# Highgate Newtown Community Centre and Fresh Youth Academy

# **Energy Strategy**

**NOVEMBER 2018** 







Document

#### **Energy Strategy Report**

Project

Highgate Newtown Residential and Community Centre Redevelopment

Client

London Borough of Camden

Date

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Contact
Tim Pegg
t.pegg@mcbains.co.uk
020 7786 7900

5th Fl, 26 Finsbury Square London EC2A 1DS +44 (0)20 7786 7900 mcbains.co.uk

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This document requires the following approvals:

Name	Title
Rolfe Jackson	Director





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#### 1.0 EXECUTIVE SUMMARY

This Energy Strategy has been prepared by McBains Ltd for the revised scheme at Highgate Newtown Community Centre in support of the Section 73 Application. The scheme comprises 39 new private dwellings, 2 houses within the refurbished Gospel Hall, and a new community centre. This document supersedes the previous Energy Strategy (VZdV, Rev 3, 28<sup>th</sup> Oct 2016).

It has been prepared as part of a series of documents to support the application, in conjunction with which it should be read, and addresses requirements related to energy use and carbon dioxide emissions reduction in accordance with local and national policy. The main policy and guidance context of the responses includes:

- London Borough of Camden Local Plan (July 2017)
- The London Plan Minor Alterations to the London Plan (MALP) (March 2016)

This document sets out how the expected energy demands of the proposed dwellings have been analysed, and formed the site-wide energy strategy in accordance with the Mayor's energy hierarchy, maximising the contribution at each step. A summary of key outcomes is provided below.

The reduction of regulated carbon dioxide emissions of the proposed scheme have been estimated as 37% across the residential and commercial elements from a Part L 2013 compliant baseline by maximising the contribution at each step of the energy hierarchy. Having minimised energy demand, a Combined Heat and Power unit will be specified and, finally, a PV array of 30 - 35kWp is proposed.

#### LEAN:

Energy demand has been minimised through a highly efficient building envelope and systems in terms of U-values and air-tightness, inverter driven pumps, reduced thermal bridges, the inclusion of high efficiency lighting throughout coupled with PIR sensors, occupancy detectors and dimmers. High efficiency heat recovery in the mechanical ventilation system will also be specified. The challenging Target Fabric Energy Efficiency criterion introduced in Part L1A 2013 is complied with across the residential elements of the development.

The overall contribution of lean measures across the site is a 6% reduction in carbon dioxide emissions.

#### CLEAN:

Further reductions have been achieved through the use of a Combined Heat and Power (CHP) unit. To ensure efficient operation throughout the year, the CHP unit will be sized to meet approximately 60%

# LONDON BOROUGH OF CAMDEN HIGHGATE NEWTOWN RESIDENTIAL & COMMUNITY CENTRE

of the space heating and domestic hot water load of the site wide load. The remaining heating load will be met by high efficiency gas boilers, with individual combi boilers for the 2 no. houses.

The overall contribution of clean measures across the site is a further 16% reduction in carbon dioxide emissions.

#### **GREEN:**

To further reduce the carbon dioxide emissions of the proposed development, an assessment of potential low and zero carbon technologies has been undertaken. The preferred option would be to install a PV array (40 - 45kWp) to contribute towards the electrical load of the development.

The overall contribution of green measures across the site is a further 15% reduction in carbon dioxide emissions.

It is expected that the proposed development will achieve a reduction of an estimated 40% in regulated  $CO_2$  reductions compared to Building Regulations Part L 2013.

