19	2	30.01	217.2	214.1	9 221	.78	237.95	258.35	277.52	7	(68)
Cookir		L s (calcula	ated in	_L Anr	endix	L equat	ior	115	or 15a)	also	See T	ahle	5			-	
(69)m=	37.39	37.39	37.39	T T	37.39	37.39	3	7.39	37.39	37.39	37	.39	37.39	37.39	37.39	7	(69)
Pump	and fa	ins gains	(Table	52)												
(70)m-					0	0		0	0	0		n	0	0	0	7	(70)
						oc) (Tob			•			•	Ů	Ů	Ů		
(71)m-	-115 1				-115 1	-115 1) 115 1	-115 1	-115	1 _11	51	-115 1	_115 1	_115 1	7	(71)
(/ I)III-	heating				110.1	110.1		110.1	110.1	110.	.	0.1	110.1	110.1	-110.1		()
		$\int_{0.74}$) 	95 70	01 <i>1</i> E	7	E 24	70.14	76.9	70	17	06.00	02.0	07.41	7	(72)
(72)III=	99.77	97.4	92.40		05.79	01.45		0.04	70.14	70.0		. 17	(70) 20.09	71) m + (70	97.41		(12)
	Interna	I gains =			420.46	400.00		(00)	264.94		$\frac{11}{2}$	- 07	(70)11 + (7 1)11 + (72	472.22	7	(73)
(73)III=	400.04	403.09	400.34	·] '	430.10	409.22		302	304.04	571.0	0 300	5.07	415.29	447.7	472.52		(13)
Solar (nains are	s. calculated	usina so	lar fl	lux from	Table 6a :	and	associ	ated equa	tions to	convert	t to th	e applica	ble orienta	ation		
Orient	ation:	Access F	Factor		Area			Flu	x		a		io appilo	FF		Gains	
Choine		Table 6d	aotor		m²			Tab	ole 6a		Table	e 6b	-	Table 6c		(W)	
North	0.9x	0.77		×Г	5.4	٩	×	1	0.63	×Г	0.8	5	_ × ۱	0.7	=	24.07	7(74)
North	0.9x	0.77		ι Σ	5.4	<u> </u>	x	י ר	0.32		0.0	5		0.7	=	/6](74)
North	0.9x	0.77		ι ΣΓ	5.4	<u> </u>	x	2	4.53	L ^ L V x L	0.0	5	^ L ⊣ ↓ r	0.7	$= \frac{1}{2}$	79.17](74)
North	0.9x	0.77		ι Γ	5.4	<u> </u>	Ϋ́	5	5.46		0.0	5		0.7	=	125.56](74)
North	0.04	0.77		^ L ↓ Γ	5.4 		^ v	- 5	4 70	^ L ↓ Γ	0.0	5	╡╏╏	0.7		160.44	」(' ^{-*)}](74)
	0.38	0.77		^ L	ວ.4	3	^		4.12	^ L	0.8	J	^	0.7		109.14	(**)

	-					_			7						
North	0.9x	0.77	>	(5.49	_ ×		79.99	×	0.85	x	0.7	=	181.06	(74)
North	0.9x	0.77)	(5.49	×		74.68	x	0.85	x	0.7	=	169.05	(74)
North	0.9x	0.77)	(5.49	×		59.25	x	0.85	x	0.7	=	134.12	(74)
North	0.9x	0.77)	(5.49	×		41.52	x	0.85	x	0.7	=	93.98	(74)
North	0.9x	0.77	>	(5.49	×		24.19	x	0.85	x	0.7	=	54.76	(74)
North	0.9x	0.77	>	(5.49	×		13.12	x	0.85	x	0.7	=	29.69	(74)
North	0.9x	0.77	>	¢	5.49	×		8.86	x	0.85	x	0.7	=	20.07	(74)
South	0.9x	0.77)	C	4.7	×		46.75	x	0.85	x	0.7	=	90.6	(78)
South	0.9x	0.77)	C	4.7	×		76.57	x	0.85	x	0.7	=	148.39	(78)
South	0.9x	0.77)	(4.7	×		97.53	x	0.85	x	0.7	=	189.02	(78)
South	0.9x	0.77	>	(4.7	×		110.23	x	0.85	x	0.7	=	213.63	(78)
South	0.9x	0.77	>	¢	4.7	×		114.87	x	0.85	x	0.7	=	222.62	(78)
South	0.9x	0.77)	(4.7	×		110.55	x	0.85	x	0.7	=	214.24	(78)
South	0.9x	0.77)	(4.7	×		108.01	x	0.85	x	0.7	=	209.32	(78)
South	0.9x	0.77)	(4.7	×		104.89	x	0.85	x	0.7	=	203.28	(78)
South	0.9x	0.77)	(4.7	×		101.89	x	0.85	x	0.7	=	197.45	(78)
South	0.9x	0.77)	(4.7	×		82.59	x	0.85	x	0.7	=	160.05	(78)
South	0.9x	0.77)	(4.7	×		55.42	x	0.85	x	0.7	=	107.4	(78)
South	0.9x	0.77	>	Ċ	4.7	₹ ×		40.4	x	0.85	x	0.7	-	78.29	(78)
Solar	pains in	watts, ca	lculate	d .	for each mo	nth			(83)m	n = Sum(74)m	n(82)m	1			
(83)m=	114.68	194.39	267.18	T	339.19 391.	75	395.3	378.37	337	7.4 291.43	214.8	1 137.09	98.36	1	(83)
Total g	<mark>gain</mark> s – i	nternal ar	nd sola	ar ((84)m = (73)	m +	(83)m	n, watts						-	
(84)m=	601.32	678.28	733.53		777.35 800.	97	777.3	743.21	709	.28 678.31	6 <mark>30</mark> .	1 584.79	570.67		(84)
7. Me	an inter	nal temp	erature	e (heating seas	son)									
Temp	perature	during he	eating	ре	eriods in the	living	g area	from Ta	ble 9	, Th1 (°C)				21	(85)
Utilis	ation fac	tor for ga	ins for	liv	ving area, h'	1,m (see T	able 9a)						L	
	Jan	Feb	Mar	Т	Apr Ma	ay	Jun	Jul	A	ug Sep	Oc	t Nov	Dec]	
(86)m=	1	1	1		1 1		0.99	0.97	0.9	98 1	1	1	1		(86)
Mear	n interna	l tempera	ature in	n li	ving area T1	(fol	low st	eps 3 to	7 in T	able 9c)		-		-	
(87)m=	19.07	19.18	19.41	Τ	19.76 20.1	13	20.49	20.73	20.	69 20.39	19.9	2 19.45	19.06]	(87)
Temr	erature	durina he	eating	ne	eriods in rest	ofd	wellin	a from T:	able			!		-	
(88)m=	18.94	18.95	18.95	T	18.97 18.9	97	18.99	18.99	18.	99 18.98	18.9	7 18.97	18.96	1	(88)
Litilia		tor for go	uno for		l		0 m (c]	
Utilisa				T		a I	2, m (s		9a)	86 0.98	1	1	1	1	(89)
(03)11-		<u> ' </u>	·	1	1 0.3	<u> </u>	0.90	0.02	0.0		<u> </u>]	(00)
Mear	interna	l tempera	ature in	n th	ne rest of dw	/ellin	g T2 (follow ste	eps 3	to 7 in Tal	ble 9c)	7 47.07	40.5	1	(00)
(90)m=	16.5	16.67	17.02		17.53 18.0	,,	18.61	18.9	18.	8/ 18.46	17.7	11.07	16.5		
												iving alea - (0.3	(91)
Mear	interna	l tempera	ature (f	or	the whole d	welli	ng) =	fLA × T1	+ (1	- fLA) × T2	2			•	
(92)m=	17.28	17.43	17.74		18.2 18.6	69	19.18	19.45	19.	42 19.04	18.4	2 17.79	17.27		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	nperatur using Ta	re obtain Ible 9a	ed at ste	ep 11 of ⁻	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	1	1	0.99	0.97	0.88	0.91	0.98	1	1	1		(94)
Usefu	I gains,	hmGm ,	W = (94	4)m x (84	4)m									
(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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8					-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m ×	‹ [(93)m-	– (96)m]				
(97)m=	4240.35	4083.09	3653.59	2987.43	2240.76	1451.55	904.1	955.42	1573.7	2505.1	3440.8	4228.68		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	2707.55	2288.24	2173.06	1592.68	1076.19	0	0	0	0	1396.03	2056.52	2721.64		
								Tota	l per year	(kWh/year	.) = Sum(9	8)15,912 =	16011.93	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year							Ì	129.13	(99)
Qh En	orav roc	uiromor	ote – Cor	nmunity	heating	schomo						l]
This pr				ting one			ator booti	ing prov	ided by	0.00mm				
Fractio	n of spa	ace heat	from se	condary	suppler/	ng or wa	neating (Table 1	1) '0' if n	one	unity SCI		0	(301)
Fractio	n of one		from oo	mmunitu	a votom	1 (201	1) _		.,]](202)
FIACIO		ice near	nom co	minumity	system	1 – (301	() =					I	1	(302)
The com	munity so	heme may	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four o	other heat	sources; tl	he latter	
Fractio	n of hea	at from C	commun	ity boiler	'S	om power	stations. c	зее дррег	idix C.			[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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	communi	ity heatir	ng syster	m					1.05	(306)
Space	heating	9										-	kWh/year	_
Annua	space	heating	requirem	nent									16011.93	
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	16812.52	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment fro	m secon	dary/sup	plemen	tary syste	em	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating water h	l neating r	equirem	ent								[2264.22	1
If DHW Water	/ from co heat fro	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30	03a) x (30	5) x (306) :	= [2377.43	(310a)
Electric	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	(310a)(310e)] =	191.9	(313)
Cooling	g Syster	n Energ	y Efficie	ncy Ratio	0								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	· (314) =		ĺ	0	(315)
Electric mecha	city for p nical ve	oumps aintilation	nd fans v - balanc	within dv ed, extra	velling (1 act or po	able 4f) sitive inp	: 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)	0	(331)	
Energy for lighting (calculated in Appendix L)			536.46	(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 t	wo fuels repeat (363) to (366) for the second fue	el 90	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	4605.59	(367)
Electrical energy for heat distribution [(3	13) x	0.52	= 99.6	(372)
Total CO2 associated with community systems (36	53)(366) + (368)(372)	:	4705.18	(373)
CO2 associated with space heating (secondary) (30	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous	us heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		4705.18	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	32))) 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)

Assessor Name: Stroma FSAP 2012 Stroma Vardaress: Version:	User Details:											
Address : , london Address : , london Address : Area(m ²) Av. Height(m) Volume(m ²) Basement 73 (1a) x 2.6 (2a) = 2015.4 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+((1n) 79 (1a) x 2.6 (2a) = 2015.4 (3a) Number of chimneys 0 + 0 = 0	Assessor Name: Software Name:	Assessor Name: Stroma FSAP 2012 Software Version: Version										
Number of channeys Area(m ²) Av. Height(m) Volume(m ²) 2.6 (2a) 205.4 (3a) Duelling volume (2a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	Address :	london		rioperty	Address.	. Onit 10						
Area(m ²) Av. Height(m) Volume(m ²) Basement 79 (n) x 2.0 (a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 79 (4) 79 (5) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+((3n)) = 205.4 (5) 2. Ventilation rate: m ³ per hour (3a)+(3b)+(3c)+(3d)+(3d)+(3d)+((3n)) = 205.4 (5) Number of chimneys 0 + 0 0 x40 = 0 (6a) Number of passive vents 0 x10 = 20 (7a) Number of flueless gas fires 0 x10 = 0 (7a) Number of storeys in the dwelling (ns) x40 = 0 (1a) 0 (1b) Additional infiltration 2.5 for stell or timber frame or 0.35 for masonry construction 0 (1b) 0 (1b) 0 (1b) 0 (1b) 0 (1c)	1. Overall dwelling dime	nsions:										
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 79 (a) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 205.4 (5) 2. Ventiliation rate: main secondary other total m³ per hour Number of chimneys 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 (7c) Number of flueless gas fires 0 ×40 = 0.1 (6) 0 (10) Number of storeys in the dwelling (ns) 0 ×40 = 0.1 (6) Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction 1 0 (10) If but ypes of wild are present, use the value coreso 0 1 0 (10) 0 (10) </td <td>Basement</td> <td></td> <td></td> <td>Are</td> <td>a(m²) 79</td> <td>(1a) x</td> <td>Av. He</td> <td>ight(m) 2.6</td> <td>(2a) =</td> <td>Volume(m³ 205.4</td> <td>) (3a)</td>	Basement			Are	a(m²) 79	(1a) x	Av. He	ight(m) 2.6	(2a) =	Volume(m³ 205.4) (3a)	
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3a)+(3a)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d	Total floor area TFA = (1a	a)+(1b)+(1c)+(′1d)+(1e)+(1n)	79	(4)			J	L		
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main heating heatingscendary heatingothertotalm ^a per hourNumber of chimneys0+0=0x40 =0(6a)Number of open flues0+0=0x20 =0(6b)Number of passive vents2x10 =20(7a)Number of passive vents0x10 =0(7a)Number of flueless gas fires0x40 =0(7a)Infiltration due to chimneys, flues and fans =(6a)+(7a)+(7b)+(7c) =20+ (a) =0Infiltration due to chimneys, flues and fans =(6a)+(7a)+(7b)+(7c) =20+ (a) =0(a)Number of storeys in the dwelling (ns)Additional infiltration(a) =0(a)(a)(a)Additional infiltration0.25 for steel or timber frame or 0.35 for masonry construction0(11)0(10)If both types of wall are present, use the value corresponding to the greater wall area (atter0(12)(14)(14)Window infiltration0.25 for steel or timber frame or 0.35 for masonry construction0(12)(14)If both types of wall are present, use the value corresponding to the greater wall area (atter0(14)(14)Window infiltration rate(b) + (10) + (11) + (12) + (13) + (15) =(16)(16)If parentability value, q60, expressed in cubic metres per hour er square metre of envelope area(10)(17)If based on air permeability value, q60, expressed in cubic metres per hour er square metre of	2. Ventilation rate:											
Number of intermittent fans2x10 =20(7a)Number of passive vents0x10 =0(7b)Number of flueless gas fires0x40 =0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = (89)+(60)+(7a)+(7b)+(7b) =20+(5) =0.1(8)If a pressurisation test has been carried out or is intended, proceed to (17) otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)0(10)Additional infiltration(10)0(11)0(11)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(12)if both types of wall are present, use the value corresponding to the greater wall area (after deducing areas of opening); if equal use: 0.350(12)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) + 100] =(15)Infiltration rate(a) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered01(19)Air permeability value, applies if a pressurisation test has been d	Number of chimneys Number of open flues	main heating 0	second heating + 0 + 0	ary <u>9</u> + [0 0] = [total 0 0	x -	40 = 20 =	m ³ per hou	r (6a) (6b)	
Number of passive vents0 $x10 =$ 0 $r0 =$	Number of intermittent far	าร	_			- F	2	x	10 =	20	(7a)	
Number of flueless gas fires 0 $x40$ 0 $7cc$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = 20 $+(5)$ = 0.1 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (0) to (36) Number of storeys in the dwelling (ns)Additional infiltrationStructural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after doubcing areas at openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00010Nindwaw infiltration0.25 - $[0.2 \times (14) \div 100] =$ 0010011If or draught lobby, enter 0.05, else enter 000001011Air premability value, q50, expressed in cubic metres per hour per square metre of envelope area101011Air premability value, q50, expressed in cubic metres per a per per advance of a degree air permeability is being usedNumber of sides sheltered <td co<="" td=""><td>Number of passive vents</td><td></td><td></td><td></td><td></td><td>Г</td><td>0</td><td>x</td><td>10 =</td><td>0</td><td> (7b)</td></td>	<td>Number of passive vents</td> <td></td> <td></td> <td></td> <td></td> <td>Г</td> <td>0</td> <td>x</td> <td>10 =</td> <td>0</td> <td> (7b)</td>	Number of passive vents					Г	0	x	10 =	0	 (7b)
Air changes per hour Infitration due to chimneys, flues and fans = $[(60)+(70)+(70) =$ 20 + (5) = 0.1 (8) It a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (2) to (16) 0 (9) Additional infiltration [(9)+1]×0.1 = 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 use 0.35 0 (12) If no draught lobby, enter 0.05, 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) + 20]+(8) atterwise (18) = (16) 0.6 (18) Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used	Number of flueless gas fir	es					0	X 4	40 =	0	(7c)	
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Infiltration due to chimney	s flues and fa	ans - (6a) + (6b)	+(7a)+(7b)+(7c) =	Г			• (5)			
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) \div 100] =0 (14)Window infiltration0.25 - [0.2 x (14) \div 100] =0 (14)Window infiltration rate(8) \div (10) \div (11) \div (12) \div (13) \div (15)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides sheltered10Shelter factor20) = 1 - [0.075 x (19)] =101011)11111111211311411511511611611711811911911 <t< td=""><td colspan="10">Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration</br></td><td>(9) (10)</td></t<>	Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) 										(9) (10)	
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In the dradight robuly, club of the original object	If no draught lobby, ent	001, effet 0.2	(unsealed) of	0.1 (Seale	eu), eise					0	= (12) $=$ (13)	
Uniformation of the correction and given uppedWindow infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area10If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.6Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used(18)Number of sides sheltered1(19)Shelter factor(20) = 1 - [0.075 \times (19)] =0.92Infiltration rate incorporating shelter factor(21) = (18) × (20) =0.55Infiltration rate modified for monthly wind speed(21) = (18) × (20) =0.55Monthly average wind speed from Table 7(22)m = 5.1 5 4.9 (22)m = 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ (22a)m = 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Percentage of windows	and doors dr	aught stripped							0	= (13) $=$ (14)	
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Image Image <t< td=""><td>Jan Feb</td><td>Mar Apr</td><td>May Jur</td><td>Jul</td><td>Αυα</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td><td></td><td></td></t<>	Jan Feb	Mar Apr	May Jur	Jul	Αυα	Sep	Oct	Nov	Dec			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Monthly average wind spe	ed from Tabl	e 7		1			1		1		
Wind Factor (22a)m = (22)m \div 4 (22a)m= 1.27 1.25 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7			
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	Wind Factor (22a)m = (22	1	I	_1	1	1	1		1	I		
	(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]		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
<u> </u>	0.7	0.69	0.68	0.61	0.59	0.52	0.52	0.51	0.55	0.59	0.62	0.65		
Calcul If ma	ate etter	ctive air	change	rate for t	he appli	cable ca	se						0	(220)
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) . other	wise (23b) = (23a)			0	(23a)
If bala	anced with	heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, (,			0	(23c)
a) If	halance	d mech	, anical ve	ntilation	with he	at recove	∘rv (M\/I	/ HR) (24a	m = (2)	2h)m + (23h) x [′	l – (23c)	0 ∸ 1001	(200)
(24a)m=				0	0	0			0	0		0		(24a)
b) If	balance	l d mech	I anical ve	Intilation	without	L heat rec	L coverv (N	L /IV) (24b)m = (22	l 2b)m + (;	L 23b)			
(24b)m=	0	0		0	0	0		0	0	0	0	0		(24b)
c) If	whole h	u ouse ex	ract ver	tilation o	or positiv	input v	ı ventilatio	on from c	outside					
c)	if (22b)n	n < 0.5 ×	(23b), 1	hen (240	c) = (23b	o); otherv	vise (24	c) = (22b	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from l	oft					
i	if (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	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		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	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		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramete	er:									
ELEN		Gros	ss	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	e	AXk
		area	(m²)	m	2	A ,r	n²	W/m2	ĸ	(W/I	K)	kJ/m²·l	<	kJ/K
Doors						1.6	x	1.4	= [2.24				(26)
Windo	ws Type	e 1				3.12	x1	/[1/(4.8)+	0.04] =	12.56				(27)
Windo	ws Type	e 2				3.66	x1	/[1/(4.8)+	0.04] =	14.74				(27)
Walls ⁻	Type1	89.	2	6.78		82.42	<u>2</u> X	1.27	=	104.83				(29)
Walls 7	Type2	26.6	63	1.6		25.03	3 X	2.1	=	52.56				(29)
Roof		46.	5	0		46.5	x	0.28	=	13.02				(30)
Total a	area of e	elements	, m²			162.3	3							(31)
Party v	wall					5.3	x	0		0				(32)
* for win	idows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	 1 3.2	
** inclua	le the area	as on both	sides of ir	nternal wal	ls and par	titions								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				199.96	(33)
Heat c	apacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TM	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be i	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	recisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						24.8	(36)
if details	s of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)							2110	()
Total f	abric he	at loss							(33) +	(36) =			224.76	(37)
Ventila	ation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	50.71	50.06	49.42	46.41	45.85	43.23	43.23	42.74	44.24	45.85	46.99	48.18		(38)
Heat tr	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	275.47	274.82	274.18	271.17	270.61	267.99	267.99	267.5	269	270.61	271.75	272.94		
	E									Average =	Sum(39)1	₁₂ /12=	271.17	(39)

Heat lo	ss para	meter (H	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		
· / L			L						,	Average =	Sum(40)1	12 /12=	3.43	(40)
Numbe	r of day	s in moi	nth (Tab		May	lun		<u><u>Aug</u></u>	Son	Oct	Nov	Dec		
(11)m-	Jan 21	reb	1VId1	20	1VIA y	20	21	Aug	Sep	21	20	21		(11)
(41)m=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4. Wat	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ipancy, 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	2. .9)	44		(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by r day (all w	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	92 f	2.24		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					I	
(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		
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1106.83	(44)
(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		_
lf instanta	aneous w	ater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1451.23	(45)
(46)m=	22.57	19.74	20.37	17.76	17.04	14.7	13.63	15.64	15.82	18.44	20.13	21.86		(46)
Storage	e volum	e (litres)	includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		160		(47)
If comm	nunity h	eating a	and no ta	ink in dw	velling, e	nter 110) litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:			'- I		- (-)-						I	(10)
a) if ma	anufact	urer's de	eclared I	OSS TACIO	or is kno	wn (kvvi	n/day):					0		(48)
Tempe			m rabie					(40) (40)	\ \			0		(49)
Energy b) If m	lost fro	m water urer's de	storage	, KVVN/ye cylinder l	ear loss fact	or is not	known:	(48) X (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	e factor	from Ta	ble 2a	011 4.0							1.	.03		(52)
Tempe	rature 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 s	storage	loss cal	culated	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 cylinde	r 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 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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m =	(58) ÷ 36	65 × (41)	m					
(mod	itied by	tactor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	ostat)	00.0-	l	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h mont	h (61)m =	(60	D) ÷ 36	65 × (41)	m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)
Total h	eat rec	quired for	water l	heating	calculate	d fo	or eacl	h month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.74	181.52	191.07	171.8	8 168.87	1	51.52	146.11	159.51	158.97	178.2	187.68	200.99]	(62)
Solar DI	HW input	calculated	using Ap	pendix C	or Appendi	хH	(negati	ve quantity	v) (enter 'C	' if no sola	r contribu	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHR	S and/c	r WWHR	S ap	oplies	, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter							-	-		_	_	
(64)m=	205.74	181.52	191.07	171.8	8 168.87	1	51.52	146.11	159.51	158.97	178.2	187.68	200.99		_
									Out	out from w	ater heate	er (annual)	12	2102.07	(64)
Heat g	ains fro	om water	heating	g, kWh/	month 0.2	25 ´	[0.85	× (45)m	+ (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	68.64	60.56	63.76	57.3	56.38		50.6	48.81	53.27	53.08	59.48	62.63	67.06		(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating															
5. Int	ternal g	ains (see	e Table	5 and	5a):										
Metab	olic gai	ns (Table	e 5), Wa	atts											
	Jan	Feb	Mar	Ар	· May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	122.18	122.18	122.18	122.1	8 122.18	1	22.18	122.18	122.18	122.18	122.18	122.18	122.18		(66)
Lightin	g gains	(calcula	ted in A	Append	x L, equa	tion	L9 o	r L9a), a	lso see	Table 5					
(67)m=	22.54	20.02	16.28	12.3	9.21		7.78	8.4	10.92	14.66	18.62	21.73	23.16		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
(68)m=	217.34	219.59	213.91	201.8	1 186.54	1	72.18	162.59	160.34	166.02	178.12	193.39	207.75		(68)
Cookir	ng gains	s (calcula	ted in <i>i</i>	Append	ix L, equa	tion	ר L15	or L15a)	, also s	ee Table	5				
(69)m=	35.22	35.22	35.22	35.2	35.22	3	35.22	35.22	35.22	35.22	35.22	35.22	35.22		(69)
Pumps	and fa	ans gains	(Table	5a)											
(70)m=	0	0	0	0	0	Г	0	0	0	0	0	0	0]	(70)
Losses	s e.g. e	vaporatio	n (neg	ative va	lues) (Tal	ble	5)					<u>.</u>		1	
(71)m=	-97.74	-97.74	-97.74	-97.7	4 -97.74	-	97.74	-97.74	-97.74	-97.74	-97.74	-97.74	-97.74]	(71)
Water	heating	gains (T	able 5)								<u>.</u>		1	
(72)m=	92.26	90.13	85.7	79.6	75.78	7	70.28	65.61	71.6	73.72	79.95	86.98	90.13]	(72)
Total i	nterna	l gains =					(66)	m + (67)m	+ (68)m ·	+ (69)m +	(70)m + (71)m + (72)	m	1	
(73)m=	391.79	389.39	375.54	353.4	8 331.19	3	309.9	296.26	302.51	314.06	336.34	361.76	380.7]	(73)
6. So	lar gain	is:	1	1		-				<u> </u>					
Solar g	ains are	calculated	using so	lar flux fro	om Table 6a	and	lassoci	iated equa	tions to co	onvert to th	ne applica	ble orientat	ion.		
Orienta	ation:	Access F	actor	Ar	ea		Flu	х		g_		FF		Gains	
		Table 6d		rr	2		Tal	ole 6a	Т	able 6b	T	able 6c		(W)	
North	0.9x	0.77		x	3.66	x	1	0.63	x	0.85	x	0.7	=	16.05	(74)
North	0.9x	0.77	:	x	3.66	x	2	.32	x	0.85	x	0.7	=	30.67	(74)
North	0.9x	0.77		x	3.66	x	3	4.53	x	0.85	x	0.7	=	52.11	(74)
North	0.9x	0.77		×	3.66	x	5	5.46	x	0.85	x	0.7	=	83.7	(74)
North	0.9x	0.77		x	3.66	x	7	4.72	x	0.85	_ × [0.7	=	112.76	(74)

North	0.9x	0.77	:	x	3.66		x	79.99	x	0.85	x	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)
North	0.9x	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	×	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	×	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	x	0.85	×	0.7	=	141.81	(78)
South	0.9x	0.77	:	x	3.12		x	114.87	x	0.85	x	0.7	=	147.78	(78)
South	0.9x	0.77	:	x	3.12		x	110.55	x	0.85	×	0.7	=	142.22	(78)
South	0.9x	0.77		x	3.12		x	108.01	x	0.85	x	0.7	=	138.96	(78)
South	0.9x	0.77		x	3.12		x	104.89	x	0.85	x	0.7	=	134.95	(78)
South	0.9x	0.77	:	x	3.12		x	101.89	x	0.85	x	0.7	=	131.07	(78)
South	0.9x	0.77	:	x	3.12		x	82.59	x	0.85	x	0.7	=	106.25	(78)
South	0.9x	0.77	:	x	3.12		x	55.42	х	0.85	x	0.7	=	71.29	(78)
South	0.9x	0.77		x	3.12		х	40.4	x	0.85	×	0.7	=	51.97	(78)
Sola <mark>r (</mark>	<mark>gain</mark> s in	watts, <mark>ca</mark>	lculate	d	for each mo	nth			(83)m	n = Sum(74)m .	<mark>(8</mark> 2)m			,	
(83)m=	76.19	129.17	177.59		225.52 260.	.54	20	52.93 25 1.65	224	.36 193.73	142.7	5 91.09	65.35		(83)
Total g	gains – i	nternal a	nd sola	ar	(84)m = (73))m +	+ (8	B3)m, watts	r			_	. <u> </u>		
(84)m=	467.98	518.56	553.13		578.99 591.	.72	5	72.83 547.91	526	.87 507.79	479.0	9 452.85	446.05		(84)
7. Me	ean inter	nal temp	erature	e (heating seas	son))							-	
Temp	perature	during he	eating	pe	eriods in the	livir	ng	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilis	ation fac	tor for ga	ains fo	r liv	ving area, h	1,m	(s	ee Table 9a)						7	
	Jan	Feb	Mar	╡	Apr M	ay		Jun Jul	A	ug Sep	Oct	t Nov	Dec		
(86)m=	1	1	1		1 0.9	9	(0.98 0.96	0.9	0.99	1	1	1		(86)
Mear	interna	l tempera	ature ir	n li	ving area T1	l (fo	ollo	w steps 3 to 7	7 in T	able 9c)				_	
(87)m=	18.61	18.74	19.02		19.43 19.8	38	2	0.33 20.62	20.	58 20.21	19.64	19.07	18.6		(87)
Temp	perature	during he	eating	ре	eriods in rest	tof	dw	elling from Ta	able 9	9, Th2 (°C)					
(88)m=	18.53	18.53	18.53	T	18.55 18.5	55	1	8.57 18.57	18.	57 18.56	18.55	5 18.55	18.54		(88)
Utilis	ation fac	tor for a	ains fo	r re	est of dwellir	na. h	า2.	m (see Table	9a)					-	
(89)m=	1	1	1	T	1 0.9	9	,	0.94 0.76	0.8	31 0.97	1	1	1]	(89)
Mear	interna	l tempera	ature ir		he rest of dw	velli	na	T2 (follow ste		to 7 in Tabl	2 9c)			4	
(90)m=	15.61	15.8	16.21	T	16.81 17.4	47	1	8.12 18.47	18.	44 17.96	17.13	3 16.29	15.6]	(90)
			· · · · ·		I					f	LA = Li	ving area ÷ (4) =	0.28	(91)
Maar	intorno	ltompore	aturo (4	for	the whole d	wo!	lin	a) _ fl ∧ ⊤4	. /1	fl A) To					
(92)m=	16.44		16.98	T	17.54 18	$\frac{1}{14}$	111	$y_{j} = 1 - A \times 11$ 8.73 19.07	+(1	$\frac{-1LA}{03} \times 12$	17 82	2 17.06	16.43	1	(92)
·····				- 1										•	(/

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r tilisation	mean int factor fo	ernal ter or gains	mperatui using Ta	re obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm					-	·					
(94)m=	1	1	1	0.99	0.98	0.95	0.84	0.87	0.97	0.99	1	1		(94)
Usefu	ıl 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)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8					_			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	k [(93)m-	– (96)m]				
(97)m=	3343.15	3218.05	2874	2342.05	1741.69	1106.73	660.6	703.52	1205.2	1954.26	2705.53	3337.08		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	2139.51	1814.65	1727.95	1272.01	862.78	0	0	0	0	1099.68	1622.53	2151.23		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	12690.34	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								160.64	(99)
9h Fn	erav rec	uiremer	nts – Cor	mmunity	heating	scheme						L		7
This pa	art is use	ed for sp	ace hea	iting, spa	ace cooli	ng or wa	ater heat	ina prov	ided by	a comm	unitv sch	neme.		
Fractic	on of spa	ace heat	from se	condary/	/supplen	nentary l	neating (Table 1	1) '0' if n	one			0	(301)
Fractic	on of spa	ace heat	from co	mmunity	v svstem	1 - (301	1) =					l l	1	(302)
The con			cobtoin be	not from or	voral aqui		rooduro	allow for	CHP and	in to four	other beet	nouroon: fl	ho lottor]```
ine community scheme may obtain neat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.														
Fractic	on of hea	at from C	ommun	<mark>ity b</mark> oiler	s								1	(303a)
Fractic	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for a	commun	ity heatir	ng syster	m					1.05	(306)
Space	heating	g											kWh/year	_
Annua	l space	heating	requirem	nent									12690.34	
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	13324.86	(307a)
Efficier	ncy of se	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	oplemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h	j neating r	equirem	ent									2102.07	1
lf DHW Water	/ from c heat fro	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30	03a) x (30	5) x (306) :	=	2207.17	(310a)
Electri	city used	d for hea	ıt distribu	ution				0.01	× [(307a).	(307e) +	· (310a)…(310e)] =	155.32	(313)
Coolin	g Syster	n Energ	y Efficie	ncy Rati	D								0	(314)
Space	cooling	(if there	is a fixe	d coolin	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electrie mecha	city for p inical ve	oumps aintilation	nd fans v - balanc	within dv ed, extra	velling (1 act or po	Table 4f) sitive inj	: 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)	0	(331)	
Energy for lighting (calculated in Appendix L)			398.03	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/ye	s ear
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to (366) for the second fue	90	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	= 3727.6	69 (367)
Electrical energy for heat distribution [(3	13) x	0.52	= 80.61	ı (372)
Total CO2 associated with community systems (36	63)(366) + (368)(372)	:	= 3808.	3 (373)
CO2 associated with space heating (secondary) (30	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous	us heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		3808.	3 (376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	= 206.5	8 (379)
Total CO2, kg/year sum of (376)(382) =			4014.8	38 (383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			50.82	2 (384)
El rating (section 14)			56.53	3 (385)

User Details:															
Assessor Name: Software Name:	Stroma FSAP 20 ⁻	12		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	on: 1.0.3.15						
	landan	Pro	operty A	Address:	Unit 11										
Address :															
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) 1.9	(2a) =	Volume(m³ 96.9) (3a)					
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n))	51	(4)										
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	96.9	(5)					
2. Ventilation rate:	-														
Number of chimneys Number of open flues	$\begin{array}{c c} main & s \\ heating & \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary heating 0 0	/ · · · · · · · · · · · · · · · · · · ·	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)					
Number of intermittent fan	S				Г	2	x ´	10 =	20	(7a)					
Number of passive vents					Ē	0	x ^	10 =	0	(7b)					
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)					
Air changes per hour															
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) = $										(8)					
Number of storeys in the Additional infiltration Structural infiltration: 0.2	If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration [(9)-1]x0.1 = [Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction														
If both types of wall are pre deducting areas of opening	sent, use the value corre gs); if equal user 0.35 oor enter 0.2 (unsea	sponding to t	tne greate	d) else	a (atter				0	– (12)					
If no draught lobby, ente	r 0.05, else enter 0		, (ooalo	u), 0.00					0	(12)					
Percentage of windows	and doors draught s	tripped							0	(14)					
Window infiltration	Ū			0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)					
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)					
Air permeability value, c	50, expressed in cul	bic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	10	(17)					
If based on air permeabilit	y value, then (18) = [(17) ÷ 20]+(8)), otherwis	se (18) = (16)				0.71	(18)					
Air permeability value applies	if a pressurisation test ha	is been done	e or a deg	iree air pei	meability i	is being u	sed		r	-					
Number of sides sheltered	1			(20) = 1 - [0.075 x (1	9)] =			1	(19)					
Infiltration rate incorporati	ng shelter factor			(21) = (18)	x (20) =	-/1			0.92	(20)					
Infiltration rate modified fo	r monthly wind spee	d		x / x -/	(-)				0.05	(21)					
Jan Feb	Mar Apr Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec							
Monthly average wind spe	ed from Table 7		•••					- • •	1						
(22)m= 5.1 5 4	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	1 1					1	1	I						
(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]						
Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
------------------------	---------------------------	-------------------------	----------------------------	-----------------------------	--------------------------	-------------------------	----------------------	-------------------------	----------------	-----------------	-------------	-----------	--------	-------------	---------
	0.83	0.82	0.8	0.72	0.7	0.62	0.62	0.6	0.65	0.7	0.74	0.77			
Calcul	ate effec	ctive air	change i tion:	rate for t	he appli	cable ca	se								
lf exh	aust air he		using Anne	endix N (2	3h) - (23a) x Fmv (e	equation (N	(15)) other	wise (23h) – (23a)			0		
If bal	anced with	heat reco		iency in %	allowing f	or in-use f	actor (from	n Table 4h) –) = (200)			0		
a) If		d moch			with hor				$\gamma = -$	2b)m i (22b) v [1 (220)	0		(230)
a) II (24a)m-									() (22)	$\frac{20}{10}$		1 - (230)]]		(24a)
(2-40)11-		d moob			without	boot roc			m = (2)		22h)	Ū	l		(2.103)
(24b)m-								0 (240	0 $11 = (22)$		230)	0	1		(24b)
(240)III-			tract vor				vontilatio	n from c	vuteido	Ŭ	Ů	Ů	J		(,
0) 11	if (22b)n	1 < 0.5 ×	(23b), t	hen (24	c) = (23b)); other	vise (24	c) = (22b)	b) m + 0.	5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh en (24d)	ole hous m = (22)	e positiv	/e input v erwise (2	ventilatio 4d)m –	on from 1 0.5 + [(2)	oft 2h)m² x	0 51					
(24d)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]		(24d)
Fffe	ctive air	change	rate - er	L ter (24a) or (24t) or (24	L c) or (24	d) in boy	(25)			I	1		
(25)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			(25)
													1		
3. He	at losse	s and he	eat loss p	Daramet	ər:							1 -1			· •
ELEN	/IEN I	area	ss (m²)	Openin	gs I ²	Net Ar A ,r	ea n²	W/m2	K	AXU (W/I	<)	k-value	e K	A X kJ/l	к К
Doo <mark>rs</mark>						1.9	x	1.4	= [2.66					(26)
Windo	ws Type	:1				1.67	x1.	/[1/(4.8)+	0.04] =	6.72					(27)
Windo	ws Type	2				0.84	x1.	/[1/(4.8)+	0.04] =	3.38	Ē.				(27)
Walls	Type1	45.3	3	2.51		42.79) X	2.1	=	89.86					(29)
Walls	Type2	15.3	9	1.9		13.49) X	2.1	=	28.33					(29)
Roof		31.9	9	0		31.9	x	0.28	=	8.93					(30)
Total a	area of e	lements	, m²			92.59)								(31)
* for win ** includ	ndows and le the area	roof wind as on both	ows, use e sides of ir	effective wi nternal wal	ndow U-va Is and part	alue calcul titions	ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	1 3.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				139	.89	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0		(34)
Therm	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K			Indica	tive Value	: High		45	0	(35)
For desi can be ι	ign assess used instea	ments wh ad of a de	ere the de tailed calci	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f			_
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						14	1	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)									_
Total f	abric he	at loss							(33) +	(36) =			153	.89	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)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	J		(38)
Heat ti	ransfer o	coefficier	nt, W/K	-					(39)m	= (37) + (3	38)m				
(39)m=	180.97	180.54	180.12	178.14	177.76	176.04	176.04	175.72	176.7	177.76	178.52	179.3			-
									/	Average =	Sum(39)1	12 /12=	178	.13	(39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) (40)m= 3.55 3.54 3.53 3.49 3.45 3.45 3.46 3.49 3.5 3.52														
(40)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		
L	r of dov		ı						,	Average =	Sum(40)1.	12 /12=	3.49	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
													1	
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	FFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag he annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by s r day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			1		1	
(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		
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	vater heatii	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	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	storage	ioss: ie (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
lf comm	nunity h	eating a	ind no ta	ink in dw	vellina. e	nter 110	litres in	(47)			L	100		()
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/y€	ear		lun numu	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	whown. ay)				0.	02]	(51)
If comm	hunity h	from To	ee secti	on 4.3									1	(50)
Tempe	rature f	actor fro	ne za m Table	2h							1.	03 6		(52)
Energy	lost fro	m water	storage		aar			$(47) \times (51)$) x (52) x (53) -		.0]	(54)
Enter (50) or ((54) in (5	55)	, KVVII/yt	501			(41) X (01)	/ x (02) x (50) –	1.	03		(55)
Water s	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)ı	m			1	
(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	r 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 Append	J lix 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	nnual) fro	om Table	93							0]	(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				-	
(mod	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h month	(61)m =	(60) ÷ 3	865 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	l for ea	ch month	(62)m =	• 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	- IW input	calculated	using Ap	pendix G c	r Appendix	H (nega	tive quantity	/) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	applie	s, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	vater hea	ter											
(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		_
								Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	om water	heating	, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57))m in calo	culation	of (65)m	n only if c	ylinder	is in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ernal g	ains (see	e Table	5 and 5a	ı):									
Metab	olic daii	ns (Table	e 5). Wa	itts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9 d	or L9a), a	lso see	Table 5					
(67)m=	17.13	15.21	12.37	9.36	7	5.91	6.39	8.3	11.14	14.15	16.51	17.6		(67)
Applia	nces ga	ains (ca <mark>lc</mark>	ulated i	n Appen	dix L, ea	uation I	_13 or L1	3a), also	see Ta	ble 5			1	
(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)
Cookir	g gains	s (calcula	ted in A	Appendix	L, equat	ion L15	or L15a), also se	ee Table	5			1	
(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 fa	ins gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.q. e	vaporatic	n (nega	ative valu	ies) (Tab	le 5)		Į	ļ	Į	1	Į	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	-68.78		(71)
Water	heating	u dains (T	able 5)	1			1				1		1	
(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 i	nterna	l gains =	I		Į	(66	5)m + (67)m	ı 1 + (68)m -	+ (69)m +	l (70)m + (7	1 1)m + (72)	m	1	
(73)m=	295.47	293.38	283.02	266.78	250.71	235.25	225.31	230.54	239.03	255.44	274.06	287.61]	(73)
6. Sol	lar gain	s:	1	1			1							
Solar g	ains are	calculated	using sol	ar flux from	Table 6a	and asso	ciated equa	itions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area	a	FI	ux		g_		FF		Gains	
		Table 6d		m²		Та	able 6a	Т	able 6b	Т	able 6c		(VV)	
East	0.9x	1)	(1.	67	x	19.64	x	0.85	x	0.7	=	13.52	(76)
East	0.9x	1)	1.	67	x	38.42	x	0.85	×	0.7	=	26.46	(76)
East	0.9x	1)	(1.	67	×	63.27	x	0.85	×	0.7	=	43.57	(76)
East	0.9x	1)	(1.	67	x	92.28	x 🗌	0.85	× [0.7	=	63.54	(76)
East	0.9x	1)	(1.	67	x	113.09	x 🗌	0.85	×	0.7	=	77.88	(76)

East $0.9x$ 1x 1.67 x 110.22 x 0.85 x 0.7 = 75.9 East $0.9x$ 1x 1.67 x 94.68 x 0.85 x 0.7 = 65.19 East $0.9x$ 1x 1.67 x 73.59 x 0.85 x 0.7 = 50.67 East $0.9x$ 1x 1.67 x 45.59 x 0.85 x 0.7 = 31.39 East $0.9x$ 1x 1.67 x 24.49 x 0.85 x 0.7 = 16.86 East $0.9x$ 1x 1.67 x 16.15 x 0.85 x 0.7 = 11.12 West $0.9x$ 0.77 x 0.84 x 10.65 x 0.7 = 6.8 West $0.9x$ 0.77 x 0.84 x 19.64 x 0.85 x 0.7 = 21.92 West $0.9x$ 0.77 x 0.84 x 9.85 x 0.7 = 31.96 West $0.9x$ 0.77 x 0.84 x 9.85 x 0.7 = 31.96 West $0.9x$ 0.77 x 0.84 x 113.09 x 0.85 x 0.7 = 31.96 West $0.9x$ 0.77 x 0.84 x 113.09 x 0.85 x 0.7 = 31.96	(76) (76) (76) (76) (76) (76) (76) (76) (76) (76) (76) (76) (76) (76) (76) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80)														
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East $0.9x$ 1x1.67x73.59x 0.85 x 0.7 = 50.67 East $0.9x$ 1x1.67x 45.59 x 0.85 x 0.7 = 31.39 East $0.9x$ 1x1.67x 24.49 x 0.85 x 0.7 = 16.86 East $0.9x$ 1x1.67x16.15x 0.85 x 0.7 = 11.12 West $0.9x$ 0.77 x 0.84 x 19.64 x 0.85 x 0.7 = 6.8 West $0.9x$ 0.77 x 0.84 x 38.42 x 0.85 x 0.7 = 13.31 West $0.9x$ 0.77 x 0.84 x 38.42 x 0.85 x 0.7 = 21.92 West $0.9x$ 0.77 x 0.84 x 92.28 x 0.85 x 0.7 = 31.96 West $0.9x$ 0.77 x 0.84 x 113.09 x 0.85 x 0.7 = 39.17 West $0.9x$ 0.77 x 0.84 x 110.22 x 0.85 x 0.7 = 32.79 West $0.9x$ 0.77 x 0.84 x 110.22 x 0.85 x 0.7 = 32.79 West $0.9x$ 0.77 x 0.84 x 24.49 x <t< td=""><td>(76) (76) (76) (76) (76) (80)</td></t<>	(76) (76) (76) (76) (76) (80)														
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West 0.9x 0.77 x 0.84 x 16.15 x 0.85 x 0.7 = 5.59 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = Sum(74)m(82)m (83)m = Sum(74)m(82)m															
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	(80)														
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	0.9x 0.9x 0.77 x 0.84 x 16.15 x 0.85 x 0.7 = 5.59 (80)														
(83)m= 20.33 39.76 65.49 95.51 117.05 119.82 114.07 97.99 76.16 47.18 25.35 16.72	(83)														
$[0,1]_{T} = \begin{bmatrix} 245 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 245 & 0 \\ $	(94)														
(64)/11= 315.0 333.14 346.5 302.20 307.75 335.07 339.38 326.53 315.19 302.03 299.4 304.32	(04)														
7. Mean internal temperature (heating season)															
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)														
Utilisation factor for gains for living area, h1,m (see Table 9a)															
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(96)														
(86)M = 1 1 1 1 1 1 0.99 0.97 0.97 0.99 1 1 1 1	(00)														
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)															
(87)m= 18.59 18.71 18.98 19.4 19.85 20.3 20.6 20.56 20.19 19.62 19.05 18.58	(87)														
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)															
(88)m= 18.5 18.51 18.52 18.53 18.54 18.54 18.54 18.53 18.52 18.51	(88)														
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)															
(89)m= 1 1 1 0.99 0.95 0.78 0.82 0.97 1 1 1	(89)														
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)															
(90)m= 15.56 15.73 16.14 16.75 17.41 18.07 18.44 18.4 17.91 17.07 16.24 15.56	(90)														
$fLA = Living area \div (4) = 0.56$	(91)														
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	-														
(92)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	(02)														