The expected CO<sub>2</sub> savings are as follows for each stage of the energy hierarchy:

Table 1: Site wide CO<sub>2</sub> Emissions after each stage of the Energy Hierarchy

Carbon dioxide emissions from proposed measures (tonnes CO <sub>2</sub> /annum)	Regulated	Unregulated
Baseline: Part L 2013 compliance	72.8	38.3
After energy demand reduction	68.1	38.3
After heat network / CHP	56.2	38.3
After renewable energy	45.5	38.3



Table 2: Site wide Regulated CO<sub>2</sub> savings from each stage of the Energy Hierarchy

Regulated carbon dioxide emissions savings from proposed measures	(tnCO <sub>2</sub> /annum)	(%)
Savings from energy demand reduction	4.7	6 %
Savings from heat network / CHP	12.0	16 %
Savings from renewable energy	10.6	14 %
Cumulative on site savings	27.3	37 %

Table 3: Cumulative Regulated carbon dioxide savings from residential and commercial areas

Regulated carbon dioxide emissions savings from proposed measures	(tnCO <sub>2</sub> /annum)	(%)
Residential cumulative CO <sub>2</sub> savings	19.9	40 %
Commercial cumulative CO <sub>2</sub> savings	7.4	31 %
Site wide cumulative CO <sub>2</sub> savings	27.3	37 %

Table 4: Cumulative savings for off-set payment for Carbon Zero Homes (residential only)

	(tnCO <sub>2</sub> /annum)
Annual Savings from off-set payment	29.1
Cumulative savings for off-set payment (over 30 years)	871

Table 5: Cumulative savings for off-set payment for Commercial areas (to reach 35% CO<sub>2</sub> saving)

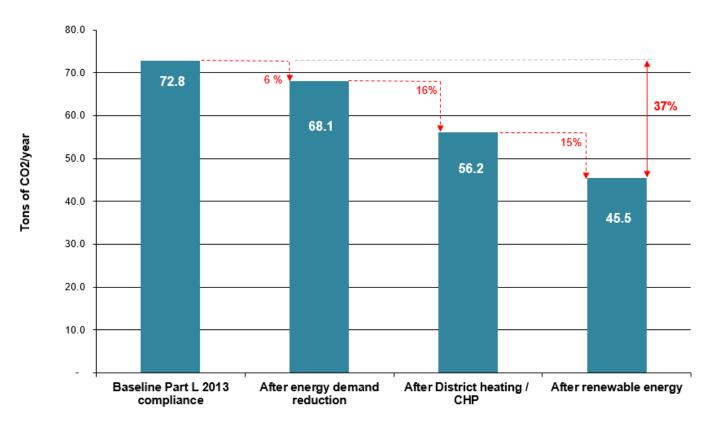
	(tnCO₂/annum)
Annual Savings from off-set payment	0.9
Cumulative savings for off-set payment (over 30 years)	28

The expected  $CO_2$  carbon off-set payment for Carbon Zero Homes and Commercial areas will be £53,991.



The development is expected to achieve regulated CO<sub>2</sub> reductions of an estimated 37% compared with Part L1A 2013 as shown below.

#### **Carbon Dioxide Emissions Reduction**





#### 2.0 METHODOLOGY

#### 2.1 The Accredited Software

In order to determine the baseline consumption and improvements in the private residential dwellings, a series of Standard Assessment Procedure (SAP) assessments were carried out. A representative sample of 11 dwellings (25% of the development) was selected to show a range of compliance strategies and potential improvements. For this exercise the Stroma FSAP 2012 Calculator Version 1.0.4.16 was used, which is also a government accredited software package (checked by BRE on behalf of DECC, CLG, SBS and DFPNI).

In order to develop the Simplified Building Energy Model (SBEM) for the non-domestic elements of the development, EDSL's TAS software was used (version 1.0.4.16). This is an accredited piece of software in accordance with CIBSE TM33:2006.

#### 2.2 The Approach

Once the Part L 2013 calculations were set up according to the information from the rest of the design team, the energy hierarchy was applied as described in London Plan Policy 5.2 Minimising carbon dioxide emissions;

Be lean: Use less energy

Be clean: Supply energy efficiently

Be green: Use renewable energy

The Baseline: The Building/Dwelling Emission Rate (BER/DER) of the development and the Target Emission Rates (TER) of the corresponding notional buildings were calculated using SBEM and SAP in accordance with Building Regulations Part L 2013. For the residential element of the development, SAP calculations were undertaken in order to establish an overall figure for the Dwelling Emission Rate (DER) across the residential element of the development. Similarly, full SBEM simulations were carried out for the community centre to estimate the associated energy demand and regulated carbon dioxide emissions.