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(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. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	1	1	0.99	0.97	0.91	0.93	0.98	1	1	1		(94)
Usefu	I gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	315.47	332.68	347.72	360.66	363.73	343.72	309.53	304.95	309.39	301.33	298.92	304.05		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	k [(93)m-	– (96)m]				
(97)m=	2347.74	2259.23	2025.38	1664.58	1259.97	832.96	538.38	566.18	900.41	1406.09	1915.15	2342.71		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4′	1)m			
(98)m=	1512.01	1294.65	1248.18	938.83	666.8	0	0	0	0	821.95	1163.68	1516.76		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	9162.85	(98)
Space	e heating	g require	ement in	kWh/m ²	/year							Ī	179.66	(99)
Qh En	erav rea	uiromor	ote – Cor	nmunity	heating	schama						L].
This pr	art is use	ad for en		ting spr			ator boat	ing prov	ided by		unity sch	omo		
Fractio	n of spa	ace heat	from se	condary/	supplen/	ng of wa	neating	Table 1	1) '0' if n	one	unity SCI		0	(301)
Fractio	n of one	no hoot	from oo	mmunitu	avetom	1 (204	1) _		, -			 Г		
FIACIO	n or spa	ice neal	Hom co	minumity	system	1 - (30)	() =					[1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C														
Fractio	n of hea	at from C	commun	ity boiler	'S	ion power	stations.	See Apper	idix C.			[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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting sys	tem		[1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng systei	m				[1.05	(306)
Space	heating	9										_	kWh/year	_
Annua	space	heating	requirem	nent									9162.85	
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (308	5) x (306) =	= [9620.99	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308
Space	heating	requirer	ment froi	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 ÷	+ (308) =	[0	(309)
Water Annua	heating water h	l neating r	equirem	ent								ſ	1831.51	1
If DHW	/ from co	ommunit	ty schem	ne:								l		J
Water	heat fro	m Comn	nunity bo	oilers					(64) x (30	03a) x (308	5) x (306) =	= [1923.08	(310a)
Electric	city used	d for hea	ıt distribu	ution				0.01	× [(307a).	(307e) +	(310a)(310e)] =	115.44	(313)
Cooling	g Syster	n Energ	y Efficiei	ncy Ratio	C							[0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =		[0	(315)
Electric mecha	city for p nical ve	oumps aintilation	nd fans v - balanc	within dw ed, extra	velling (1 act or po	able 4f) sitive inp	: 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 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 the source of	two fuels repeat (363) to (366) for the second fue	el 90	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] 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 (3	63)(366) + (368)(372)	:	= 2830.49	(373)
CO2 associated with space heating (secondary) (3	09) 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	73) + (374) + (375) =		2830.49	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	32))) 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)

User Details:				
Assessor Name: Stroma Number Software Name: Stroma FSAP 2012 Software Vers	oer: sion:	Versio	n: 1.0.3.15	
Property Address: Unit 12				
Address : , London				
Basement 55 (1a) x	Av. Height(m)	(2a) =	Volume(m³) 119.35	(3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55 (4)				
Dwelling volume (3a)+(3b)-	+(3c)+(3d)+(3e)+	.(3n) =	119.35	(5)
2. Ventilation rate:				
main heatingsecondary heatingotherNumber of chimneys 0 + 0 + 0 =Number of open flues 0 + 0 + 0 =	0 x 2 0 x 2	40 = 20 =	0 0	(6a) (6b)
Number of intermittent fans	2 × 7	10 =	20	(7a)
Number of passive vents	0 x ²	10 =	0	(7b)
Number of flueless gas fires	0 × 4	40 =	0	(7c)
		Air ch	ange <mark>s per</mark> ho	ur
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue fro Number of storeys in the dwelling (ns)	0.17	(8) (9)		
Additional infiltration	[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constru- 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	uction]	0](11)](12)
If no draught lobby, enter 0.05, else enter 0		l	0	(12)
Percentage of windows and doors draught stripped		l	0	(13)
Window infiltration $0.25 - [0.2 \times (14) \div 10]$	00] =	l	0	(15)
Infiltration rate (8) + (10) + (11) + (12)	2) + (13) + (15) =		0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square me	etre of envelope	area	10	(17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$			0.67	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is	s being used	r		_
Number of sides sheltered $(20) = 1 - 10.075 \times (100)$	9)] =		2	(19)
(20) = 1 (20) = 1	5)] -] I	0.85	(20)
Infiltration rate modified for monthly wind speed			0.57	(21)
lan 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 Eactor (22a)m = (22)m $\cdot 4$				
(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		

Adjuste	ed infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(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		
Calcula If me	ate etteo chanica	ctive air	change	rate for t	he appli	cable ca	ise					1	0	(232)
If exh	aust air he	eat pump	usina App	endix N. (2	3b) = (23a) × Fmv (e	equation (N5)) . othe	rwise (23b) = (23a)		l I	0	(23b)
If bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, (,		l I	0	(23c)
a) If	halance	d mech	anical ve	ntilation	with he	at recov	erv (MV/	HR) (24:	′ a)m – (2'	2h)m + (23h) v [1 – (23c)	0 	(200)
(24a)m=	0				0	0							. 100]	(24a)
b) If	halance	d mech	anical ve	I	without	heat rec	covery (I	I MV) (24k	1 = (2)	2h)m + (23b)			
(24b)m=	0	0		0	0	0					0	0		(24b)
c) If	whole h	ouse ex	I tract ver	ntilation of	or positiv	re input v	I ventilatio	n from o	L outside					
i i	f (22b)n	n < 0.5 ×	(23b), 1	then (240	c) = (23b); other	wise (24	c) = (22	o) m + 0	.5 × (23t))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilati	on from	loft	-	-			
i	f (22b)n	n = 1, th	en (24d)	m = (22k	o)m othe	rwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]	r			
(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)
Effec	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (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. Hea	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN	1ENT	Gros	s	Openin	gs	Net Ar	rea	U-val	ue	AXU		k-value		AXk
Deere		area	(m²)	m	12	A ,r	m²	VV/m2	2K	(VV/	K)	kJ/m ² ·ł	< l	kJ/K
Doors	. .					1.9	×	1.4	=	2.66	-			(26)
vvindo\	ws Type	:1				4.59	x1	/[1/(1.6)+	0.04] =	6.9	Ľ.			(27)
Window	ws Type	2				1.87	x ¹	/[1/(4.8)+	0.04] =	7.53				(27)
Window	ws Type	93				0.65	x1	/[1/(4.8)+	0.04] =	2.62				(27)
Window	ws Type	e 4				1.87	x1	/[1/(1.6)+	0.04] =	2.81				(27)
Floor						55	x	0.93	=	51.15				(28)
Walls 7	Гуре1	28.	9	8.33		20.57	7 X	2.1	=	43.2				(29)
Walls 7	Гуре2	7.8	1	2.55		5.26	X	2.1	=	11.05				(29)
Total a	rea of e	lements	, m²			91.71	1							(31)
Party v	vall					27.9	x	0	=	0				(32)
Party v	vall					1.13	x	0	=	0				(32)
* for win	dows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
** includ	e the area	as on both	sides of in	nternal wal	ls and part	itions		(26) (20)) (22)					
Fabric	neat los	S, W/K :	= 5 (A X	0)				(20)(30)) + (32) =	(00) . (0)	0) . (00 .)	(00.)	127.9	1 (33)
Heat Ca		Cm = S((A X K)			1/1021			((28).	(30) + (3)	2) + (32a).	(32e) =	0	(34)
For dooi		parame		- = CM +	- IFA) IN	i KJ/IN-K	t known n	raciaaly th	indicativ	uve value	. піgn : тмр ін т	able 1f	450	(35)
can be u	used inste	ad of a de	tailed calc	ulation.	CONSTRUCT	on are no	ι κποιντη ρι	ecisely ine		- values of				
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	K						14.4	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			142.3	1 (37)

Ventila	'entilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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 ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	172.32	171.92	171.52	169.68	169.34	167.73	167.73	167.43	168.35	169.34	170.03	170.76		
									(10)	Average =	Sum(39)1	12 /12=	169.68	(39)
Heat lo	oss para	imeter (H	HLP), W	/m²K	0.00	0.05	0.05	0.04	(40)m	= (39)m ÷	- (4)			
(40)m=	3.13	3.13	3.12	3.09	3.08	3.05	3.05	3.04	3.06	3.08	3.09	3.1	2.00	
Numbe	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 / 12=	3.09	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 Wa	ater heat	ting ene	rav reau	irement [.]								kWh/ve	ear:	
			igy ioqu											
		upancy, I	N 1 76 v	[1 ovp	(0 0003		- 120	\2\ <u>1 - 0</u> (1012 v (*	TEA 12	1.	.84		(42)
if TF	A £ 13.	9, $N = 1$ 9, $N = 1$	+ 1.70 X	. [1 - exp	(-0.0003	949 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA-13.	.9)			
Annua	l averag	je hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		77	.84		(43)
Reduce	the annua e that 125	al average litres per	hot water person pe	usage by r dav (all w	5% if the a ater use. I	lwelling is hot and co	designed i Id)	to achieve	a water us	se target o	f			
			Max					A	0.00	Ort	Neu			
Hot wat	Jan er usage i	n litres per	Iviar dav for ea	Apr ach month	Vd.m = fa	ctor from 7	JUI Table 1c x	(43)	Sep	Oct	INOV	Dec		
(44)m-	85.62	82.51	79 30	76.28	73 17	70.05	70.05	73 17	76.28	79 39	82.51	85.62		
(++)11-	05.02	02.51	79.55	10.20	15.11	10.05	10.00	73.17	- 10.20	$\frac{79.59}{100} = Su$	m(44)1 12 =	00.02	934.05	(44)
Energy	content of	hot water	used - ca	lculated me	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)	001.00	
(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		
										Total = Su	m(45) ₁₁₂ =	=	1224.68	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)					
(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)
Storag	storage	1055: Do (litros)	includir		alar ar M	/\//HBC	storada	within s	ame ves	ما		400		(47)
If com	munity h	e (illes)	and no to	ng any su ank in du	velling e	ntor 110	litros in	(47)		501		160		(47)
Otherv	vise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water	storage	loss:		,					,	·				
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	y lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	nanufact	urer's de	eclared (cylinder com Tabl	loss fact	or is not b/litro/da	known:							(54)
If com	munity h	neating s	ee secti	on 4.3		1/11110/08	iy)				0.	.02		(51)
Volum	e factor	from Ta	ble 2a								1.	.03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	y lost fro	m water	storage	e, 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	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 cylinde	er contain	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	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)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = (58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (6	61)m
(62)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		(62)
Solar DH	HW input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
								Outp	out from wa	ater heate	r (annual)₁	12	1875.5	2 (64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	60.83	53.73	56.71	51. <mark>23</mark>	50.48	4 <u>5.5</u> 1	44.1	47.86	47.61	53.1	55.66	59.5		(65)
inclu	de (57)	m in calc	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5) Wat	ts										
in o to to	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	91.87	91.87	91.87	91. <mark>87</mark>	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equati	ion L9 oi	⁻ L9a), a	lso see	Table 5					
(67)m=	14.74	13.1	10.65	8.06	6.03	5.09	5.5	7.15	9.59	12.18	14.22	15.15		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1:	3a), also	see Tal	ble 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)
Cookin	ig gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e 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 fai	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49		(71)
Water	heating	gains (T	able 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 i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	307.25	305.46	295.1	278.52	261.93	245.77	235.17	240.21	248.64	265.4	284.62	298.8		(73)
6. Sol	ar gains	5:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicat	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	
	٦	Table 6d		m²		Tab	ole 6a	Т	able 6b	Ta	able 6c		(W)	

North	0.9x	0.77	x	1.87	x	10.63	x	0.85	x	0.7	=	8.2	(74)
North	0.9x	0.77	x	0.65	x	10.63	x	0.85	x	0.7] =	2.85	(74)
North	0.9x	0.77	×	1.87	x	20.32	x	0.85	x	0.7] =	15.67	(74)
North	0.9x	0.77	x	0.65	x	20.32	x	0.85	x	0.7	=	5.45	(74)
North	0.9x	0.77	×	1.87	x	34.53	x	0.85	x	0.7] =	26.63	(74)
North	0.9x	0.77	x	0.65	x	34.53	x	0.85	x	0.7	=	9.25	(74)
North	0.9x	0.77	x	1.87	x	55.46	x	0.85	x	0.7] =	42.77	(74)
North	0.9x	0.77	x	0.65	x	55.46	x	0.85	x	0.7	=	14.87	(74)
North	0.9x	0.77	x	1.87	x	74.72	x	0.85	x	0.7] =	57.61	(74)
North	0.9x	0.77	x	0.65	×	74.72	x	0.85	x	0.7	=	20.03	(74)
North	0.9x	0.77	x	1.87	x	79.99	x	0.85	x	0.7	=	61.67	(74)
North	0.9x	0.77	x	0.65	x	79.99	x	0.85	x	0.7	=	21.44	(74)
North	0.9x	0.77	x	1.87	×	74.68	x	0.85	x	0.7	=	57.58	(74)
North	0.9x	0.77	x	0.65	x	74.68	x	0.85	x	0.7	=	20.01	(74)
North	0.9x	0.77	x	1.87	x	59.25	x	0.85	x	0.7	=	45.68	(74)
North	0.9x	0.77	x	0.65	x	59.25	x	0.85	x	0.7	=	15.88	(74)
North	0.9x	0.77	x	1.87	x	41.52	x	0.85	x	0.7	=	32.01	(74)
North	0.9x	0.77	x	0.65	X	41.52	x	0.85	х	0.7] =	11.13	(74)
North	0.9x	0.77	x	1.87	х	24.19	x	0.85	x	0.7	=	18.65	(74)
North	0.9x	0.77	x	0.65	x	24.19	x	0.85	x	0.7	=	6.48	(74)
North	0.9x	0.77	x	1.87	x	13.12	x	0.85	x	0.7] =	10.11	(74)
North	0.9x	0.77] ×	0.65	×	13.12	х	0.85	x	0.7	=	3.52	(74)
North	0.9x	0.77	x	1.87	x	8.86	x	0.85	x	0.7] =	6.84	(74)
North	0.9x	0.77	x	0.65	×	8.86	x	0.85	x	0.7	=	2.38	(74)
East	0.9x	1	x	1.87	x	19.64	x	0.76	x	0.7	=	13.54	(76)
East	0.9x	1	x	1.87	x	38.42	x	0.76	x	0.7	=	26.49	(76)
East	0.9x	1	x	1.87	x	63.27	x	0.76	x	0.7	=	43.62	(76)
East	0.9x	1	x	1.87	x	92.28	x	0.76	x	0.7	=	63.62	(76)
East	0.9x	1	x	1.87	x	113.09	x	0.76	x	0.7	=	77.97	(76)
East	0.9x	1	x	1.87	×	115.77	x	0.76	x	0.7] =	79.81	(76)
East	0.9x	1	x	1.87	x	110.22	x	0.76	x	0.7	=	75.99	(76)
East	0.9x	1	x	1.87	x	94.68	x	0.76	x	0.7	=	65.27	(76)
East	0.9x	1	x	1.87	x	73.59	x	0.76	x	0.7	=	50.73	(76)
East	0.9x	1	x	1.87	x	45.59	x	0.76	x	0.7	=	31.43	(76)
East	0.9x	1	x	1.87	×	24.49	x	0.76	x	0.7] =	16.88	(76)
East	0.9x	1	x	1.87	x	16.15	x	0.76	x	0.7	=	11.14	(76)
South	0.9x	0.77	×	4.59	×	46.75	x	0.76	x	0.7	=	79.11	(78)
South	0.9x	0.77	x	4.59	×	76.57	x	0.76	x	0.7	=	129.57	(78)
South	0.9x	0.77	×	4.59	×	97.53	x	0.76	x	0.7] =	165.05	(78)
South	0.9x	0.77	×	4.59	×	110.23	×	0.76	x	0.7	=	186.54	(78)
South	0.9x	0.77	×	4.59	×	114.87	x	0.76	x	0.7	=	194.39	(78)

South	0.9x	0.77	,	4.	59	x	1	10.55	x		0.76	x	Γ	0.7		=	187.07	(78)
South	0.9x	0.77	,	4.	59	x	1	08.01	x		0.76	- x	Г	0.7		=	182.78	(78)
South	0.9x	0.77		4.	59	x	1	04.89	x		0.76	×	Ē	0.7		=	177.5	(78)
South	0.9x	0.77		4.	59	x	1	01.89	x		0.76	×	Γ	0.7		=	172.41	(78)
South	0.9x	0.77		4.	59	x	<u>ــــــ</u>	32.59	x		0.76	۲ × آ	Г	0.7		=	139.75	(78)
South	0.9x	0.77	>	4.	59	x	5	55.42	x		0.76	×	Ē	0.7		=	93.78	(78)
South	0.9x	0.77		4.	59	x		40.4	x		0.76	- x	Γ	0.7		=	68.36	(78)
	L												-					
Solar (gains in	watts, ca	alculate	d for eac	h mont	h			(83)m	= Sı	um(74)m .	(82)r	n					
(83)m=	103.7	177.17	244.55	307.79	349.99)	350	336.36	304	.34	266.29	196.	32	124.29	88.	71		(83)
Total g	gains – i	nternal a	nd sola	ar (84)m :	= (73)m) + (83)m	, watts										
(84)m=	410.95	482.64	539.65	586.31	611.92	2 5	95.77	571.53	544	.55	514.92	461.	71	408.91	387	.51		(84)
7. Me	ean intei	nal temp	perature	e (heating	g seaso	n)												
Temp	perature	during h	eating	periods i	n the liv	/ing	area	from Tak	ole 9,	Th	1 (°C)						21	(85)
Utilis	ation fac	ctor for g	ains for	living ar	ea, h1,ı	m (s	ее Та	able 9a)								I		
	Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug	Sep	00	ct	Nov	D	ec		
(86)m=	1	1	1	0.99	0.98	T	0.95	0.88	0.9	Э	0.97	0.9	9	1	1			(86)
Mear	interna	temper	ature in	living ar	ea T1 (follo	w ste	ens 3 to 7	7 in T	able	e 9c)							
(87)m=	18.89	19.04	19.33	19.73	20.16		20.56	20.8	20.	76	20.43	19.8	38	19.32	18.	87		(87)
Tamm		du univo en la						from To										
l emt					18 71		eiiing			73 I	18 72	187	71	18.7	18	7		(88)
(00)11-	10.00	10.00	10.00	10.71	10.71		10.75	10.75	10.	/ 5	10.72	10.7	•	10.7		. /		(00)
Utilis	ation fac	tor for g	ains for	rest of d	welling	, h2	,m (se	e Table	9a)				_				1	(00)
(89)m=	1	1	0.99	0.99	0.96		0.84	0.58	0.6	4	0.92	0.9	9	1	1			(89)
Me <mark>ar</mark>	interna	l temper	ature in	the rest	of dwe	lling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c)</mark>						
(90)m=	16.09	16.32	16.74	17.34	17.95		18.49	18.69	18.	68	18.33	17.5	55	16.73	16.	07		(90)
											f	LA = L	ivin	g area ÷ (4	4) =		0.55	(91)
Mear	n interna	l temper	ature (f	or the wh	nole dw	ellin	g) = f	LA x T1	+ (1	– fL	A) × T2							
(92)m=	17.63	17.81	18.16	18.65	19.17		19.63	19.85	19.8	82	19.48	18.8	33	18.15	17.	61		(92)
Apply	/ adjustr	nent to t	he mea	n interna	l tempe	eratu	ure fro	m Table	e 4e, '	whe	re appro	opriat	e				L	
(93)m=	17.63	17.81	18.16	18.65	19.17	Ŀ	19.63	19.85	19.8	82	19.48	18.8	33	18.15	17.	61		(93)
8. Sp	ace hea	ting requ	uiremer	nt														
Set T	i to the tilisation	mean int	ernal te	mperatu	re obta	inec	at st	ep 11 of	Tabl	e 9b	o, so tha	t Ti,n	า=(76)m an	d re-	calc	ulate	
ine u	lan	Feb	Mar			,	lun		Δ		Sen	0	~t	Nov	П	90		
Utilis	ation fac	tor for a	ains, hr	<u>ן איז</u> n:			Juli			ug [OCP	0		INOV		00	I	
(94)m=	1	1	0.99	0.99	0.96	Т	0.9	0.77	0.8	1	0.94	0.9	9	1	1			(94)
Usefu	ul gains.	hmGm	W = (9	 94)m x (8	1 4)m			I	<u> </u>								i .	
(95)m=	410.33	481.23	536.43	578.12	589.75	5 5	36.45	439.68	440	.15	485.81	456.	54	407.77	387	.05		(95)
Mont	hly aver	age exte	rnal ter	nperature	e from	Tab	le 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 rat	e for mea	an inter	nal temp	erature	, Ln	י, W	=[(39)m	x [(93	3)m-	– (96)m]						
(97)m=	2296.27	2219.89	2000.14	1655.19	1264.1	38	42.86	544.66	572	.64	906.46	1393	.84	1879.44	2289	9.52		(97)
Spac	e heatin	g require	ement f	or each r	nonth, l	kWł	n/mon	th = 0.02	24 x [(97)	m – (95)m] x	(4	1)m	_		I	
(98)m=	1403.13	1168.38	1089	775.49	501.74		0	0	0		0	697.	35	1059.6	1415	5.44		

	Total per year (kWh/y	ear) = Sum(98) _{15,912}	= 81	10.13	(98)
Space heating requirement in kWh/m²/year			14	47.46	(99)
9b. Energy requirements – Community heating scheme)				
This part is used for space heating, space cooling or wa Fraction of space heat from secondary/supplementary	ater heating provided by a com heating (Table 11) '0' if none	munity scheme.		0	(301)
Fraction of space heat from community system $1 - (30)$	1) =			1](302)
The community scheme may obtain heat from several sources. The	' procedure allows for CHP and up to fo	ur other heat sources	s; the latter		1
includes boilers, heat pumps, geothermal and waste heat from power Fraction of heat from Community boilers	r stations. See Appendix C.			1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =		1	(304a)
Factor for control and charging method (Table 4c(3)) fo	r community heating system			1	(305)
Distribution loss factor (Table 12c) for community heating	ng system		· · ·	1.05	(306)
Space heating			k\	Nh/year	-
Annual space heating requirement			81	10.13	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	85	515.63	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Append	dix E)		0	(308
Space heating requirement from secondary/supplemen	tary system (98) x (301) x 10	00 ÷ (308) =		0	(309)
Water heating					-
Annual water heating requirement			18	375.52]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1	060 3] (310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] :	= 1	04.85](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 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)			20	60.39	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto kg CO2/kWh	r Emiss kg CO	ions 2/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 (366) for the second f	uel	90	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0	= 2	2516.38	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	54.42	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372))	=	2570.8	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)

CO2 associated with water from immer	sion heater or insta	ntaneous heater (312) x	0.22	=	0	(375)				
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			2570.8	(376)				
CO2 associated with electricity for pum	D2 associated with electricity for pumps and fans within dwelling (331) x									
CO2 associated with electricity for light	(332))) x	0.52	=	135.14	(379)					
Total CO2, kg/year	sum of (376)(382) =				2705.94	(383)				
Dwelling CO2 Emission Rate	(383) ÷ (4) =				49.2	(384)				
El rating (section 14)					63.74	(385)				



			User D	etails:									
Assessor Name: Software Name:	Stroma FSAP 2012	2	concertu /	Stroma Softwa	a Num ire Ver	ber: sion:		Versic	on: 1.0.3.15				
Address :	. london		openy /	Audress.									
1. Overall dwelling dimer	isions:												
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) .17	(2a) =	Volume(m 3 110.67	3) (3a)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e))+(1n)	51	(4)								
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	110.67	(5)			
2. Ventilation rate:	-												
Number of chimneys Number of open flues Number of intermittent fan	$\begin{array}{c} main & se \\ heating & heating \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary eating 0 0	y + [] + []	0 0 0] = [] = [total 0 2		40 = 20 = 10 =	m ³ per hou	(6a) (6b)			
Number of passive vents							x /	10 =					
Number of flueless res fir						0		10 -	0				
$\begin{array}{c} 0 \\ \hline 0 \hline \hline$													
If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	en carried out or is intende e dwelling (ns) 25 for steel or timber f esent, use the value corresp gs); if equal user 0.35	d, proceed rame or boonding to	to (17), c 0.35 for the greate	therwise c masonr er wall area	ontinue fro y constr a (after	om (9) to (uction	(16) [(9)	-1]x0.1 =	0 0 0	(9) (10) (11)			
If suspended wooden flo	oor, enter 0.2 (unseale	ed) or 0.	1 (seale	d), else	enter 0				0	(12)			
If no draught lobby, ente	er 0.05, else enter 0								0	(13)			
Window infiltration	and doors draught str	ipped		0 25 - [0 2	x (14) ∸ 1	001 =			0	(14)			
				(8) + (10) -	F (11) + (1	2) + (13) ·	+ (15) =		0	(15)			
Air permeability value, o	50. expressed in cubi	ic metre	s per ho	ur per so	uare m	etre of e	envelope	area	10				
If based on air permeabilit	y value, then (18) = [(17	7) ÷ 20]+(8), otherwi	se (18) = (16)				0.68	(18)			
Air permeability value applies	if a pressurisation test has	been don	e or a deg	ıree air pei	meability	is being u	sed						
Number of sides sheltered	ł								3	(19)			
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.78	(20)			
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.53	(21)			
Infiltration rate modified fo	r monthly wind speed								1				
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J				
Monthly average wind spe	ed from Table 7							1	1				
(22)m= 5.1 5 4	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J				
Wind Factor (22a)m = (22)m ÷ 4						1	r	1				
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J				

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		-		_	
	0.67	0.66	0.65	0.58	0.57	0.5	0.5	0.49	0.53	0.57	0.59	0.62	ĺ	
Calcul If m	ate effe	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), othei	rwise (23b) = (23a)				(23b)
If bala	anced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,				(23c)
a) If	balance	ed mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22	2b)m + (23b) x [[,]	1 – (23c)	÷ 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	L Covery (N	u MV) (24b)m = (22	1 2b)m + (2	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	/e input v	ventilatio	on from c	outside	!			1	
,	if (22b)r	n < 0.5 ×	(23b) , t	then (24o	c) = (23b	o); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	ĺ	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft					
(2.1.1)	if (22b)r	n = 1, th	en (24d)	m = (22k	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)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	l	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in boy	(25)	0.00	0.00	0.00	1	(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	J	(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		G <mark>ros</mark> area	ss (m²)	Openin m	gs 2	Net Ar A ,r	rea m²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²·l) K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	=	2.66				(26)
Windo	<mark>ws</mark> Type	e 1				4.59	x1	/[1/(1.6)+	0.04] =	6.9				(27)
Win <mark>do</mark>	ws Type	e 2				4.64	x1	/[1/(4.8)+	0.04] =	18.68				(27)
Floor						51	x	0.99	=	50.49	5		┐ ┌─	(28)
Walls ⁻	Type1	16.1	4	4.59		11.55	5 X	2.1		24.25	ז ד		=	(29)
Walls ⁻	Type2	16.	1	6.54		9.56	x	2.1		20.08	ז ד		⊣ ⊢	(29)
Total a	area of e	elements	, m²			83.24	1							(31)
Party v	wall					33.3	x	0	=	0				(32)
* for win	idows and	l roof wind	ows, use e sides of i	effective wi	ndow U-va	alue calcul	ated using	g formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss. W/K :	= S (A x	U)	o una pun			(26)(30)	+ (32) =				123.07	(33)
Heat c	apacity	Cm = S((Axk)	-)					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	⊃ = Cm ÷	- TFA) ir	ר kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be i	ign asses: used inste	sments wh ad of a de	ere the de	etails of the	construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		(```
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.8	(36)
if details	s of therma	al bridging	, are not kr	nown (36) =	= 0.15 x (3	:1)								
Total f	abric he	at loss							(33) +	(36) =			135.87	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	26.52	26.2	25.89	24.41	24.13	22.85	22.85	22.61	23.34	24.13	24.69	25.28	J	(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	162.39	162.07	161.75	160.28	160	158.72	158.72	158.48	159.21	160	160.56	161.14		
										Average =	Sum(39)1	12 /12=	160.28	(39)

Heat lo	ss para	imeter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.18	3.18	3.17	3.14	3.14	3.11	3.11	3.11	3.12	3.14	3.15	3.16		
L	r of day		I			<u> </u>			,	Average =	Sum(40)1.	12 /12=	3.14	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Ϋ́ L													l	
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	:[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	FFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag he annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by r day (all w	es per da 5% if the a vater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per I	r day for ea I	ach month I	Vd,m = fa	ctor from	Table 1c x I	(43)					1	
(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	000.40	
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	total = Su	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	Fotal = Su	m(45) ₁₁₂ =		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	e volum	loss: le (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comm	nunity h	eating a	and no ta	ink in dw	elling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:											1	
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/ye	ear	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02]	(51)
Volume	factor	from Ta	ble 2a	on 4.3							1	03	1	(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(52)
' Enerav	lost fro	m water	. storage	kWh/ve	ear			(47) x (51)) x (52) x (53) =		02]	(54)
Enter (50) or ((54) in (5	55)	,, , .	Jul			() (-)	((- / (,	1.	03		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(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	s dedicate	l d solar sto	rage, (57)	m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	I lix 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	nnual) fro	om Table	e 3							0]	(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				-	
(mod	ified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	ostat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eacl	n month	(61)m =	(60) ÷ 3	365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating c	alculated	l for ea	ch month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	IW input	calculated	using Ap	pendix G o	r Appendix	H (nega	tive quantity	/) (enter 'C)' if no sola	r contribu	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applie	s, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
							-	Out	put from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder	is in the	dwelling	or hot w	ater is f	rom com	munity h	- neating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic gair	ns (Table	e 5). Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso see	Table 5					
(67)m=	13.51	12	9.76	7.39	5.52	4.66	5.04	6.55	8.79	11.16	13.03	13.89		(67)
Appliar	nces ga	ins (calc	ulated i	n Appen	dix L, eq	uation	L13 or L1	3a), also	see Ta	ble 5			1	
(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)
Cookin	a gains	s (calcula	ted in A	ppendix	L. equat	ion L1	5 or L15a), also s	ee Table	5			1	
(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	1	(69)
Pumps	and fa	ns gains	(Table	5a)				I				I		
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses		I vaporatio	n (neas	u ntive valu	i les) (Tab	le 5)	_!		I		I		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	-68.78]	(71)
Water	heating	L L dains (T	l able 5)										1	
(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	1	(72)
Total i	nterna	l aains –		1	1	(6		L 1 + (68)m ·	L + (69)m + (L(70)m + (7	1 (1)m + (72)		1	
(73)m=	291.86	290.17	280.41	264.8	249.23	234	223.96	228.79	236.68	252.46	270.57	283.89	1	(73)
6. Sol	ar gain	s:		1	1		1		1	[· ,
Solar g	ains are	calculated	using sola	ar flux from	Table 6a	and asso	ciated equa	itions to co	onvert to th	ne applical	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area		F	lux		g_		FF		Gains	
	-	Table 6d		m²		Т	able 6a	Г	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	×	4.0	64	x	10.63	x	0.85	x	0.7	=	20.34	(74)
North	0.9x	0.77	×	4.0	64	x	20.32		0.85	= × [0.7	=	38.88	(74)
North	0.9x	0.77	×	4.0	64	x	34.53	i x 🗖	0.85	=	0.7	=	66.06	(74)
North	0.9x	0.77	×	4.0	64	× 🕅	55.46	i x 🗖	0.85	╡ <u> </u>	0.7	=	106.12	– (74)
North	0.9x	0.77	×	4.0	64	×	74.72	i × 🗆	0.85	≓ × [0.7	=	142.95	(74)

North	0.9x	0.77		x	4.6	4	x	7	9.99	x	0.8	85) × [0.7		=	153.03	(74)
North	0.9x	0.77		x	4.6	4	x	7	4.68	x	3.0	85] × [0.7		= [142.87	(74)
North	0.9x	0.77		x	4.6	4	x	5	59.25	x	3.0	85	_ × [0.7		= [113.35	(74)
North	0.9x	0.77		x	4.6	4	×	4	1.52	x	3.0	85] × [0.7		= [79.43	(74)
North	0.9x	0.77		x	4.6	4	x	2	24.19	x	3.0	85	_ × [0.7		= [46.28	(74)
North	0.9x	0.77		x	4.6	4	x	1	3.12	x	3.0	85	_ × [0.7		= [25.1	(74)
North	0.9x	0.77		x	4.6	4	x	6	8.86	x	3.0	85	_ × [0.7		= [16.96	(74)
South	0.9x	0.77		x	4.5	9	x	4	6.75	x	0.7	76	×	0.7		= [79.11	(78)
South	0.9x	0.77		x	4.5	9	x	7	6.57	x	0.7	76	x	0.7		= [129.57	(78)
South	0.9x	0.77		x	4.5	9	x	g	97.53	x	0.7	76) × [0.7		=	165.05	(78)
South	0.9x	0.77		x	4.5	9	x	1	10.23	x	0.7	76) × [0.7		= [186.54	(78)
South	0.9x	0.77		x	4.5	9	x	1	14.87	x	0.7	76	×	0.7		=	194.39	(78)
South	0.9x	0.77		x	4.5	9	x	1	10.55	x	0.7	76] × [0.7		= [187.07	(78)
South	0.9x	0.77		x	4.5	9	x	1	08.01	x	0.7	76) × [0.7		=	182.78	(78)
South	0.9x	0.77		x	4.5	9	x	1	04.89	x	0.7	76	×	0.7		=	177.5	(78)
South	0.9x	0.77		x	4.5	9	x	1	01.89	x	0.7	76) × [0.7		=	172.41	(78)
South	0.9x	0.77		x	4.5	9	x	8	32.59	x	0.7	76	×	0.7		=	139.75	(78)
South	0.9x	0.77		x	4.5	9	×	5	5.42	x	0.7	76	×	0.7		=[93.78	(78)
South	0.9x	0.77		x	4.5	9	x	4	40.4] x	0.7	76	×	0.7		= [68.36	(78)
Solar (gains in	watts, ca		ted	for each		th		005.05	(83)m	n = Sum(7)	74)m	. <mark>(8</mark> 2)m	110.00	05	~~		(02)
(83)m=	99.46	168.45	231.1		(84)m –	337.3	4 · · ·	$\frac{340.1}{83}$	325.65	290	.86 25	1.84	186.03	118.88	85.	32		(03)
(84)m-	301 32	458 62	511.5	212	557 46	586 5		74 1	, walls	510	65 48	8 53	138 10	380.45	360	22		(84)
(04)11-	001.02	400.02	011.0	<u>~</u> [337.40	500.5		// 4.1	040.02		.00 40	0.00	430.43	505.45	000	.22		(01)
7. Me	ean inter	nal temp	eratu	re (heating	seaso	on)				T 4 (0					Г		
Temp	perature	during h	eating	g pe	eriods in	the li	ving	area	from Tab	ole 9	, Th1 (°	'C)					21	(85)
Utilis	ation fac	tor for ga	ains fo	or li	ving are	a, h1,	m (s	ee Ta	ible 9a)				0.1					
(00)	Jan	Feb	Ma	ır	Apr	Ma	/	Jun	Jul	A	ug t	Sep	Oct	Nov		ec		(96)
(86)m=	1	1	1		0.99	0.98		0.94	0.87	0.	9 0	.97	0.99	1	1			(00)
Mear	n interna	l temper	ature	in li	iving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able 90	<u>)</u>			-			
(87)m=	18.87	19.02	19.3	1	19.72	20.16	2	20.56	20.8	20.	76 20	0.42	19.87	19.3	18.	85		(87)
Temp	erature	during h	eating	g pe	eriods ir	rest o	of dw	elling	from Ta	able 9	9, Th2 ((°C)						
(88)m=	18.66	18.66	18.6	7	18.68	18.68		18.7	18.7	18	.7 18	3.69	18.68	18.68	18.	67		(88)
Utilis	ation fac	ctor for g	ains fo	or re	est of d	velling	j, h2	,m (se	e Table	9a)								
(89)m=	1	1	0.99)	0.99	0.95		0.83	0.56	0.6	63 0	.91	0.99	1	1	l		(89)
Mear	n interna	l temper	ature	in t	he rest	of dwe	ellina	T2 (f	ollow ste	eps 3	to 7 in	Table	9c)	-				
(90)m=	16.05	16.27	16.7	·	17.3	17.93		18.46	18.66	18.	65 1	8.3	17.52	16.69	16.	02		(90)
	L								I		I	fL	A = Liv	ing area ÷ (4) =		0.55	(91)
Mear	interna	l temper	ature	(for	the wh	مام طب	ollin	a) – fl	ΙΔ 🗸 Τ1	⊥ (1	_ fl Δ) ·	∨ T2				L		
(92)m=	17.61	17.8	18.1	5	18.64	19.16		97 – 11 19.63	19.85	19.	82 19	9.48	18.82	18.14	17.	59		(92)
· /···	L									1		-		_	1			

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.61	17.8	18.15	18.64	19.16	19.63	19.85	19.82	19.48	18.82	18.14	17.59		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	mean int factor fo	ernal ter or gains	mperatu using Ta	re obtain able 9a	ied at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	1 <u>.</u> 1:										
(94)m=	1	1	0.99	0.98	0.96	0.89	0.76	0.8	0.94	0.99	1	1		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	390.65	457.14	508.22	549.06	563.55	512.99	417.82	416.97	459.68	433.2	388.24	368.72		(95)
Month	nly avera	age exte	ernal tem	iperature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	x [(93)m·	– (96)m]				
(97)m=	2161.61	2090.45	1884.16	1561.9	1194.33	797.77	515.33	541.66	856.45	1315.47	1772.4	2157.57		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	1317.59	1097.58	1023.7	729.25	469.3	0	0	0	0	656.41	996.6	1330.91		
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	7621.33	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								149.44	(99)
Qh En	orav roo	uiromor	ote – Cor	nmunity	heating	schomo]```
Thic pr	art is use	d for on					tor boot	ing prov	idod by	0.0000	upity och	omo		
Fractio	on of spa	ace heat	from se	condarv	/supplen	nentarv l	heating	Table 1	1) '0' if n	one		leme.	0	(301)
Freetie	n of one		(rem ee			4 (20)	1)		., •					
Fractio	on or spa	ace neat	from co	mmunity	system	1 - (30	1) =					_	1	(302)
The com	nmunity so	cheme may	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four (other heat	sources; ti	he latter	
Fractio	on of hea	at from C	Commun	itv boiler	'S	iom power	Stations.	See Apper	iuix C.				1	(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	I2c) for a	commun	ity heatii	ng syster	m					1.05	(306)
Space	heating	a											kWh/year	
Annua	l space	heating	requirem	nent									7621.33]
Space	heat fro	om Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	8002.39	(307a)
Efficier	ncy of se	econdary	y/supple	mentary	heating	system	in % (fro	m Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	oplemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h	j neating r	equirem	ent									1831.51	1
If DHW Water	/ from co heat fro	ommunit m Comn	ty schem nunity bo	ne: oilers					(64) x (30	03a) x (30	5) x (306) :	=	1923.08	(310a)
Electric	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)…([310e)] =	99.25	(313)
Cooling	g Syster	n Energ	y Efficie	ncy Rati	0								0	(314)
Space	cooling	(if there	is a fixe	d coolin	g system	n, if not e	enter 0)		= (107) ÷	· (314) =			0	(315)
Electric mecha	city for p nical ve	oumps aintilation	nd fans v - balanc	within dv ed, extra	velling (1 act or po	Fable 4f) 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 =(33	i0a) + (330b) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L)			238.64	(332)
12b. CO2 Emissions – Community heating scheme				_
Energy kWh/ye	Emission fact ar kg CO2/kWh	or Er kg	nissions J 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 repe	at (363) to (366) for the second	fuel	90	(367a)
CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div$	(367b) x 0	=	2382.11	(367)
Electrical energy for heat distribution [(313) x	0.52	=	51.51	(372)
Total CO2 associated with community systems (363)(366) + ((368)(372)	=	2433.63	(373)
CO2 associated with space heating (secondary) (309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x 0.22	=	0	(375)
Total CO2 associated with space and water heating (373) + (374) +	(375) =		2433.63	(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	=	123.85	(379)
Total CO2, kg/year sum of (376)(382) =			2557.4 <mark>8</mark>	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			50.15	(384)
El rating (section 14)			64.3	(385)

			User D	etails:							
Assessor Name: Software Name:	Stroma FSAP 2	2012	roperty	Stroma Softwa	a Num are Ver	ber: sion:		Versio	n: 1.0.3.15		
Address :	. london		roperty /	-luui 033.							
1. Overall dwelling dimer	sions:										
Basement			Area	a(m²) 51	(1a) x	Av. He	ight(m) .18	(2a) =	Volume(m³ 111.18) (3a)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+	(1e)+(1n	ı)	51	(4)						
Dwelling volume					(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3n) =	111.18	(5)	
2. Ventilation rate:									<u> </u>		
Number of chimneys Number of open flues	main heating 0 +	secondar heating	y] + [_] + [_	0 0] = [total 0 0		40 = 20 =	0 0	r (6a) (6b)	
Number of intermittent fan	S					2	x ′	10 =	20	(7a)	
Number of passive vents						0	x ′	10 =	0	 (7b)	
Number of flueless gas fire	0	(7c)									
								Air ch	anges <mark>per</mark> ho	ur	
Air change Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 \div (5) = If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) \bullet (5) =											
Additional infiltration							[(9)	-1]x0.1 =	0	(10)	
Structural infiltration: 0.2	25 for steel or timb	er frame or	0.35 for	masonr	y constr	uction			0	(11)	
if both types of wall are pre deducting areas of opening	sent, use the value co ns); if equal user 0.35	rresponding to	the great	er wall area	a (after					_	
If suspended wooden flo	oor, enter 0.2 (uns	ealed) or 0.	1 (seale	ed), else	enter 0				0	(12)	
If no draught lobby, ente	er 0.05, else enter	() tetrioned							0		
Window infiltration	and doors draugh	tstripped		0.25 - [0.2	x (14) - 1	001 =			0	$-\frac{(14)}{(15)}$	
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	$-1^{(15)}_{(16)}$	
Air permeability value, o	50. expressed in (cubic metre	s per ho	our per so	uare m	etre of e	envelope	area	10	$= \frac{(10)}{(17)}$	
If based on air permeabilit	y value, then $(18) =$	= [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.68	(18)	
Air permeability value applies	if a pressurisation test	has been don	e or a deg	gree air pei	meability	is being u	sed				
Number of sides sheltered	l								2	(19)	
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)	
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.58	(21)	
Infiltration rate modified to	r monthly wind spe	eed			0						
Jan Feb I	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind spe	ed from Table 7		2.0	0.7	4	4.0	4.5	4 7			
(22)m= 5.1 5 2	4.4 4.3	3.8	3.ర	3.1	4	4.3	4.5	4./			
Wind Factor (22a)m = (22)m÷4	0.05	0.05	0.02	1	1.09	1 10	1 10			
(22a)III= 1.27 1.25 1	.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18			