The Energy Hierarchy: Once the baselines were determined, the energy hierarchy was applied to maximise the reduction of carbon dioxide emissions; energy efficiency measures first, followed by an assessment of the options for meeting the remaining energy demand efficiently and finally an assessment of the options to further reduce carbon dioxide emissions from renewable energy generated onsite.

Following preliminary calculations it is expected that overall regulated carbon dioxide emissions will be reduced by at least 37% across the development compared to Part L 2013 through the Lean, Clean and Green measures.

#### 3.0 THE BASELINE

To assess the performance of the residential element of the development, the following parameters summarised in Table 3 were applied to the representative sample dwellings.

Table 3: RESIDENTIAL - Fabric and services parameters

Element or system	Units	Highgate Newtown	Notional building (Part L1a 2013)	Limiting Values (Part 1a 2013)
FABRIC PERFORMANCE				
Ground Floor - U value	W/m²K	0.11	0.13	0.25
External Walls - U value	W/m <sup>2</sup> K	0.15	0.18	0.3
Party walls - U value	W/m <sup>2</sup> K	0	0	0.2
Roof - U value	W/m <sup>2</sup> K	0.11	0.13	0.25
Windows, rooflights, glazed doors				
U value	W/m <sup>2</sup> K	1.4	1.4	2
g value		0.44 - 0.558 - Flats 0.76 - House	0.63	-
frame factor		0.7		
External Doors		1.4	1	
Air tightness	m <sup>3</sup> /hr/m <sup>2</sup>	3	5	10
Thermal bridging (y factor)		Accredited Construction Details		
BUILDING SERVICES				
CHP heat efficiency (fraction of load)	%	51% (0.60)		
CHP electrical efficiency	%	33		
Boiler efficiency (fraction of thermal	%	91% (0.40)	89.5%	
Energy efficient lighting	%	100	100	100
Mechanical ventilation & heat recovery: Specific Fan Power (SFP) / heat recovery efficiency	W/L/s	SFP = 0.53 / 94%		
Mechanical cooling SEER		None		



Table 4: COMMERCIAL - Fabric and services parameters

Element or system	Units	Highgate Newtown	Notional building (Part L1a 2013)	Limiting Values (Part 1a 2013)
FABRIC PERFORMANCE				
External Walls - U value	W/m²K	0.24	0.18	0.3
Party walls - U value	W/m²K	0	0	0.2
Roof - U value	W/m <sup>2</sup> K	0.15	0.13	0.25
Windows, rooflights, glazed doors				
U value	W/m <sup>2</sup> K	1.59	1.4	2
g value		0.512	0.63	-
frame factor		0.8		
External Doors		1.63	1	
Air tightness	m³/hr/m²	3	5	10
BUILDING SERVICES				
CHP heat efficiency (fraction of load)	%	51% (0.60)		
CHP electrical efficiency	%	33		
Boiler efficiency (fraction of thermal	%	91% (0.40)	89.5%	
Lighting (lm/W)	%	80	100	100
Mechanical ventilation & heat recovery: Specific Fan Power (SFP) / heat recovery efficiency	W/L/s	SFP = 1.6 / 70%		
Mechanical cooling SEER		None		



#### 4.0 IMPROVEMENTS FROM REDUCING ENERGY DEMAND ('BE LEAN')

Reducing carbon emissions from the total energy needs (heating, cooling and power) of the development is one of the fundamental aims of any development adopting the principles of sustainable design in order to mitigate the effects of climate change and help conserve fossil fuel resources.

The first step in the energy hierarchy is to use passive design and energy efficiency measures to reduce the energy demand of the building. From preliminary calculations, it is estimated that a regulated carbon dioxide emissions reduction of 6% over Part L 2013 across the development as a whole through lean measures alone can be achieved. It is worth noting that the challenging Target Fabric Energy Efficiency criterion has been achieved in all of the sample dwellings and on a block basis this criterion is passed.