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m			-	_	
<u> </u>	0.74	0.72	0.71	0.64	0.62	0.55	0.55	0.53	0.58	0.62	0.65	0.68	ĺ	
Calcula If me	ate etter	ctive air al ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	rwise (23b) = (23a)				(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =	, , ,				(23c)
a) If	balance	ed mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22	2b)m + (23b) x [[,]	1 – (23c)	 _ ÷ 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	i ed mecha	anical ve	entilation	without	heat rec	coverv (N	MV) (24b	m = (22)	1 2b)m + (;	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside		!		1	
, i	if (22b)n	n < 0.5 ×	: (23b), t	then (24d	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from l	oft					
i	if (22b)n	n = 1, th	en (24d)	m = (22k	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x I	0.5]		1	1	
(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	l	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24k	o) or (240	c) or (24	d) in boy	(25)				1	(05)
(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		(25)
3. He	at l <mark>osse</mark>	s and he	at loss	paramete	er:									
ELEN		Gros	(m^2)	Openin	gs	Net Ar	ea	U-valu	Je	A X U		k-value	e e	A X k
Doors		aica	(111-)							2.66		NJ/111-1	`	(26)
Windo		1				1.9		/[1/(1 6)+	0 041 -	2.00	H			(20)
Windo						4.42		/[1/(1.0)]	0.041	6.65	8			(27)
Floor	ws type	52				4.96		/[1/(4.0)+	0.04] =	19.97	╘┤╷			(27)
	Turned					51	×	0.97		49.47	╡╎		\dashv	(28)
	турет	39.3	2	4.96		34.24	×	2.1	=	71.9			\dashv	(29)
vvalis	Type2	10.9	9	6.32		4.67	X	2.1	=	9.81				(29)
lotal a	area of e	elements	, m²			101.1	9							(31)
Party v	wall					16.1	X	0	=	0				(32)
* for win ** includ	dows and le the area	l roof wind as on both	ows, use e sides of ii	effective wi nternal wal	ndow U-va Is and par	alue calcula titions	ated using	g formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				160.4	6 (33)
Heat c	apacity	Cm = S(Axk)	,					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi	ign assess	sments wh	ere the de	tails of the	construct	ion are not	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f	<u> </u>	
can be ι —.	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.2	(36)
<i>if details</i> Total f	of therma abric he	al bridging at loss	are not kr	10wn (36) =	= 0.15 x (3	1)			(33) +	(36) =			175.0	(37)
Ventila	ation her	at loss c	alculated	1 monthly	,				(38)m	(00) =	25)m x (5)		175.0	5 (57)
v Gritilo	Jan	Feh	Mar	Anr	Mav	Jun	.lul	Aug	Sen			Dec		
(38)m=	28.3	27.92	27.54	25.76	25.42	23.87	23.87	23.59	24.47	25.42	26.1	26.8		(38)
Heat tr	L		L						(30)m	- (37) ± (*	38)m		I	
(39)m=	203.97	203.58	203.2	201.42	201.09	199.53	199.53	199.25	200.13	201.09	201.76	202.46	I	
()		1			0			L		Average =	Sum(39)1		201.4	2 (39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	4	3.99	3.98	3.95	3.94	3.91	3.91	3.91	3.92	3.94	3.96	3.97		
L	r of day		u ath (Tab	l <u> </u>					,	Average =	Sum(40)1.	12 /12=	3.95	(40)
]	.lan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Ύ L			_							_		_	l	
4. Wat	ter hea	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, I 9, N = 1 9, N = 1	N + 1.76 x	:[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	1. .9)	72]	(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person per	ge in litre usage by r day (all w	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	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		
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	900.48	(44)
(45)m=	122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		_
lf instanta	aneous w	vater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46)) to (61)	Total = Su	m(45) ₁₁₂ =	-	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)
Water s	storage	loss:											1	
Storage	e volum	ie (litres)	Includir	ig any se	olar or V	/WHRS	storage	within sa	ame ves	sel		160		(47)
It comn Otherw	nunity r ise if no	eating a	nd no ta hot wate	ink in dw er (this ir	/elling, e ncludes i	nter 110 nstantar	nitres in	(47) mbi boil	ers) ente	er 'O' in <i>(</i>	(47)			
Water s	storage	loss:	not mate			notantai					,			
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared	cylinder	loss fact	or is not	known:						1	
Hot was	ter stor: nunity h	age loss	Tactor II	rom 1 ab	ie z (kvv	n/litre/da	iy)				0.	02		(51)
Volume	factor	from Tal	ble 2a	011 4.0							1.	03]	(52)
Tempe	rature f	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 s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(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 contain	s dedicate	d solar sto	rage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	I lix 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	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				_	
(mod	lified by	factor fi	rom Tab	le H5 if t r	here is s	solar wat	ter heati	ng and a	t cylinde	r thermo	stat)		1	1-01
(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 I	oss ca	Iculated	for eac	h month	(61)m =	(60) ÷ 3	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat req	uired for	water h	neating ca	alculated	for eac	h month	(62)m =	0.85 × 0	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	N input	calculated	using Ap	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ad	ditiona	l lines if	FGHRS	and/or	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	rom w	ater heat	ter											
(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		
_				-			-	Outp	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat ga	ins fro	m water	heating	j, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
incluc	le (57)	m in calc	ulation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	vater is fi	rom com	munity h	leating	
5. Inte	rnal g	ains (see	Table	5 and 5a):									
Metabol	lic gair	ns (Table	5). Wa	tts	,									
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lighting	gains	(calculat	ted in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	1 <mark>3.48</mark>	11.97	9.74	7.37	5.51	4.65	5.03	6.53	8.77	11.14	13	13.86		(67)
Applian	ces da	ins (calc	ulated i	n Appene	dix L. ea	uation L	13 or L1	3a), also	see Ta	ble 5	1			
(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	aains	(calcula	ted in A	ppendix	L equat	ion I 15	or L 15a)	also se	e 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 fa	ns gains	(Table	5a)										
(70)m=	0		0		0	0	0	0	0	0	0	0		(70)
		anoratio	n (nea:	I ative valu	L es) (Tab	le 5)								
(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	l	(71)
Water b	eating	T) aning	able 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	l	(72)
	tornal	gaine -			00.01	(66)	m + (67)m	+ (68)m -	+ (69)m + 1	(70)m + (7)	(1)m + (72)			()
(73)m-	291.82	290 14	280 39	264 79	249.22	233.99	223.95	228 78	236.66	252 43	270 54	283.86	l	(73)
(73)III-	r gain	200.14	200.00	204.75	243.22	200.00	220.00	220.10	200.00	202.40	270.04	200.00		(10)
Solar ga	ins are o	calculated	using sol	ar flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Orientat	tion:	Access F	actor	Area	l	Flu	IX		q		FF		Gains	
	-	Fable 6d		m²		Та	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77)	4.9	96	x r	10.63	x	0.85	x	0.7	=	21.75	(74)
North	0.9x	0.77	,	4.9	96	x 2	20.32	x	0.85		0.7	=	41.56	(74)
North	0.9x	0.77	<u> </u>	4.9	96	x	34.53	x	0.85	╡╷┝	0.7		70.62	(74)
North	0.9x	0.77	— ,	4.9	96	x .	55.46	×	0.85	╡╷┝	0.7	=	113.43	(74)
	Ļ							_ -	0.05	╡╷╞	0.7	≓_	450.04] (74)

North	0.9x	0.77	;	k	4.96] ,	< [79.99	x	0.85	×	0.7	=	163.58	(74)
North	0.9x	0.77		<	4.96] ,	< [74.68	x	0.85	×	0.7	=	152.73	(74)
North	0.9x	0.77	:	ĸ	4.96)	<mark>،</mark> (59.25	x	0.85	x	0.7	=	121.17	(74)
North	0.9x	0.77	;	<	4.96] ,	< [41.52	x	0.85	x	0.7	=	84.91	(74)
North	0.9x	0.77	:	<	4.96] ,	< [24.19	x	0.85	x	0.7	=	49.47	(74)
North	0.9x	0.77	;	ĸ	4.96] ,	< [13.12	x	0.85	×	0.7	=	26.83	(74)
North	0.9x	0.77	;	ĸ	4.96] ,	<u>،</u> (8.86	x	0.85	×	0.7	=	18.13	(74)
South	0.9x	0.77	;	ĸ	4.42] ,	< [46.75	x	0.76	×	0.7	=	76.18	(78)
South	0.9x	0.77	;	ĸ	4.42] ,	< [76.57	x	0.76	×	0.7	=	124.77	(78)
South	0.9x	0.77	:	<	4.42] ,	× [97.53	x	0.76	x	0.7	=	158.94	(78)
South	0.9x	0.77	;	ĸ	4.42) ,	< [110.23	x	0.76	x	0.7	=	179.63	(78)
South	0.9x	0.77	:	ĸ	4.42)	<mark>،</mark> (114.87	x	0.76	x	0.7	=	187.19	(78)
South	0.9x	0.77	3	ĸ	4.42] ,	< [110.55	x	0.76	x	0.7	=	180.14	(78)
South	0.9x	0.77	;	ĸ	4.42] ,	< [108.01	x	0.76	×	0.7	=	176.01	(78)
South	0.9x	0.77	;	ĸ	4.42] ,	< [104.89	x	0.76	×	0.7	=	170.93	(78)
South	0.9x	0.77		ĸ	4.42] ,	< [101.89	x	0.76	×	0.7	=	166.03	(78)
South	0.9x	0.77	:	k	4.42] ,	× [82.59	x	0.76	x	0.7	=	134.58	(78)
South	0.9x	0.77	2	ĸ	4.42] >	< [55.42	х	0.76	x	0.7	=	90.3	(78)
South	0.9x	0.77	:	k	4.42)	×	40.4	x	0.76	x	0.7	=	65.83	(78)
Sola <mark>r g</mark>	<mark>gain</mark> s in t	watts, <mark>ca</mark>	lculate	d	for each mor	nth			(83)m	n = Sum(74)m .	<mark>(8</mark> 2)m			,	
(83)m=	97.93	166.33	229.56		293.07 340		34	13.73 32 <mark>8.74</mark>	292	2.1 250.94	184.0	5 117.13	83.96		(83)
Total g	jains – ii	nternal ar	nd sola	ar	(84)m = (73)i	m +	3)	33)m, watts	r -					,	
(84)m=	389.76	456.47	509.94	L	557.85 589.2	21	57	7.72 552.69	520	.88 487.6	436.4	8 387.68	367.82		(84)
7. Me	an inter	nal temp	erature	e (I	heating seas	on)									
Temp	erature	during he	eating	pe	eriods in the I	ivin	ga	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisa	ation fac	tor for ga	ins for	· liv	ving area, h1	,m	(se	ee Table 9a)						7	
	Jan	Feb	Mar	╇	Apr Ma	ıy	,	Jun Jul	A	ug Sep	Oct	t Nov	Dec	-	
(86)m=	1	1	1		0.99 0.98	;	C	0.95 0.9	0.9	0.97	0.99	1	1		(86)
Mear	interna	l tempera	ature ir	۱ li	ving area T1	(fo	llo	w steps 3 to 7	7 in T	able 9c)				-	
(87)m=	18.42	18.58	18.91		19.38 19.8	9	2	0.37 20.67	20.	62 20.22	19.57	7 18.92	18.4		(87)
Temp	erature	during he	eating	ре	eriods in rest	of c	w	elling from Ta	able 9	9, Th2 (°C)					
=m(88)	18.33	18.34	18.34		18.35 18.3	5	1	8.36 18.36	18.	37 18.36	18.35	5 18.35	18.34]	(88)
Utilisa	ation fac	tor for ga	ins foi	· re	est of dwellin	g, h	n2,	m (see Table	9a)					-	
(89)m=	1	1	0.99	Т	0.98 0.95	;	Ć	0.85 0.57	0.6	64 0.92	0.99	1	1]	(89)
Mean	interna	l tempera	ature ir	n tł	ne rest of dw	ellir	na	T2 (follow ste	ens 3	to 7 in Tabl	e 9c)	-1		-	
(90)m=	15.23	15.48	15.95	T	16.65 17.3	8	1	8.03 18.32	18.	29 17.85	16.93	3 15.98	15.21	1	(90)
		<u> </u>		_	I			I	!	f	LA = Li	ving area ÷ (4) =	0.47	(91)
Mean	interna	l tompora	ature /ł	'n	the whole du	الصرر	ling	n) – fl∆ v ⊤1	⊥ (1	_ fl Δ) 🗸 Το				L	
(92)m=	16.74	16.94	17.35	T	17.94 18.5	6	1	9.14 19.43	19.	39 18.97	18.18	3 17.37	16.71	1	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	16.74	16.94	17.35	17.94	18.56	19.14	19.43	19.39	18.97	18.18	17.37	16.71		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r tilisation	mean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	0.99	0.98	0.96	0.89	0.77	0.81	0.94	0.99	1	1		(94)
Usefu	ıl gains,	hmGm	W = (94	4)m x (84	4)m									
(95)m=	388.73	454.4	505.69	548	564.62	517.01	423.26	420.18	457.86	430.1	385.95	367.03		(95)
Month	nly avera	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	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	k [(93)m	– (96)m]				
(97)m=	2536.89	2451.88	2205.01	1820.41	1380.16	905.61	564.51	596.43	974.38	1524.28	2072.09	2533.6		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mon	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	1598.23	1342.31	1264.29	916.14	606.76	0	0	0	0	814.07	1214.03	1611.93		-
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	9367.75	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								183.68	(99)
9b. En	erav rea	uiremer	nts – Cor	nmunitv	heating	scheme	2					L		7
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by	a c <mark>omm</mark>	unity sch	neme.		1(204)
Flacic		ace near	nom se	condary/	supplen	lentary i	lieating (Table I	1) 0 11 11	one			0	(301)
Fractic	on of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The con	nmunity so	cheme m <mark>a</mark> g	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four o	other heat	sou <mark>rces</mark> ; tl	he latter	
includes Fractic	boilers, h	eat pumps at from C	s, geotherr Commun	nal and wa ity boiler	aste heat fi S	rom powei	r stations. S	See Apper	ndix C.			_	1	(303a)
Fractic	on of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting syst	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	communi	ity heatii	ng syster	m					1.05	(306)
Space	heating	g											kWh/year	-
Annua	l space	heating	requirem	nent									9367.75	
Space	heat fro	om Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	9836.14	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment froi	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating	j neating r	equirem	ent								[1831.51	1
If DHW Water	/ from contract from heat from the state of	ommunit m Comn	ty schem	ne: pilers					(64) x (30)3a) x (30	5) x (306) =	=	1923.08] (310a)
Electri	city used	d for hea	t distribi	ution				0.01	× [(307a).	(307e) +	(310a)(310e)] =	117.59] (313)
Coolin	g Syster	n Enera	y Efficier	ncy Ratio	C				L	x - 7 -		/*	0] (314)
Space	cooling	(if there	is a fixe	- d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =		l	0] (315)
Electri	city for p	oumps ai	nd fans v	within dw	velling (T	Table 4f)	:					I		
mecha	inical ve	ntilation	- balanc	ea, 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)				238.08	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto kg CO2/kWh	or Er kg	nissions J CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using the	wo fuels repeat (363) to (3	366) for the second	fuel	90	(367a)
CO2 associated with heat source 1 [(307b)+(37	10b)] x 100 ÷ (367b) x	0	=	2822.21	(367)
Electrical energy for heat distribution [(3	13) x	0.52	=	61.03	(372)
Total CO2 associated with community systems (36	63)(366) + (368)(372)		=	2883.24	(373)
CO2 associated with space heating (secondary) (30	09) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating (37	73) + (374) + (375) =			2883.24	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting (33	32))) x	0.52	=	123.56	(379)
Total CO2, kg/year sum of (376)(382) =				<mark>3006.8</mark> 1	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				58.96	(384)
El rating (section 14)				57.9	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num Ire Ver	ber: sion:		Versic	n: 1.0.3.15	
A daha a a	London	PI	roperty <i>i</i>	Address:	Unit 15					
Address :	, London									
Basement	50015.		Area	a(m²) 55	(1a) x	Av. He	ight(m) 17	(2a) =	Volume(m³) 119.35) (3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1n)	55	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	119.35	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	main s heating • 0 + 0 +	secondar heating 0 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	S				Γ	2	X ²	10 =	20	(7a)
Number of passive vents					Γ	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	s, flues and fans = en carried out or is inten- e dwelling (ns) 25 for steel or timbe sent, use the value corre rs); if equal user 0.35	6a)+(6b)+(7 ded, proceed r frame or esponding to	a)+(7b)+(7 d to (17), c 0.35 for the greate	7c) = otherwise c masonr er wall area	ontinue fro y constr a (after	20 om (9) to (uction	(16) [(9)	÷ (5) = -1]x0.1 =	0.17 0 0 0 0	(8) (9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate	50 1.			(8) + (10) ·	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
Air permeability value, q	50, expressed in cu	101C metre:	s per ho	our per so	quare m	etre of e	envelope	area	10	(17)
Air permeability value applies	y value, then $(10) - 1$	as been don	e or a deo	aree air nei	meability	is heina u	sed		0.67	(18)
Number of sides sheltered			o or a dog	, ee an per	incusinty i	o bonng u			2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0.57	(21)
Infiltration rate modified fo	r monthly wind spee	ed								
Jan Feb M	/lar Apr May	, Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22))m ÷ 4	1 1					1		I	
(zza)m= 1.27 1.25 1.	1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	speed) =	(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		
Calcula	ate ette	ctive air	change	rate for t	he appli	cable ca	ise					1	0	
lf exh	aust air h	eat nump	using App	endix N (2	3b) = (23a	u) x Fmv (e	equation (I	N5)) othe	rwise (23h) = (23a)		l	0	(234)
lf bala	anced with	n heat reco	overv: effic	viency in %	allowing f	or in-use f	actor (fron	n Table 4h) –	<i>(</i> 200)		l	0	(230)
a) If		d moob			with hor				$\gamma = (2)$	0h) m i (22h) [1 (22م)	0	(230)
a) II					with nea			лк) (24a	a = (2)	$\frac{20}{1}$	230) × [1 - (230)	÷ 100]	(24a)
(24a)III=					0	0						0		(244)
D) IT	balance		anical ve		without	neat rec	covery (r	VIV) (240 T	p)m = (2, 1)	2b)m + (. T	23D)			(24b)
(240)m=		0	0		0			0		0	0	0		(240)
c) If	whole h		tract ver	tilation o	or positiv	e input v	ventilatio	on from (b) m i 0	5 v (22h	2)			
(24c)m-					<i>)</i> = (230			C = (22)	$\frac{1}{1}$					(24c)
(۲۹۵) If		vontilati					Ventileti	n from		0	0	0		(210)
a) n	if (22b)n	n = 1, th	en (24d)	m = (22k)	b)m othe	e input erwise (2	24d)m =	0.5 + [(2	2b)m² x	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)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	L c) or (24	d) in bo	x (25)	<u> </u>	<u> </u>	1		
(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)
											I			
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN		Gros	SS (m²)	Openin	gs 2	Net Ar	rea m²	U-val W/m2	ue 2K	A X U (W/I	K)	k-value) <	A X k kJ/K
Doors			()			19	x	14		2.66				(26)
Window		e 1				3		/[1/(1.6)+	- 0.041 –	1.51	Ħ			(27)
Window		2				1 76		/[1/(4 8)+	0.041 -	7.00	H			(27)
Windo		2				1.76		/[1/(4.0)]	0.04]	7.09	4			(27)
	ws type T					0.64		/[1/(4.0)+	0.04] =	2.58				(27)
	ws Type	94				3.84	X1	/[1/(1.6)+	0.04] =	5.77	_ ,			(27)
Floor						55	X	0.93	=	51.15			$_$ $_$	(28)
Walls 7	Type1	28.	9	8.6		20.3	X	2.1	=	42.63				(29)
Walls 7	Гуре2	7.8	1	2.54		5.27	x	2.1	=	11.07				(29)
Total a	rea of e	elements	s, m²			91.71	1							(31)
Party v	vall					27.9	x	0	=	0			\neg	(32)
Party v	vall					1.13	x	0	=	0	i F		$\neg \neg$	(32)
* for win	dows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	formula 1	l/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
** includ	le the area	as on both	sides of ir	nternal wall	s and part	titions								
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30) + (32) =				127.4	6 (33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	eter (TMF	⁻ = Cm ÷	- TFA) in	∩ kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be u	gn assess ised inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix I	K					[14.4	(36)
if details	of therma	al bridging	are not kn	nown (36) =	= 0.15 x (3	1)				()				
Fotal fa	abric he	at loss							(33) +	(36) =			141.8	6 (37)

Ventila	ation hea	at loss ca	alculated	d monthl	у				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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 t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	171.86	171.46	171.07	169.22	168.88	167.27	167.27	166.98	167.89	168.88	169.57	170.3		
Heat le	oss para	meter (I	HLP), W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	169.22	(39)
(40)m=	3.12	3.12	3.11	3.08	3.07	3.04	3.04	3.04	3.05	3.07	3.08	3.1		
Numb	er of day	/s in mo	nth (Tab	le 1a)						Average =	Sum(40)1	12 /12=	3.08	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			-	-				•	-		-			
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum if TF if TF	ned occu FA > 13.9 FA £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 >	([1 - exp	(-0.0003	349 x (TF	⁻ A -13.9)2)] + 0.((25 x NI)	0013 x (⁻	TFA -13.	1. .9)	84		(42)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	(25 X N) to achieve	+ 30 a water us	se target o	f 77	.84		(43)
not mor	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)				_			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for e	ach m <mark>onth</mark>	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	<mark>8</mark> 5.62	82.51	79.39	76.28	73.17	70.05	70.05	73.17	76.28	79.39	82.51	<mark>8</mark> 5.62		_
Energy	content of	hot water	used - ca	lculated m	onthly = 4.	190 x Vd,r	m x nm x E	0Tm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	934.05	(44)
(45)m=	126.97	111.05	114.6	99. <mark>9</mark> 1	95.86	82.72	76. <mark>6</mark> 5	87.96	89.01	10 <mark>3.74</mark>	113.24	122.97		_
lf instan	taneous w	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	=	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:												
Storag	je volum	ie (litres)) incluair	ng any s	Diar or W	/WHRS	storage		ame ves	sei		160		(47)
If com Others	munity r vise if no	b stored	hot wate	ank in dw er (this ir	velling, e ncludes i	nstantar) litres in neous co	(47) ombi boil	ers) ente	er '0' in ((47)			
a) If n	nanufact	urer's d	eclared	loss fact	or is kno	wn (kWł	n/dav):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b		,	, , , , , , , , , , , , , , , , , , ,					0		(49)
Energ	v lost fro	m water	storage	e. kWh/v	ear			(48) x (49) =			10		(50)
b) If n	nanufact	urer's d	eclared	cylinder	loss fact	or is not	known:				L'	10		()
Hot wa	ater stor	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)				0.	02		(51)
If com	munity h	eating s	ee secti	on 4.3									I	
Volum	e tactor erature f	Trom Ta	ble 2a m Table	2h							1.	.03		(52)
Temp								(47) × (64)) y (FQ) y (50)		.6		(55)
Energ	y iost tro (50) or /	(54) in (4	storage 55)	ε, κννη/y	al			(47) X (51)) X (⊃∠) X (53) =		03		(54) (55)
Wator	storage		culated	for each	month			((56)m - (55) × (41)	m	L1.	US		(55)
(56)~	22.04	20 00	22.04	20.00	22.04	20.00	22.04	22.04	20.00	22.04	20.00	22.04	l	(56)
=m(ac)	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(30)