#### A. Building Fabric Improvements and Overheating

The glazed areas in the residential element of the scheme are a key component. The proportion of glazing to façade area was assessed with careful consideration of beneficial heat gain, winter heat losses, daylight and aesthetic appeal of the building. Windows with a U-value of 1.40 W/m<sup>2</sup>K are proposed. This will help to minimise excessive heat loss in winter and solar gain in the summer, reducing the associated heating load in winter and the risk of overheating in summer. Furthermore, external wall U-values of 0.15 - 0.22 W/m<sup>2</sup>K have been selected.

#### B. Air Tightness Improvements

An improvement upon the minimum requirements of the Part L 2013 will be targeted with 3m<sup>3</sup>/m<sup>2</sup>hour at 50 Pa pressure. The Contractor will incorporate suitable construction details into the design and adopt best practice construction practices in order to achieve these figures.

#### C. Thermal Bridging

Thermal bridging will be carefully considered to improve upon the minimum default y value of 0.15. Thermal bridges at all window junctions (sills, jambs and lintels) will be designed with Accredited Construction Details to ensure that heat transferred through to the building is reduced. Particular attention will also be paid to the balconies, which are one of the highest risk areas to cause thermal bridging due to construction method and detailing.





#### D. Luminaires and Controls

Low energy lighting has become an essential feature of building design. Advances in lamp and ballast design have led to higher efficiency luminaires with control measures having become standard in most new developments in order to respond to changes to standards such as Part L of the Building Regulations and sustainability assessment methods such as BREEAM and the Code for Sustainable Homes.

Lighting controls can consist of simple presence detection which when combined with daylight control can switch luminaires on/off automatically or regulate the lighting levels in accordance with the outside conditions. These systems are proposed for use in conjunction with each other for the most energy efficient installation. Daylight control is intended for use to control external lighting.

Energy efficient light fittings will be provided throughout the development to reduce the electrical load. Daylight sensors and timers will be installed to all external lighting (not including security lighting). High efficiency lamps will be installed in communal areas managed by the landlord. These will be controlled by a combination of infrared occupancy control.

#### E. Ventilation

Due to the high performance of the building fabric and the location of the development, relying solely on natural ventilation for the residential dwellings is not considered an appropriate strategy and a balanced mechanical ventilation strategy with mechanical extract is proposed. This will ensure minimum fresh air requirements, moisture and odour removal from the kitchen and toilet areas and allow for a boost / purge facility to increase the volume of air flow controlled. In order to optimise the energy performance of the system, each unit will incorporate heat recovery.

For the community centre, a natural ventilation strategy is proposed. Given that the building is on multiple floors and based around a central atrium with large open spaces, the opportunity exists to adopt this operational strategy.

#### F. Comfort Cooling

The controlled ventilation strategies and high performance fabric within both the residential dwellings and community centre assume that comfort cooling will not be required. Likewise, both buildings will be provided with openable windows, and a summertime boost function on the MVHR (mechanical ventilation unit) will allow the occupants choice as to how to regulate the internal comfort within the apartment blocks.



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It should be noted that internal blinds are assumed for all dwellings, with certain units requiring white coloured blinds subject to the exact U values and glazing g-values confirmed at Detailed Design.

The table below demonstrates how the development has addressed the issue of cooling in line with Cooling Hierarchy as included within Policy 5.2 of the Minor Alterations to the London Plan (MALP) (March 2016).

Cooling hierarchy	Proposed Development
1 minimise internal heat generation through energy efficient design	Selection of high performance glazing units with U values and g- values that exceed Part L 2013 requirements.
2 reduce the amount of heat entering a building in summer through orientation,	In terms of external shading, window reveals and a significant quantum of balconies substantially reduce excessive solar gains.
shading, albedo, fenestration, insulation and green roofs and walls	Areas of green roofs are also being considered in combination with the roof mounted PV arrays.
3 manage the heat within the building through exposed internal thermal mass and high ceilings	An ample floor -ceiling height of 2.5m is provided. A nighttime cooling strategy via openable windows or rooflights is proposed to allow the structure of the buildings to cool down.
4 passive ventilation	Openable windows are provided to all dwellings and the community centre allow users control over their environment
5 mechanical ventilation	Mechanical ventilation with heat recovery is to be installed in all dwellings, with a summertime boost function.
6 active cooling systems (ensuring they are the lowest carbon options).	More indepth overheating analysis will be undertaken at a later stage in order to inform the solar control glazing specification.
tomest carbon options).	No active cooling systems are not proposed at this stage.