If cylinde	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	7)m = (56)i	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)
Primar	y circuit	loss (an	inual) fro	om Table	e 3	-						0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinder	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 ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (6	61)m
(62)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		(62)
Solar DH	W input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contribut	on to wate	r heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies.	, see Ap	pendix G	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(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		
I								Outp	out from wa	ater heate	r (annual)	12	1875.52	2 (64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	60.83	53.73	56.71	51. <mark>2</mark> 3	50.48	45.51	44.1	47.86	47.61	53.1	55.66	59.5		(65)
inclu	de (57)	m in calc	culation of	of (65)m	only if c	ylinder is	s in th <mark>e</mark> c	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	91.87	91.87	91.87	91. <mark>87</mark>	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	14.68	13.04	10.6	8.03	6	5.06	5.47	7.11	9.55	12.12	14.15	15.08		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L [.]	13 or L1	3a), also	see Tal	ole 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)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e 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 fai	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49		(71)
Water	heating	gains (T	able 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 i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	307.18	305.4	295.05	278.48	261.9	245.75	235.14	240.17	248.59	265.34	284.55	298.73		(73)
6. Sol	ar gains	s:		•	•	•								
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	x	_	g	_	FF		Gains	
		i able 6d		m ²		Iat	Die 6a	I	able 6b	E	adie 60		(VV)	

North	0.9x	0.77	x	1.76	x	10.63	x	0.85	x	0.7	=	7.72	(74)
North	0.9x	0.77	x	0.64	x	10.63	x	0.85	x	0.7] =	2.81	(74)
North	0.9x	0.77	×	1.76	x	20.32	x	0.85	x	0.7] =	14.75	(74)
North	0.9x	0.77	x	0.64	x	20.32	x	0.85	x	0.7	=	5.36	(74)
North	0.9x	0.77	×	1.76	x	34.53	x	0.85	x	0.7] =	25.06	(74)
North	0.9x	0.77	x	0.64	x	34.53	x	0.85	x	0.7	=	9.11	(74)
North	0.9x	0.77	x	1.76	x	55.46	x	0.85	x	0.7	=	40.25	(74)
North	0.9x	0.77	x	0.64	x	55.46	x	0.85	x	0.7	=	14.64	(74)
North	0.9x	0.77	x	1.76	x	74.72	x	0.85	x	0.7] =	54.22	(74)
North	0.9x	0.77	x	0.64	×	74.72	x	0.85	x	0.7	=	19.72	(74)
North	0.9x	0.77	x	1.76	x	79.99	x	0.85	x	0.7	=	58.05	(74)
North	0.9x	0.77	x	0.64	x	79.99	x	0.85	x	0.7	=	21.11	(74)
North	0.9x	0.77	x	1.76	x	74.68	x	0.85	x	0.7	=	54.19	(74)
North	0.9x	0.77	x	0.64	x	74.68	x	0.85	x	0.7	=	19.71	(74)
North	0.9x	0.77	x	1.76	x	59.25	x	0.85	x	0.7	=	43	(74)
North	0.9x	0.77	x	0.64	x	59.25	x	0.85	x	0.7	=	15.63	(74)
North	0.9x	0.77	x	1.76	x	41.52	x	0.85	x	0.7	=	30.13	(74)
North	0.9x	0.77	x	0.64	X	41.52	x	0.85	х	0.7] =	10.96	(74)
North	0.9x	0.77	x	1.76	х	24.19	x	0.85	x	0.7	=	17.55	(74)
North	0.9x	0.77	x	0.64	x	24.19	x	0.85	x	0.7	=	6.38	(74)
North	0.9x	0.77	x	1.76	x	13.12	x	0.85	x	0.7] =	9.52	(74)
North	0.9x	0.77] ×	0.64	×	13.12	х	0.85	x	0.7	=	3.46	(74)
North	0.9x	0.77	x	1.76	x	8.86	x	0.85	x	0.7	=	6.43	(74)
North	0.9x	0.77	x	0.64	×	8.86	x	0.85	x	0.7	=	2.34	(74)
East	0.9x	1	x	3.84	x	19.64	x	0.76	x	0.7	=	27.81	(76)
East	0.9x	1	x	3.84	x	38.42	x	0.76	x	0.7	=	54.39	(76)
East	0.9x	1	x	3.84	x	63.27	x	0.76	x	0.7	=	89.58	(76)
East	0.9x	1	x	3.84	x	92.28	x	0.76	x	0.7	=	130.64	(76)
East	0.9x	1	x	3.84	x	113.09	x	0.76	x	0.7	=	160.11	(76)
East	0.9x	1	x	3.84	×	115.77	x	0.76	x	0.7] =	163.9	(76)
East	0.9x	1	x	3.84	x	110.22	x	0.76	x	0.7	=	156.04	(76)
East	0.9x	1	x	3.84	x	94.68	x	0.76	x	0.7	=	134.03	(76)
East	0.9x	1	x	3.84	×	73.59	x	0.76	x	0.7] =	104.18	(76)
East	0.9x	1	x	3.84	x	45.59	x	0.76	x	0.7	=	64.54	(76)
East	0.9x	1	x	3.84	×	24.49	x	0.76	x	0.7] =	34.67	(76)
East	0.9x	1	x	3.84	x	16.15	x	0.76	x	0.7	=	22.87	(76)
South	0.9x	0.77	x	3	×	46.75	x	0.76	x	0.7	=	51.71	(78)
South	0.9x	0.77	x	3	×	76.57	x	0.76	x	0.7	=	84.69	(78)
South	0.9x	0.77	×	3	×	97.53	x	0.76	×	0.7] =	107.88	(78)
South	0.9x	0.77	×	3	×	110.23	×	0.76	x	0.7] =	121.92	(78)
South	0.9x	0.77	×	3	×	114.87	x	0.76	x	0.7	=	127.05	(78)

South	0.9x	0.77	×		3	x	1	10.55] × [0.76	x	0.7	=	122.27	(78)
South	0.9x	0.77	×	3	3	x	1	08.01	i × [0.76		0.7	=	119.46	(78)
South	0.9x	0.77	×	3	3	x	1	04.89	i × [0.76	 × [0.7	=	116.02	(78)
South	0.9x	0.77	×		3	x	1	01.89	i . [0.76	= .	0.7	= =	112.69	(78)
South	0.9x	0.77	×		3	x	8	32.59	i x F		0.76		0.7	=	91.34	(78)
South	0.9x	0.77	×	3	3	x	5	5.42	1 × [0.76		0.7	=	61.29	(78)
South	0.9x	0.77	×	3	3	x		40.4	i . [0.76		0.7		44.68	(78)
	L											I				
Solar g	gains in	watts, ca	alculate	d for eac	h month	ו			(83)m =	= Sur	m(74)m	(82)m				
(83)m=	90.04	159.19	231.62	307.45	361.1	3	65.32	349.4	308.6	58 I	257.95	179.82	108.94	76.32		(83)
Total g	jains – i	nternal a	ind sola	r (84)m =	- = (73)m	+ (83)m	, watts								
(84)m=	397.22	464.59	526.67	585.93	623	6	11.07	584.54	548.8	35	506.55	445.16	393.5	375.05		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)										
Temp	erature	during h	eating	periods i	n the liv	ing	area	from Tak	ole 9, [·]	Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ble 9a)			. ,					
	Jan	Feb	Mar	Apr	May	Ì	Jun	Jul	Au	g	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.98		0.94	0.87	0.9	<u> </u>	0.97	1	1	1		(86)
Moan	intorna	tompor	atura in	living or	00 T1 /f	مالە	w sto	r = 3 to 7	I 7 in Ta		ـــــــــــــــــــــــــــــــــــــ				1	
(87)m=	18.88	19.03	19.32	19.74	20.17		0.57	20.8	20.7		20.43	19.87	19.31	18.86		(87)
_								· · ·							1	
l emp		during h	eating		n rest of	t dw	elling	from 1a	able 9, 10.7	$\frac{1}{2}$	2 (°C)	40.70	40.74	40.7	1	(99)
(00)11=	16.69	10.09	10.7	10.71	10.72		0.73	16.73	16.75		10.72	10.72	10.71	10.7	l	(00)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (se	e Table	9a)						1	
(89)m=	1	1	1	0.99	0.95		0.83	0.57	0.64	·	0.92	0.99	1	1	J	(89)
Mear	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3 t	to 7	in Tabl	e 9 <mark>c)</mark>				
(90)m=	16.08	16.3	16.73	17.35	17.97		18.5	18.7	18.6	8	18.33	17.54	16.72	16.07		(90)
											fl	LA = Liv	ing area ÷ (4	4) =	0.55	(91)
Mean	interna	l temper	ature (fe	or the wh	ole dwe	ellin	g) = fl	LA × T1	+ (1 –	- fLA	() × T2					
(92)m=	17.62	17.8	18.15	18.66	19.18	1	9.64	19.85	19.8	2	19.48	18.82	18.14	17.6		(92)
Apply	adjustr	nent to t	he mea	n interna	l tempe	ratu	ire fro	m Table	4e, w	here	e appro	priate	•		1	
(93)m=	17.62	17.8	18.15	18.66	19.18	1	9.64	19.85	19.8	2	19.48	18.82	18.14	17.6		(93)
8. Sp	ace hea	iting requ	uiremen	t												
Set T	i to the	mean int	ernal te	mperatu	re obtai	ned	at ste	ep 11 of	Table	9b,	so that	t Ti,m=	(76)m an	d re-calo	culate	
the ut	tilisation	tactor fo	or gains	using Ta	able 9a	1							1		1	
1.1411	Jan	Feb	Mar	Apr	Мау		Jun	Jul	Au	g	Sep	Oct	Nov	Dec	J	
Utilisa (04)m-		tor for g	ains, nn	n:	0.06	Т	0.90	0.76	0.91		0.05	0.00	1	1	1	(94)
			0.99	(0.99)	() () () () () () () () () () () () () (0.69	0.76	0.01		0.95	0.99		I	J	(34)
(05)m-		163.4	VV = (9)	4)111 X (0 577 77	4)111 500.28	5	16 51	111 20	111	<u> </u>	170.06	440 71	302 53	374 65	1	(95)
Montl	hlv aver		rnal ten		from T	 ahl	- 8 - 8	44.23		5	475.00	40.71	002.00	074.00	l	(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	1	(96)
Heat	loss rate	e for me	an inter	nal temp	I erature	Lm	1.W=	I =[(39)m	x [(93))m_	(96)m	1	1		I	
(97)m=	2288.92	2211.97	1993.62	1651.6	1263.19	8	42.84	544.36	571.8	33	903.47	1388.0	9 1872.71	2282.38		(97)
Spac	L heatin	g require	ement fo	or each n	nonth. k	Wh	/mon	u th = 0.02	24 x [(97)n	n – (95))m] x (41)m	<u> </u>	1	
(98)m=	1407.83	1175.04	1093.56	773.16	493.95	Τ	0	0	0	Í	0	704.85	, 1065.72	1419.35	1	
	L	·			·	_		·	L						1	

	Total per year (kWh/y	ear) = Sum(98) _{15,912}	= 8133.46	(98)
Space heating requirement in kWh/m²/year			147.88	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or wa Fraction of space heat from secondary/supplementary h	ter heating provided by a com	munity scheme.	0	(301)
Fraction of space heat from community system $1 - (301)$			1	(302)
The community scheme may obtain heat from several sources. The o	, – rocedure allows for CHP and up to fo	ur other heat sources	the latter	(002)
includes boilers, heat pumps, geothermal and waste heat from power Fraction of heat from Community boilers	stations. See Appendix C.		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 heatin	g system		1.05	(306)
Space heating			kWh/y	ear
Annual space heating requirement			8133.46	
Space heat from Community boilers	(98) x (304a) x ((305) x (306) =	8540.14	(307a)
Efficiency of secondary/supplementary heating system in	n % (from Table 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supplement	ary system (98) x (301) x 10	00 ÷ (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)(307e	e) + (310a)(310e)] =	= 1 <mark>05.09</mark>	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	nter 0) = (107) ÷ (314) =	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):	ut from outside			(330a)
warm air beating system fors			0	(330b)
nume for onlor water booting			0	(3300)
	(2200) + (2200) + (220~)	0	(3309)
	=(3308) + (3300) + (330g) =	0	
			259.19	(332)
12b. CO2 Emissions – Community heating scheme	Energy	Emission factor	r Emissions	
	kWh/year	kg CO2/kWh	kg CO2/yea	ar
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	t CHP) CHP using two fuels repeat (363) to (366) for the second fu	Jel 90	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0	= 2522.2	7 (367)
Electrical energy for heat distribution	[(313) x	0.52	= 54.54	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372))	= 2576.8	1 (373)
CO2 associated with space heating (secondary)	(309) x	0	=0	(374)

CO2 associated with water from immer	sion heater or insta	ntaneous heater (312) x	0.22	=	0	(375)			
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			2576.81	(376)			
CO2 associated with electricity for pum	D2 associated with electricity for pumps and fans within dwelling (331) x								
CO2 associated with electricity for light	0.52	=	134.52	(379)					
Total CO2, kg/year	sum of (376)(382) =				2711.33	(383)			
Dwelling CO2 Emission Rate	(383) ÷ (4) =				49.3	(384)			
El rating (section 14)				63.67	(385)				


			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa	a Num ire Ver	ber: sion:		Versio	n: 1.0.3.15	
	landan	Pro	operty A	Address:	Unit 16					
Address :										
Basement			Area	1 (m²) 51	(1a) x	Av. He	ight(m) .17	(2a) =	Volume(m³ 110.67) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)		51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	110.67	(5)
2. Ventilation rate:									<u> </u>	
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{s} \\ \text{heating} & \text{I} \\ \hline 0 & + \end{array} $	econdary neating 0) + [] + [0 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hou	r (6a) (6b)
Number of intermittent fan	S					2	Х ′	10 =	20	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
								Air ch	anges <mark>per</mark> ho	ur
Infiltration due to chimney If a pressurisation test has be	s, flues and fans = (6 en carried out or is intend	a)+(6b)+(7a ed, proceed)+(7b)+(7 to (17), o	(c) = therwise c	ontinue fro	20 om (9) to ((16)	÷ (5) =	0.18	(8)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	25 for steel or timber esent, use the value corres gs); if equal user 0.35	frame or (sponding to t).35 for	masonr er wall area	y constr a <i>(after</i>	uction			0	(11)
If no draught lobby, onto	0.2 (unsea		(Seale	u), eise					0	(12)
Percentage of windows	and doors draught s	tripped							0	(13)
Window infiltration		inpped	(0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, o	50, expressed in cut	oic metres	per ho	ur per so	uare m	etre of e	envelope	area	10	(17)
If based on air permeabilit	y value, then (18) = [(1	7) ÷ 20]+(8)	, otherwis	se (18) = (*	16)				0.68	(18)
Air permeability value applies	if a pressurisation test ha	s been done	or a deg	ree air per	meability	is being u	sed			_
Number of sides sheltered	1			(20) - 1 [0 075 v (1	0)1			3	(19)
Sheller lactor	ag aboltar factor			(20) = 1 - [(21) = (18)	v (20) -	9)] =			0.78	(20)
Inflitration rate incorporation	ng sheller lactor	1		(21) = (10)	x (20) =				0.53	(21)
	Apr Apr Max		lul	Aug	Son	Oct	Nov	Dee		
	vial Api Viay		Jui	Aug	Sep	001		Dec		
$(22)_{m=}$		3.8	3.8	37	Δ	43	15	A 7		
	···· · ··· ···· ·····		0.0	5.7	Ŧ	- 1 .0	L 7.5			
Wind Factor (22a)m = (22 (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		
		<u> </u>					ļ		I	

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-		_	
~ ' '	0.67	0.66	0.65	0.58	0.57	0.5	0.5	0.49	0.53	0.57	0.59	0.62		
Calcul If me	ate ette	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , other	wise (23b) = (23a)			0	(23b)
lf bala	anced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h)) =	, , ,				(23c)
a) If	balance	ed mech	, anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	n)m = (22)	2b)m + (23b) x [*	1 – (23c)	1001	(200)
(24a)m=	0	0		0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	L Coverv (N	MV) (24b)m = (22	1 2b)m + ()	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside	!			1	
í	if (22b)r	n < 0.5 ×	(23b), t	then (24d	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft					
(0.4.1)	if (22b)r	n = 1, th	en (24d)	m = (22k)	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		0.00	1	(244)
(24d)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	J	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in box	(25)	0.00	0.00	0.00	1	(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		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/I	K)	k-value kJ/m²·l	¥ K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	= [2.66				(26)
Win <mark>do</mark>	<mark>ws</mark> Type	e 1				4.8	x1	/[1/(1.6)+	0.04] =	7.22				(27)
Windo	ws Type	e 2				4.16	x 1	/[1/(4.8)+	0.04] =	16.75	F			(27)
Floor						51	×	0.99	=	50.49				(28)
Walls ⁻	Type1	16.1	4	4.8		11.34	×	2.1		23.81			\exists	(29)
Walls ⁻	Type2	16.	1	6.06		10.04	×	2.1		21.08			\dashv	(29)
Total a	area of e	elements	, m²			83.24			เ		L			(31)
Partv v	wall					33.3	×	0	= [0				(32)
* for win	dows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	formula 1,	L /[(1/U-valu	ie)+0.04] a	L as given in	paragraph	L 1 3.2	(/
** inclua	le the area	as on both	sides of in	nternal wall	ls and par	titions								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				122.02	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be ι	ign asses: used inste	sments wh ead of a de	ere the de tailed calc	etails of the ulation.	construct	ion are not	t known pi	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.8	(36)
if details	of therma	al bridging	are not kr	10wn (36) =	= 0.15 x (3	1)			(00)	(0.0)				
	abric ne	atioss		1					(33) +	(36) =			134.82	(37)
ventila					/	1	1. 1	Δ	(38)m	= 0.33 × (25)m x (5)	Det	1	
(29)~	Jan			Apr	May	Jun	JUI	Aug	Sep	UCt	1NOV	Dec	{	(38)
(30)11)=	20.02	20.2	25.69	24.41	24.13	22.00	22.00	22.01	23.34	24.13	24.09	20.28	I	(00)
Heat tr	ranster of		nt, W/K	450.00	450.05	457.00	457.00	457.40	(39)m	= (37) + (37)	38)m	400.00	1	
(ວອ)ເມ=	101.34	101.02	100.7	159.23	158.95	00.101	137.00	157.43	138.16		Sum(30)	100.09	159.23	(39)
										ugu -			100.20	(30)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.16	3.16	3.15	3.12	3.12	3.09	3.09	3.09	3.1	3.12	3.13	3.14		
L	r of day		I	l <u> </u>					,	Average =	Sum(40)1.	12 /12=	3.12	(40)
	.lan	Feb	Mar	Anr	May	Jun	Jul	Aug	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Ϋ́ L													l	
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ıpancy, l 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	FFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by s r day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					1	
(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		—
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1180.67	(45)
(46)m=	18.36	16.06	16.57	14. <mark>45</mark>	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
Storage	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
lf comm	nunitv h	eating a	and no ta	ink in dw	vellina. e	nter 110	litres in	(47)				100		()
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water s	storage	loss:												
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/y€	ear		lun numu	(48) x (49)) =		1	10		(50)
Hot wat	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	whown. ay)				0.	02]	(51)
If comm Volume	nunity n factor	from Ta	iee secti hle 2a	on 4.3							1	02	1	(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(52)
Enerav	lost fro	m water	. storage	kWh/ve	ar			(47) x (51)) x (52) x (53) =		02]	(54)
Enter ((50) or ((54) in (5	55)	,, , .					((- / (,	1.	03		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(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	s dedicate	l d solar sto	rage, (57)ı	m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	l lix 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	nnual) fro	om Table	e 3							0]	(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
mod) ר	ified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	ostat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h month	(61)m =	(60) ÷	365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	l for e	ach month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	177.69	156.99	165.75	149.81	147.69	133.2	4 129.18	140.08	139.31	155.28	162.66	173.82		(62)
Solar DH	W input	calculated	using Ap	pendix G o	r Appendix	H (neg	ative quantit	y) (enter '()' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	S and/or	WWHRS	appli	es, see Ap	pendix	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output	from w	ater hea	ter											
(64)m=	177.69	156.99	165.75	149.81	147.69	133.2	4 129.18	140.08	139.31	155.28	162.66	173.82		
					-		-	Out	put from w	ater heate	er (annual)₁	12	1831.51	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.8	35 × (45)m	ı + (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.5	3 43.18	46.81	46.54	51.86	54.31	58.03		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinde	r is in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Int	ernal g	ains (see	e Table	5 and 5a):									
Metabo	olic dair	ns (Table	e 5). Wa	itts										
	Jan	Feb	Mar	Apr	May	Jur	n Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.9	3 85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso see	Table 5					
(67)m=	13.58	12.06	9.81	7.42	5.55	4.69	5.06	6.58	8.83	11.21	13.09	13.95		(67)
Applia	nces ga	ains (ca <mark>lc</mark>	ulated i	n Appen	dix L, ea	uation	L13 or L1	3a), also	o see Ta	ble 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	1	(68)
Cookin	g gains	s (calcula	ted in A	, ppendix	L, equat	ion L1	5 or L15a), also s	ee Table	9 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	1	(69)
Pumps	and fa	ns gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(70)
Losses	se.g. e	vaporatio	n (nega	ative valu	ies) (Tab	le 5)		Į	1	1	1	Į	1	
(71)m=	-68.78	-68.78	-68.78	-68.78	-68.78	, -68.7	8 -68.78	-68.78	-68.78	-68.78	-68.78	-68.78]	(71)
Water	heating	u dains (T	able 5)	1					1	ļ			1	
(72)m=	79.72	77.99	74.39	69.49	66.32	61.84	4 58.04	62.91	64.64	69.71	75.43	77.99]	(72)
Total i	nterna	l gains =	I	1		I (66)m + (67)n	ı 1 + (68)m	+ (69)m +	(70)m + (7	1 71)m + (72)	l Im	1	
(73)m=	291.92	290.22	280.45	264.84	249.26	234.0	2 223.99	228.82	236.72	252.51	270.63	283.96]	(73)
6. Sol	lar gain	s:		1	I			1			1			
Solar g	ains are	calculated	using sol	ar flux from	Table 6a	and ass	ociated equa	ations to c	onvert to th	ne applica	ble orientat	ion.		
Orienta	ation:	Access F	actor	Area	l	F	lux		g_		FF		Gains	
		Table 6d		m²		٦	able 6a	٦	Table 6b	Т	able 6c		(VV)	
North	0.9x	0.77)	4.	16	×	10.63	x 🗌	0.85	x	0.7	=	18.24	(74)
North	0.9x	0.77	>	4.	16	x	20.32) x [0.85	×	0.7	=	34.86	(74)
North	0.9x	0.77	>	4.	16	×	34.53) x [0.85	×	0.7	=	59.23	(74)
North	0.9x	0.77)	4.	16	x	55.46) x [0.85	× [0.7	=	95.14	(74)
North	0.9x	0.77)	4.	16	×	74.72) × [0.85	× [0.7	=	128.16	(74)

North	0.9x	0.77	x		4.16	x	7	9.99	x	0.85	x	0.7	=	137.2	(74)
North	0.9x	0.77	x		4.16	x	7	4.68	x	0.85	x	0.7	=	128.09	(74)
North	0.9x	0.77	x		4.16	x	5	9.25	x	0.85	x	0.7	=	101.63	(74)
North	0.9x	0.77	x		4.16	x	4	1.52	x	0.85	x	0.7	=	71.21	(74)
North	0.9x	0.77	x		4.16	x	2	4.19	x	0.85	x	0.7	=	41.49	(74)
North	0.9x	0.77	x	Γ	4.16	x	1	3.12	x	0.85	x	0.7	=	22.5	(74)
North	0.9x	0.77	x		4.16	x		8.86	x	0.85	x	0.7	=	15.21	(74)
South	0.9x	0.77	x	Γ	4.8	x	4	6.75	x	0.76	x	0.7	=	82.73	(78)
South	0.9x	0.77	x		4.8	x	7	6.57	x	0.76	x	0.7	=	135.5	(78)
South	0.9x	0.77	x		4.8	x	g	7.53	x	0.76	x	0.7	=	172.6	(78)
South	0.9x	0.77	x		4.8	x	1	10.23	x	0.76	x	0.7	=	195.08	(78)
South	0.9x	0.77	x		4.8	x	1	14.87	x	0.76	x	0.7	=	203.28	(78)
South	0.9x	0.77	x		4.8	x	1	10.55	x	0.76	x	0.7	=	195.63	(78)
South	0.9x	0.77	x	Γ	4.8	x	1	08.01	x	0.76	x	0.7	=	191.14	(78)
South	0.9x	0.77	x		4.8	x	1	04.89	x	0.76	x	0.7	=	185.63	(78)
South	0.9x	0.77	x		4.8	x	1	01.89	x	0.76	x	0.7	=	180.3	(78)
South	0.9x	0.77	x		4.8	x	6	2.59	x	0.76	x	0.7	=	146.15	(78)
South	0.9x	0.77	x		4.8	x	5	5.42	x	0.76	x	0.7	=	98.07	(78)
South	0.9x	0.77	×	Γ	4.8	x		40.4	x	0.76	x	0.7		71.49	(78)
Solar g	<mark>gain</mark> s in	watts, <mark>ca</mark> l	lculateo	d fo	or each mont	:h			(83)m	n = Sum(74)m .	(<mark>8</mark> 2)m			,	
(83)m=	100.97	170.35	231.83	29	90.21 331.44	1 3	32.83	319.24	287	.25 251.52	187.6	4 120.57	86.7		(83)
Total (gains – i	nternal ar	nd sola	r (8	(73)m = (73)m	ו + (83)m	, watts	-		-	_	i		
(84)m=	392.89	460.58	512.28	55	55.05 580.7		66.85	543.22	516	.07 488.24	440.1	5 391.2	370.66		(84)
7. Me	ean inter	nal tempe	erature	(he	eating seaso	n)									
Temp	perature	during he	eating p	beri	iods in the liv	ving	area	from Tab	ble 9	, Th1 (°C)				21	(85)
Utilis	ation fac	tor for ga	ins for	livir	ng area, h1,	m (s	see Ta	ble 9a)						7	
	Jan	Feb	Mar		Apr May	/	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m=	1	1	1	(0.99 0.98		0.94	0.87	0.	9 0.97	0.99	1	1		(86)
Mear	n interna	l tempera	iture in	livi	ing area T1	follo	ow ste	ps 3 to 7	7 in T	able 9c)	-			_	
(87)m=	18.88	19.03	19.32	1	19.73 20.16	:	20.56	20.8	20.	76 20.43	19.88	19.31	18.86		(87)
Tem	perature	during he	eating p	beri	iods in rest c	of dv	velling	from Ta	able 9	9, Th2 (°C)					
(88)m=	18.67	18.67	18.68	1	18.69 18.69		18.7	18.7	18.	71 18.7	18.69	18.69	18.68]	(88)
Utilis	ation fac	tor for ga	ins for	res	st of dwelling	. h2	.m (se	e Table	9a)					-	
(89)m=	1	1	0.99	(0.99 0.95	T	0.84	0.57	0.6	63 0.91	0.99	1	1]	(89)
Moor		l tempera	itura in	the	rest of dwe	lling	T2 (f	l ollow sta		to 7 in Tabl		I	ļ	1	
(90)m=	16.07	16.3	16.72	1	17.32 17.94		18.47	18.67	18.	66 18.32	17.54	16.71	16.05	1	(90)
. /				<u> </u>				ļ			LA = Liv	/ing area ÷ (4) =	0.55	(91)
Maar	intorna	Itomnore	turo /f	\r 4L	ho whole du		(a) - 4	ΛΤ4	. /4						
(92)m=	17.63		18.16		18.66 19.17		19,63	LA × II 19.85	+(1	- ILA) × IZ	18.84	18 16	17.61	1	(92)
		, I										1 10.10			(/

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.63	17.82	18.16	18.66	19.17	19.63	19.85	19.82	19.49	18.84	18.16	17.61		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	0.99	0.99	0.96	0.9	0.76	0.8	0.94	0.99	1	1		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m						-			
(95)m=	392.23	459.09	508.98	546.81	558.48	507.93	414.81	414.87	459.38	434.79	389.98	370.16		(95)
Month	nly avera	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	e for mea	an intern	al tempe	erature,	_m , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2150.66	2079.93	1874.55	1553.44	1187.39	793.04	512.58	538.88	852.2	1309.03	1763.48	2146.51		(97)
Space	e heating	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	1308.27	1089.21	1015.98	724.77	467.91	0	0	0	0	650.43	988.92	1321.61		-
								Tota	l per year	(kWh/yeai	[•]) = Sum(9	8)15,912 =	7567.09	(98)
Space	e heating	g require	ement in	kWh/m²	/year								148.37	(99)
9b. En	erav rea	uiremer	nts – Cor	nmunitv	heating	scheme	1					L. L. L. L. L. L. L. L. L. L. L. L. L. L		7
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by	a comm	unity sch	neme.		1/22.45
Fractio	n of spa	ice neat	trom se	condary/	suppien	ientary i	neating (Table 1	1) 'U' If n	one			0	(301)
Fractio	n of spa	ice heat	from co	<mark>mmu</mark> nity	system	1 - (301	1) =						1	(302)
The com	nmunity so	heme may	y obtain he	eat from se	everal sour	ces. The p	procedure .	allows for	CHP and u	up to four	other heat	sources; tl	ne latter	
<i>includes</i> Fractio	boilers, h n of hea	eat pumps at from C	s, geotherr Commun	nal and wa ity boiler	aste heat fi S	rom powei	r stations.	See Apper	ndix C.				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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m				[1.05	(306)
Space	heating	3										_	kWh/year	_
Annua	space	heating	requirem	nent									7567.09]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	-	7945.45	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment froi	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annual	heating water h	l neating r	equirem	ent								[1831.51	1
lf DHW Water	/ from co heat fro	ommunit m Comn	ty schem	ne: pilers					(64) x (30	03a) x (30	5) x (306) :	=	1923.08] (310a)
Electric	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	(310a)([310e)] =	98.69	」 [、] ((313)
Cooline	g Syster	n Energ	y Efficier	ncy Ratio	C				/			· · · ·	0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electric	city for p nical ve	oumps aintilation	nd fans v - balanc	within dw ed, extra	velling (1 act or po	able 4f) 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)			2	39.76	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh	Emiss kg CC	sions)2/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 fu	el	90	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0	=	2368.45	(367)
Electrical energy for heat distribution [(313) x	0.52	=	51.22	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372)		=	2419.67	(373)
CO2 associated with space heating (secondary) (3	309) 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) =			2419.67	(376)
CO2 associated with electricity for pumps and fans within dwellin	(331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting (3	332))) x	0.52	=	124.43	(379)
Total CO2, kg/year sum of (376)(382) =				2544.1	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				49.88	(384)
El rating (section 14)				64.49	(385)

		Use	r Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	2	Stroma Softwa	a Numi Ire Ver	ber: sion:		Versio	n: 1.0.3.15	
	leveleve	Proper	ty Address:	Unit 17					
Address :	, london								
Basement	1510115.	A	rea(m²) 51	(1a) x	Av. He	ight(m) .18	(2a) =	Volume(m³ 111.18) (3a)
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+(1e)	+(1n)	51	(4)					
Dwelling volume				(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	111.18	(5)
2. Ventilation rate:	-								
Number of chimneys Number of open flues	$\begin{array}{c} main & se \\ heating & he \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	condary eating 0 + 0 +	0 0] = [total 0 0	x 4	40 = 20 =	0 0	(6a) (6b)
Number of intermittent far	IS		-	- F	2	x 1	0 =	20	(7a)
Number of passive vents					0	x 1	10 =	0	(7b)
Number of flueless gas fir	es				0	x 4	40 =	0	(7c)
							Air ch	ange <mark>s per</mark> ho	our
Infiltration due to chimney	s, flues and fans = $(6a)$	(+(6b)+(7a)+(7b))	(7c) =		20 om (9) to ((16)	÷ (5) =	0.18	(8)
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dwelling (ns) 25 for steel or timber fi	rame or 0.35	for masonr	y constru	uction	[(9)-	·1]x0.1 =	0 0 0	(9) (10) (11)
if both types of wall are pre deducting areas of opening	esent, use the value corresp gs); if equal user 0.35	oonding to the gr	eater wall area	a (after			r		
If suspended wooden fil	oor, enter 0.2 (unseale	ed) or 0.1 (se	aled), else	enter U				0	(12)
Percentage of windows	and doors draught str	inned					l	0	(13)
Window infiltration	and doors dradynt str	ipped	0.25 - [0.2	x (14) ÷ 1	00] =		l	0	(14)
Infiltration rate			(8) + (10) -	+ (11) + (1	- 2) + (13) -	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubi	c metres per	hour per so	quare me	etre of e	nvelope	area	10	(17)
If based on air permeabilit	ty value, then (18) = [(17	') ÷ 20]+(8), othe	erwise (18) = (16)			ĺ	0.68	(18)
Air permeability value applies	if a pressurisation test has	been done or a	degree air per	meability i	is being u	sed			_
Number of sides sheltered	b		(00) 4 5	0.075 (4	0)1			2	(19)
Shelter factor	n n al altan fa stan		(20) = 1 - [0.075 X (1	9)] =			0.85	(20)
Inflitration rate incorporation	ng sheiter factor		(21) = (18)	x (20) =			l	0.58	(21)
	or monthly wind speed			San	Oct	Nov	Dee		
		Jun Ju	i Aug	Sep	OCI	NOV	Dec		
$(22)m = \begin{bmatrix} 51 \\ 51 \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \end{bmatrix}$		38 28	37	4	43	45	47		
		0.0 0.0	5.7	7	- 1 .0		-7.7		
Wind Factor (22a)m = (22 (22a)m = 1.27 1.25 1)m ÷ 4	0.95 0.95	5 0.92	1	1.08	1.12	1.18		
		0.00	0.02	·		L <u>-</u>			

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-	-	_	
	0.74	0.72	0.71	0.64	0.62	0.55	0.55	0.53	0.58	0.62	0.65	0.68		
If m	ate effe	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), othei	rwise (23b) = (23a)				(23b)
If bala	anced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,			0	(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MV	HR) (24a	u)m = (22	2b)m + (23b) x [′	1 – (23c)	÷ 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	overv (ľ	MV) (24b)m = (22	1 2b)m + (;	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside	!			1	
,	if (22b)r	n < 0.5 ×	(23b), t	then (24o	c) = (23b); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilati	on from I	oft					
	if (22b)r	n = 1, th	en (24d)	m = (22k	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(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	J	(240)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24)	c) or (24	d) in boy	(25)	0.00	0.74	0.70	1	(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		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/I	K)	k-value kJ/m²·l) K	A X k kJ/K
Doo <mark>rs</mark>						1.9	x	1.4	= [2.66				(26)
Windo	<mark>ws</mark> Type	e 1				4.8	x1	/[1/(1.6)+	0.04] =	7.22				(27)
Win <mark>do</mark>	ws Type	e 2				4.32	x1	/[1/(4.8)+	0.04] =	17.4				(27)
Floor						51	×	0.97	= [49.47				(28)
Walls ⁻	Type1	39.	2	4.32		34.88	3 X	2.1		73.25			╡	(29)
Walls ⁻	Type2	10.9	9	6.7		4.29	×	2.1	= [9.01			╡	(29)
Total a	area of e	elements	, m²			101.1	9							(31)
Party v	wall					16.1	×	0	=	0				(32)
* for win	idows and	l roof wind as on both	ows, use e sides of ir	effective wi	ndow U-va Is and par	alue calcul titions	ated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				159	(33)
Heat c	apacity	Cm = S((Axk)	,					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMI	- = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		450	(35)
For desi can be ı	ign asses used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pi	recisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.2	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			174.2	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × (25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	28.3	27.92	27.54	25.76	25.42	23.87	23.87	23.59	24.47	25.42	26.1	26.8	J	(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m		1	
(39)m=	202.51	202.12	201.74	199.96	199.63	198.08	198.08	197.79	198.67	199.63	200.3	201		
										Average =	Sum(39)1	12 /12=	199.96	(39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.97	3.96	3.96	3.92	3.91	3.88	3.88	3.88	3.9	3.91	3.93	3.94		
L	r of day		I					I	,	Average =	Sum(40)1.	12 /12=	3.92	(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)
Ϋ́ Υ													l	
4. Wat	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	FFA -13	1. .9)	72		(42)
Annual Reduce t not more	averag he annua that 125	e hot wa al average litres per j	ater usag hot water person pel	ge in litre usage by s r day (all w	es per da 5% if the a rater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	75 f	.04]	(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			1		1	
(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		
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	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		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	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	e volum	loss. le (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		160	1	(47)
If comm	nunity h	eating a	and no ta	ink in dw	elling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:											1	
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/y∉ ≫dindor l	ear ann faot	or io not	known:	(48) x (49)) =		1	10		(50)
Hot wat	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02]	(51)
Volume	factor	from Ta	ble 2a	011 4.3							1	03		(52)
Temper	rature f	actor fro	m Table	2b							0	.6		(53)
Enerav	lost fro	m water	storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		03]	(54)
Enter (50) or ((54) in (5	55)	, ,						,	1.	03		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(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	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (L H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is fro	m Append	I lix 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	nnual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi I	oss ca	lculated	for eac	h month	(61)m =	(60) ÷ 3	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat req	uired for	water h	neating c	alculated	l for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)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		(62)
Solar DH	N input	calculated	using Ap	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ad	ditiona	l lines if	FGHR	S and/or	WWHRS	applies	, see Ap	pendix (G)			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	rom w	ater hea	ter											
(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		
_		-			-		-	Out	out from w	ater heate	r (annual)₁	12	1831.51	(64)
Heat ga	ins fro	m water	heating	g, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	59.31	52.41	55.34	50.03	49.34	44.53	43.18	46.81	46.54	51.86	54.31	58.03		(65)
incluc	le (57)	m in calc	ulation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	vater is fi	rom com	munity h	eating	
5. Inte	rnal g	ains (see	Table	5 and 5a):									
Metabol	lic gair	ns (Table	5). Wa	atts	, 									
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	85.98	8 <mark>5.98</mark>	85.98	85.98		(66)
Lighting	gains	(calculat	ted in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	13.54	12.03	9.78	7.4	5.53	4.67	5.05	6.56	8.81	11.18	13.05	13.92		(67)
Applian	ces da	ins (calc	ulated i	n Appen	dix L. ea	uation L	13 or L1	3a), also	see Ta	ble 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	aains	(calcula	ted in A	Appendix	L equat	ion I 15	or I 15a)	also se	e 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 fa	ns gains	(Table	5a)										
(70)m=	0		0		0	0	0	0	0	0	0	0		(70)
		l vanoratio	n (nea:	l ative valu	l les) (Tab	le 5)								
(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	l	(71)
Water b	oating													. ,
(72)m =	79 72	921113 (1	74 39	69.49	66 32	61 84	58.04	62 91	64 64	69.71	75.43	77 99	l	(72)
	tornal		1 1.00	00.10	00.02	(66	m + (67)m	+ (68)m -	(60)m ± ((70)m + (7)	(1)m + (72)			(/
(73)m-	201 88	200 10	280.43	264.82	249.24	234.01	223.07	228.8	236.7	252.48	270.6	283.92		(73)
(73)III-	r gain	230.13	200.43	204.02	243.24	204.01	220.07	220.0	200.1	202.40	270.0	200.02		(10)
Solar ga	ins are	calculated	using sol	ar flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Orientat	tion:	Access F	actor	Area	l	Flu	IX		q		FF		Gains	
	-	Table 6d		m²		Та	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	,	4 .	32	x	10.63	x	0.85	x	0.7	=	18.94	(74)
North	0.9x	0.77	,	< <u>4.</u>	32	x	20.32	x	0.85		0.7		36.2	(74)
North	0.9x	0.77	,	(4.3	32	x [:	34.53	×	0.85	╡╷┝	0.7		61.51	(74)
North	0.9x	0.77	— ,	4	32	x .	55.46	×	0.85	╡╷┝	0.7	=	98.8	(74)
		0.77	\dashv		32	x	74.72		0.85	╡╷┝	0.7		133.09] (74)

North	Г			1				<u> </u>		1			י ר			Г		
North	0.9x	0.77		x	4.32		x	7	9.99] ×		0.85		0.7		=	142.48	(74)
North	0.9x	0.77		x	4.32		x	7	4.68	X	(0.85	×	0.7		= [133.02	(74)
North	0.9x	0.77		x	4.32		x	5	9.25	X	(0.85	×	0.7		= [105.53	(74)
North	0.9x	0.77		x	4.32		х	4	1.52	X	(0.85	_ ×	0.7		= [73.95	(74)
North	0.9x	0.77		x	4.32		X	2	4.19	x	(0.85	×	0.7		=	43.09	(74)
North	0.9x	0.77		x	4.32		x	1	3.12	x	(0.85	×	0.7		= [23.37	(74)
North	0.9x	0.77		x	4.32		x	8	3.86	x	(0.85	×	0.7		=	15.79	(74)
South	0.9x	0.77		x	4.8		x	4	6.75	x	(0.76	×	0.7		=	82.73	(78)
South	0.9x	0.77		x	4.8		x	7	6.57	x	(0.76	×	0.7		=	135.5	(78)
South	0.9x	0.77		x	4.8		x	9	7.53	x	(0.76	×	0.7		=	172.6	(78)
South	0.9x	0.77		x	4.8		x	1	10.23	x	(0.76	×	0.7		=	195.08	(78)
South	0.9x	0.77		x	4.8		x	1	14.87	x	(0.76	×	0.7		= [203.28	(78)
South	0.9x	0.77		x	4.8		x	1	10.55	x	(0.76	×	0.7		=	195.63	(78)
South	0.9x	0.77		x	4.8		x	10	08.01	x	(0.76	×	0.7		=	191.14	(78)
South	0.9x	0.77		x	4.8		x	10	04.89	x	(0.76	×	0.7		= [185.63	(78)
South	0.9x	0.77		x	4.8		x	10	01.89	x	(0.76	×	0.7		= [180.3	(78)
South	0.9x	0.77		x	4.8		x	8	2.59	x	(0.76	×	0.7		= [146.15	(78)
South	0.9x	0.77		x	4.8		x	5	5.42	х		0.76	x	0.7		=	98.07	(78)
Sout <mark>h</mark>	0.9x	0.77		x	4.8		x	4	40.4	x		0.76	x	0.7		= [71.49	(78)
Solar (pains in	watts, <mark>ca</mark>	Iculate	d	for each	mont	h			(83)m	n = Sum	n(74)m	. <mark>(8</mark> 2)m					(00)
(83)m=	101.68	171.7	234.11		293.87	(72)	3	38.11	324.16	291	.16 2	254.25	189.24	121.43	87.	.28		(83)
	jains – II			ar	(84)m =	(73)IT		83)m	, watts	540	07	400.05	444 70	202.02	07	4.0		(94)
(84)11=	393.00	401.89	514.54	1	556.69	365.01		72.12	546.14	519	.97	490.95	441.72	392.03	37	1.2		(04)
7. Me	an inter	nal temp	erature	e (heating s	seaso	n)											
Temp	perature	during he	eating	pe	eriods in	the liv	ring	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilis	ation fac	tor for ga	ins fo	r li	ving area	a, h1,r	n (s	ee Ta	ble 9a)	<u> </u>								
	Jan	Feb	Mar		Apr	Мау	′ 	Jun	Jul	A	ug	Sep	Oct	Nov	D	ec		
(86)m=	1	1	1		0.99	0.98		0.95	0.9	0.9	92	0.97	0.99	1	1	1		(86)
Mear	interna	l tempera	ature ir	n li	ving area	a T1 (follo	w ste	ps 3 to 7	7 in T	able	9c)						
(87)m=	18.44	18.6	18.93		19.39	19.89	2	20.38	20.67	20.	63	20.23	19.59	18.94	18.	.41		(87)
Temp	erature	during he	eating	ре	eriods in	rest o	f dw	elling	from Ta	able 9	9, Th2	2 (°C)						
(88)m=	18.34	18.35	18.35	T	18.36	18.36	1	8.37	18.37	18.	38	18.37	18.36	18.36	18.	.35		(88)
Utilis	ation fac	tor for a	nins fo	r re	est of dw	ellina	h2	m (se	e Table	9a)		•		•				
(89)m=	1	1	0.99	T	0.98	0.96		0.85	0.57	0.6	64	0.92	0.99	1	1	1		(89)
Moor			aturo ir	 > ti	he rest o	f dwo	lling	T2 (f	l ollow ste		to 7 i	in Table						
(90)m=	15.26	15.51	15.98	T	16.67	17.39		12 (10	18.33	18	3	17.86	16.96	16.01	15	24		(90)
·- ·/··· ·				_							-	fL	A = Liv	ing area ÷ (4	1 4) =	-+	0.47) (91)
							- 112		۸ ۲			\ 		- ``		L		
Mear	interna	tempera	ature (tor T	the who	le dw	ellin	g) = fl	$A \times T1$	+ (1	- tLA	$) \times [2]$	10.0	47.00	40	74		(00)
(92)M=	16.76	10.97	17.37	1	17.96	18.57	1 1	9.14	19.44	I 19	.4	18.98	18.2	17.39	1 16.	.14		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	16.76	16.97	17.37	17.96	18.57	19.14	19.44	19.4	18.98	18.2	17.39	16.74		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain Ible 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	1	0.99	0.98	0.96	0.9	0.77	0.81	0.94	0.98	1	1		(94)
Usefu	Il gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	392.51	459.74	510.17	548.82	561.51	512.98	420.9	419.4	460.54	435.09	390.25	370.39		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m >	k [(93)m∙	– (96)m]				
(97)m=	2523.66	2439.48	2193.86	1810.63	1372.12	900.2	561.56	593.54	969.94	1517.12	2061.56	2520.18		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	1585.58	1330.38	1252.66	908.5	603.09	0	0	0	0	805.03	1203.34	1599.44		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	9288.03	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year							Ì	182.12	(99)
Oh En	oraviroo	uiromor	te Cor	nmunity	hosting	schomo						l	-], ,
Thic pr	ergy rec	d for co		ting one			tor boot	ing prov	idod by	0.0000				
Fractio	n of spa	ace heat	from se	condary	suppler	ng of wa	heating (Table 1	1) '0' if n	one	unity SCI		0	(301)
Fractio	n of one		from oo	o no unitu	aveters	1 (20)	1)		.,					
Fractio	in or spa	ice neal	from co	mmunity	system	1 - (30	1) =						1	(302)
The com	nmunity so	heme may	y obtain he	eat from se	everal sour	ces. The p	procedure a	allows for	CHP and u	up to four o	other heat	sources; tl	ne latter	
Fractio	n of hea	at from C	commun	ity boiler	Sie near n		stations.	See Apper	IUIX C.				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	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	ting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	communi	ity heatir	ng syster	m					1.05	(306)
Space	heating	9											kWh/year	_
Annua	space	heating	requirem	nent									9288.03]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	9752.44	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	m Table	e 4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment froi	m secon	dary/sup	oplemen	tary syst	em	(98) x (30	01) x 100 -	- (308) =		0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								I	1831.51]
If DHW Water	/ from co heat fro	ommunit m Comn	ty schem nunity bo	ne: pilers					(64) x (30	03a) x (30	5) x (306) =	= [1923.08] (310a)
Electric	city used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	(310a)(310e)] =	116.76	(313)
Cooling	g Syster	n Energ	y Efficiei	ncy Ratio	C								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	· (314) =		 	0	(315)
Electric mecha	city for p nical ve	oumps ai ntilation	nd fans v - balanc	within dw ed, extra	velling (1 act or po	Table 4f) sitive inj	: 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)	0	(331)	
Energy for lighting (calculated in Appendix L)			239.12	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/yea	r
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to (366) for the second fu	el 90	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	= 2802.12	(367)
Electrical energy for heat distribution [(3	313) x	0.52	= 60.6	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372)		= 2862.72	(373)
CO2 associated with space heating (secondary) (3	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		2862.72	(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	32))) x	0.52	= 124.11	(379)
Total CO2, kg/year sum of (376)(382) =			2986.83	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			58.57	(384)
El rating (section 14)			58.17	(385)

User Details:											
Assessor Name: Software Name:	Assessor Name: Stroma FSAP 2012 Software Version: Versio Property Address: Unit 18										
Address :	. london		operty /	1001000.	Onic TO						
1. Overall dwelling dimen	isions:										
Basement			Area	a(m²) 79	(1a) x	Av. He	ight(m) 2.6	(2a) =	Volume(m³ 205.4) (3a)	
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1n))	79	(4)						
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	205.4	(5)	
2. Ventilation rate:		_									
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{se} \\ \text{heating} & \text{h} \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array} $	econdary eating 0 0	/] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hou 0 0	r (6a) (6b)	
Number of intermittent fan	S				Γ	2	x ′	10 =	20	(7a)	
Number of passive vents						0	x	10 =	0	 (7b)	
Number of flueless gas fire	ЭS				Ē	0	X 4	40 =	0	(7c)	
	ange <mark>s per</mark> ho	ur									
Infiltration due to chimneys	0.1	(8)									
Number of storeys in the Additional infiltration	e dwelling (ns) 25 for steel or timber	frame or	0.35 for	masonr	v constr	uction	[(9)-	-1]x0.1 =	0	(9) (10) (11)	
if both types of wall are pre deducting areas of opening	sent, use the value corres	ponding to	the greate	er wall area	a (after	Gotton			0		
If suspended wooden flo	bor, enter 0.2 (unseal	ed) or 0.2	1 (seale	d), else	enter 0				0	(12)	
If no draught lobby, ente	r 0.05, else enter 0	rinned							0		
Window infiltration	and doors draught st	npped		0 25 - [0 2	x (14) - 1	001 =			0	$-\frac{(14)}{(15)}$	
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	$-1^{(15)}_{(16)}$	
Air permeability value, o	150. expressed in cub	oic metres	s per ho	ur per so	auare m	etre of e	envelope	area	10	$= \frac{(10)}{(17)}$	
If based on air permeabilit	y value, then $(18) = [(1)]$	7) ÷ 20]+(8)), otherwis	se (18) = (16)				0.6		
Air permeability value applies	if a pressurisation test has	s been done	e or a deg	ıree air pei	meability	is being u	sed				
Number of sides sheltered	1			(- 17			1	(19)	
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.92	(20)	
Infiltration rate incorporatir	ng shelter factor	_		(21) = (18)	x (20) =				0.55	(21)	
Infiltration rate modified fo	r monthly wind speed	и Г.Т			-	<u> </u>					
Jan Feb N	viar Apr May	Jun	Jui	Aug	Sep	Oct	NOV	Dec			
Monthly average wind spe	ed from Table 7		2.0	0.7	4	4.0	4.5	4 7			
(22)m= 5.1 5 4	9.9 4.4 4.3	3.8	ა.ზ	3.1	4	4.3	4.5	4./			
Wind Factor (22a)m = (22)	$)m \div 4$	0.95	0.95	0.92	1	1 08	1 12	1 18			
			0.00	0.02	•						

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
<u> </u>	0.7	0.69	0.68	0.61	0.59	0.52	0.52	0.51	0.55	0.59	0.62	0.65			
Calcul If me	ate effe	<i>ctive air</i> al ventila	change	rate for t	he appli	cable ca	se								(23a)
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a	a) × Fmv (e	equation (1	N5)) . othei	wise (23b) = (23a))	$\int_{(23h)}^{(23h)}$
If bala	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (from	n Table 4h) =	, (,					(230)
a) If	balance	ed mech	, anical ve	entilation	with he	at recove	erv (MVI	- - - - - - - - - - - - - - - - - - -) m = (22	2b)m + (23b) x [1 – (23c)	⊥ ∸ 1001		
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If	balance	ed mecha	L anical ve	entilation	without	L heat rec	L Coverv (N	I //V) (24b)m = (22	L 2b)m + ()	1 23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	i louse ex	ract ver	ntilation of	n pripositiv	i ve input v	ventilatio	n from c	outside						
	if (22b)r	n < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22b	o) m + 0.	5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	-	-	-			
i	if (22b)r	n = 1, th	en (24d) I	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			I		
(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			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24k	o) or (24)	c) or (24	d) in box	(25)				1		(05)
(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			(25)
3. He	at l <mark>osse</mark>	s and he	at loss	paramete	er:										
ELEN	/IENT	Gros	s	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	e l	AX	< k
Deere		area	(m²)	m	12	A ,r	n²	VV/m2	K T	(VV/	K)	KJ/M ² ·I	1	KJ/	K
Duuis						1.6				2.24					(26)
windo	ws Type					11.64		/[1/(4.8)+	0.04] =	46.87	H				(27)
vvindo	ws type	e Z		_	\	4.55	x 1	/[1/(4.8)+	0.04] =	18.32	Ľ,				(27)
walls	Type1	89.1	2	16.19	9	73.01	x	1.27	= [92.87	_ ļ		_ L		(29)
Walls	Type2	26.6	63	1.6		25.03	3 X	2.1	=	52.56					(29)
Total a	area of e	elements	, m²			115.8	3								(31)
Party v	wall					5.3	x	0	=	0					(32)
* for win	dows and le the area	l roof wind as on both	ows, use e sides of ir	effective wi	ndow U-va Is and par	alue calcul titions	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2		
Fabric	heat los	ss. W/K :	= S (A x	U)	o una pun			(26)(30)	+ (32) =				212	2 86	(33)
Heat c	apacity	Cm = S(Axk)	-)					((28)	.(30) + (32	2) + (32a).	(32e) =		 ງ	(34)
Therm	al mass	parame	ter (TMI	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: High		45		(35)
For desi	ign asses:	sments wh	ere the de	tails of the	construct	ion are noi	t known pr	ecisely the	indicative	values of	TMP in T	able 1f			
can be ι	used inste	ad of a de	tailed calc	ulation.											_
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix I	<						24	.8	(36)
if details Total f	of therma abric he	al bridging at loss	are not kr	10wn (36) =	= 0.15 x (3	1)			(33) +	(36) =			007	7.66	7(37)
Ventila	ation he	at loss c	alculater	1 monthly					(38)m	$= 0.33 \times ($	25)m x (5		237	.00	
ventile	.lan	Feb	Mar	Apr	Mav	Jun	Jul	Αυσ	Sen	Oct	Nov	Dec			
(38)m=	50.71	50.06	49.42	46.41	45.85	43.23	43.23	42.74	44.24	45.85	46.99	48.18			(38)
Heat tr	L		L				L		(30)m	- (37) ± (*	1 38)m		I		
(39)m=	288.38	287.72	287.08	284.08	283.51	280.89	280.89	280.41	281.9	283.51	284.65	285.84			
· / ··		L					L			Average =	Sum(39)1	12 /12=	284	1.07	(39)

Heat lo	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	3.65	3.64	3.63	3.6	3.59	3.56	3.56	3.55	3.57	3.59	3.6	3.62		
Numbe	r of day	l /s in mor	unth (Tab	le 1a)				1	,	Average =	Sum(40)1.	12 /12=	3.6	(40)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			_		-					_		_		
4. Wa	ter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
Assum if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, I 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	2. .9)	44		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person per	ge in litre usage by s ^r day (all w	es per da 5% if the d rater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	92 f	.24		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres per	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		-
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1106.83	(44)
(45)m=	150.46	131.59	135.79	<mark>118</mark> .39	113.6	98.02	90.83	104.23	105.48	122.93	134.18	145.71		_
lf instanta	aneous w	/ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =		1451.23	(45)
(46)m=	22.57	19.74	20.37	17. <mark>7</mark> 6	17.04	14.7	13.63	15.64	15.82	18.44	20.13	21.86		(46)
Storage	storage	loss: le (litres)	includir	ng any so	olar or M	/WHRS	storage	within sa	ame ves	sel		160		(47)
lf comn	nunity h	neating a	ind no ta	ink in dw	vellina, e	nter 110	litres in	(47)				100		(-17)
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:				. /1 \ \ //	(1-1						I	()
a) if ma	anutact	urer's de	eciared I	oss tacto	or is kno	wn (kvvr	n/day):					0		(48)
Tempe	rature f	actor fro	m l able	20				((0		(49)
Energy	lost fro	om water	storage	, KVVN/ye sylinder l	ear oss fact	or is not	known:	(48) x (49)) =		1	10		(50)
Hot wa	ter stor	age loss	factor fr	rom Tabl	e 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	e factor	from Tal	ble 2a	011 4.5							1	03		(52)
Tempe	rature f	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 s	storage	loss cal	culated f	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 cylinde	r 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	lix 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	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m		- 1 - 1			
(mod	infied by	ractor fi			nere is s	solar wat	ter heati	ng and a			stat)	00.00	l	(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 ca	alculated	for eac	h month	(61)m =	(60) ÷ 3	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat rec	uired for	water h	neating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.74	181.52	191.07	171.88	168.87	151.52	146.11	159.51	158.97	178.2	187.68	200.99		(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	r Appendix	H (negat	ve quantity	/) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter											
(64)m=	205.74	181.52	191.07	171.88	168.87	151.52	146.11	159.51	158.97	178.2	187.68	200.99		-
								Out	out from w	ater heate	r (annual)₁	12	2102.07	(64)
Heat g	ains fro	om water	heating	∣, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 >	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	68.64	60.56	63.76	57.37	56.38	50.6	48.81	53.27	53.08	59.48	62.63	67.06		(65)
inclu	include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating													
5. Int	ternal g	ains (see	Table	5 and 5a):									
Metab	olic gai	ns (Table	5), Wa	tts	-		-	-	-	-	-	-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	122.18	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>tin</mark>	g gains	(calcula	ted in A	ppendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	1 <mark>9.38</mark>	17.21	14	10.6	7.92	<mark>6</mark> .69	7.23	9.39	12.61	16.01	18.68	19.91		(67)
App <mark>liance</mark> s gains (ca <mark>lculat</mark> ed in Appendix L, equation L13 or L13a), also see Table 5														
(68)m=	217.34	219.5 <mark>9</mark>	213.91	201.81	186.54	172.18	162.59	160.34	166.02	178.12	193.39	207.75		(68)
Cookir	ng gains	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5		-		
(69)m=	35.22	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 fa	ins gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e	vaporatio	n (nega	ative valu	es) (Tab	le 5)		•		-				
(71)m=	-97.74	-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	, g 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 i	nterna	I gains =				(66)m + (67)m	• n + (68)m ·	• + (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	388.62	386.58	373.26	351.75	329.89	308.81	295.08	300.98	312.01	333.73	358.71	377.45		(73)
6. So	lar gain	IS:		•			•		1	1				
Solar g	jains are	calculated	using sol	ar flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area		Flu	IX	_	g_	_	FF		Gains	
		Table 6d		m²		Та	ble 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77)	4.	55	x	10.63	x	0.85	x	0.7	=	19.95	(74)
North	0.9x	0.77	>	4.	55	x	20.32	x	0.85	x	0.7	=	38.12	(74)
North	0.9x	0.77)	4.5	55	x;	34.53	x	0.85	x	0.7	=	64.78	(74)
North	0.9x	0.77	>	4.	55	x !	55.46	x	0.85	x	0.7	=	104.06	(74)
North	0.9x	0.77)	4.	55	x	74.72	x	0.85	×	0.7	=	140.18	(74)

North	0.9x	0.77	x		4.55	x	7	9.99	x	0.85	×	0.7	=	150.06	(74)
North	0.9x	0.77	x		4.55	x	7	4.68	x	0.85	x	0.7	=	140.1	(74)
North	0.9x	0.77	x		4.55	x	5	9.25	x	0.85	x	0.7	=	111.15	(74)
North	0.9x	0.77	x		4.55	x	4	1.52	x	0.85	x	0.7	=	77.89	(74)
North	0.9x	0.77	x	Γ	4.55	x	2	4.19	x	0.85	×	0.7	=	45.38	(74)
North	0.9x	0.77	x	Γ	4.55	x	1	3.12	x	0.85	×	0.7	=	24.61	(74)
North	0.9x	0.77	x	Γ	4.55	x	8	3.86	x	0.85	×	0.7	=	16.63	(74)
South	0.9x	0.77	×	Γ	11.64	x	4	6.75	x	0.85	×	0.7	=	224.39	(78)
South	0.9x	0.77	x	Γ	11.64	x	7	6.57	x	0.85	×	0.7	=	367.49	(78)
South	0.9x	0.77	x		11.64	x	9	7.53	x	0.85	x	0.7	=	468.12	(78)
South	0.9x	0.77	×	Ē	11.64	x	1'	10.23	x	0.85	×	0.7	=	529.08	(78)
South	0.9x	0.77	x	Γ	11.64	x	1	14.87	x	0.85	×	0.7	=	551.33	(78)
South	0.9x	0.77	x	Γ	11.64	x	1	10.55	x	0.85	×	0.7	=	530.58	(78)
South	0.9x	0.77	×	Ē	11.64	x	10	08.01	x	0.85	×	0.7	=	518.41	(78)
South	0.9x	0.77	×	Γ	11.64	x	10)4.89	x	0.85	×	0.7	=	503.45	(78)
South	0.9x	0.77	×	Γ	11.64	x	10	01.89	x	0.85	×	0.7	=	489.01	(78)
South	0.9x	0.77	×	Ē	11.64	x	8	2.59	x	0.85	×	0.7	=	396.38	(78)
South	0.9x	0.77	×		11.64	X	5	5.42	x	0.85	x	0.7	=	265.98	(78)
Sout <mark>h</mark>	0.9x	0.77	×	Ē	11.64	x	4	40.4	x	0.85	x	0.7		193.89	(78)
Sola <mark>r</mark> g	<mark>gain</mark> s in	watts, <mark>ca</mark> l	Iculate	d fo	or each mont	h			(83)m	n = Sum(74)m .	<mark>(8</mark> 2)m			,	
(83)m=	244.34	405.62	532.9	6	33.14 691.51	6	80.65	658.51	614	.6 566.9	441.7	6 290.59	210.52		(83)
Total (gains – i	nternal ar	nd sola	r (8	(73)m = (73)m) + (83)m	, watts	r			_			
(84)m=	632.96	792.2	906.16	9	84.88 1021.4	1 9	89.45	953.6	915	.58 878.9	775.4	9 649.3	587.98		(84)
7. Me	ean inter	nal tempe	erature	(he	eating seasc	n)									
Temp	perature	during he	eating	oeri	iods in the liv	/ing	area f	rom Tab	ole 9	, Th1 (°C)				21	(85)
Utilis	ation fac	tor for ga	ins for	livi	ng area, h1,	m (s	ee Ta	ble 9a)						7	
	Jan	Feb	Mar		Apr May	/	Jun	Jul	A	ug Sep	Oct	t Nov	Dec		
(86)m=	1	1	0.99	(0.99 0.97		0.93	0.86	0.8	38 0.96	0.99	1	1		(86)
Mear	n interna	l tempera	ature in	livi	ing area T1 (follo	ow ste	ps 3 to 7	7 in T	able 9c)				_	
(87)m=	18.62	18.81	19.14	1	19.59 20.06		20.5	20.76	20.	72 20.37	19.75	5 19.11	18.59		(87)
Temp	perature	during he	eating	oeri	iods in rest c	of dv	velling	from Ta	able 9	9, Th2 (°C)					
(88)m=	18.46	18.46	18.47	1	18.48 18.48	Т	18.5	18.5	18	.5 18.49	18.48	3 18.48	18.47]	(88)
Utilis	ation fac	tor for ga	ins for	res	st of dwelling	. h2	.m (se	e Table	9a)			-	-	-	
(89)m=	1	1	0.99	(0.98 0.94	Ť	0.81	0.52	0.5	68 0.88	0.98	1	1]	(89)
Mear	interna	l tempera	ature in	the	e rest of dwe	lling	T2 (fr	nllow ste		to 7 in Tabl	e 9c)			J	
(90)m=	15.58	15.86	16.35		17.01 17.68		18.25	18.47	18.	45 18.1	17.25	5 16.31	15.55]	(90)
. /				1						f	LA = Li	ving area ÷ (4	4) =	0.28	(91)
Maar	interne	Itomnora	turo /f	- r 41	ho whole due	مالات	a) 4	۸., ד.	. /4	fl A) TO					` ′
(92)m=	16 42		17.12		17.72 18.33		(y) = 11 18.87	_A X I I 19.1	+ (1	$-1LA \times 12$	17.94	17.08	16.39	1	(92)
·····														•	· · · · /

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	16.42	16.68	17.12	17.72	18.33	18.87	19.1	19.08	18.73	17.94	17.08	16.39		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	0.99	0.99	0.97	0.94	0.84	0.64	0.69	0.89	0.98	0.99	1		(94)
Usefu	Il gains,	hmGm	W = (94	4)m x (84	4)m									
(95)m=	631.06	787.09	894.38	957.41	955.26	828.76	611.72	630.75	785.18	756.9	645.52	586.61		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8					_			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m-	– (96)m]				
(97)m=	3494.95	3388.72	3048.26	2505.69	1880.69	1199.29	702.21	751.31	1304.59	2080.64	2841.02	3484.74		(97)
Space	e heating	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	2130.73	1748.3	1602.48	1114.76	688.52	0	0	0	0	984.86	1580.76	2156.21		
								Tota	l per year	(kWh/year	.) = Sum(9	8)15,912 =	12006.63	(98)
Space	e heating	g require	ement in	kWh/m ²	/year							Ī	151.98	(99)
Qh En	orav roa	uiromor	ote – Cor	nmunity	heating	schomo						L], ,
Thic pr	ergy rec	d for on		ting one			ator boot	ing prov	ided by	o comm	upity och			
Fractio	n of spa	ace heat	from se	condarv/	supplen/	ng or wa	neating	Table 1	10e0 by (1) '0' if n	one	unity SCI	leme.	0	(301)
Freetie			6 m m m m m m m			4 (20)	1		,					
Fractio	in or spa	ice neal	from co	minumity	system	1 - (30	() =					[1	(302)
The com	nmunity so	heme may	y obtain he	eat from se	everal sour	ces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; th	ne latter	
Fractio	on of hea	at from C	commun	ity boiler	'S	ioni power	stations.	See Apper	idix C.				1	(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting syst	tem		[1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m				[1.05	(306)
Space	heating	9										,	kWh/year	
Annua	space	heating	requirem	nent								l	12006.63]
Space	heat fro	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [12606.96	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment froi	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								[2102.07	1
If DHW Water	/ from co	ommunit m Comn	ty schem	ne: Dilers					(64) x (30)3a) x (30)	5) x (306) :	ו _ [2207 17] (310a)
Flectri	rity user	for hea	t distribu	ition				0.01	x [(307a)	(307e) +	(310a) (310e)] - [1/2 1/](313)
Coolin	n Sveter		v Efficien	ncv Rati	n			0.01		(0076) T	(υτυα)(- [[]	۱ 4 0.14 ۸	(314)
Snace	cooling	(if there	is a five	d cooling	n svetam	if not a	onter (1)		= (107) ∸	(314) –		l I	0	(315)
	site of a second								- (101) -	(017) -		l	U](010)
mecha	nical 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) + (330b)) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			342.18	(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 the source 1 (%)	two fuels repeat (363) to (366) for the second fue	el 90	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0	= 3555.39	(367)
Electrical energy for heat distribution [(313) x	0.52	= 76.89	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372)	:	= 3632.28	(373)
CO2 associated with space heating (secondary) (3	09) 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	73) + (374) + (375) =		3632.28	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	= 177.59	(379)
Total CO2, kg/year sum of (376)(382) =			3809.87	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			48.23	(384)
El rating (section 14)			58.69	(385)