#### IMPROVEMENT FROM SUPPLYING ENERGY EFFICIENTLY ('BE CLEAN') 5.0

#### 5.1 District Heating Network

The London Plan shows great support for district heating networks and all developments are required to assess the feasibility of connecting to existing or planned networks, and also the integration with nearby proposed development.

Although not indicated on the London Heat Map below, existing heating networks exist in close proximity and are under London Borough of Camden's ownership. These are Highgate Newtown and Brookfield. However, it is our understanding that these networks are both refurbishments and the respective plant rooms do not include sufficient capacity to extend the networks to service the Highgate Newtown Community Centre.

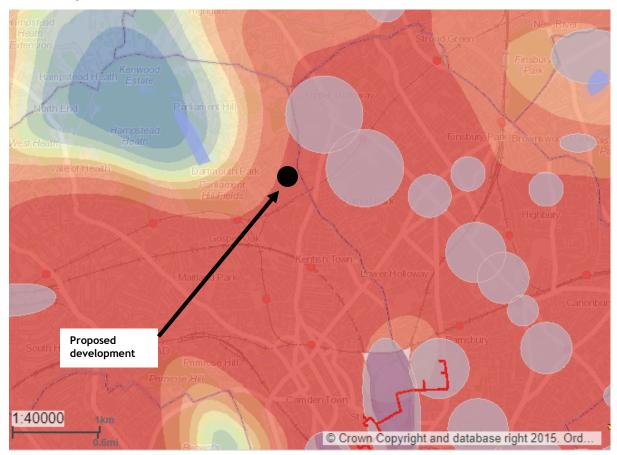


Figure 1: London Heat Map showing heat loads and district heating networks in the vicinity of the Heat mapping decentralised energy potential proposed development. Potential District Heating Networks

Rivers, lakes or sea

Existing District Heating Networks



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

Connecting to a district heating network was the first option assessed. As no suitable heat network currently exists, nor plans confirmed in terms of future network routes, the next priority in Policy 5.6 of the London Plan (MALP) 2016 to be assessed is to install a Combined Heat and Power (CHP) unit. As the technology would be installed onsite, the transmission losses associated with larger district networks would be far reduced. Furthermore, for every unit of electricity generated, the heat can be captured and used for 'free' to contribute to a thermal base load. These two main advantages lead to significant carbon dioxide emissions reductions.

The residential led nature of the scheme is particularly suited to CHP given the large, consistent thermal loads, which allow the CHP unit to run constantly for long periods. This allows it to run most efficiently and maximises its working life. It is assumed that the CHP will be sized to meet around 60% of the total heat demand in the development and it will have community boilers as back up. Detailed calculations load profile calculations will be carried out at Detailed Design

The inclusion of the community centre within the site wide energy network also complements CHP. The electricity generated whilst the CHP runs during the daytime will directly correspondence with electrical load of the community centre.

In order to estimate the size for the CHP unit, the main considerations are twofold:

- 1. To ensure the unit would run at the rated output for at least 10 hours per day and 329 days a year (to account for maintenance 10% downtime); and
- 2. Avoid the need to export electricity or heat

At this concept stage, it is proposed that a CHP unit of approximately 20 - 25 kWe capacity is installed with thermal stores in order to maximise running hours. This will be examined further at Detailed Design, ensuring that the unit selected will have NOx emissions less than 40mg/kWh.

A potential CHP unit for installation is as follows:

#### XRGI 20 (SAV Systems)

Electrical rated output (kWe) [efficiency]: 20
Thermal rated output (kWth) [efficiency]: 38.7
Overall efficiency 96%



# 6.0 IMPROVEMENT FROM INTRODUCING RENEWABLE ENERGY TECHNOLOGIES ('BE GREEN')

#### 6.1 Initial feasibility

A renewable and low carbon technology feasibility study has been carried out to investigate the contribution that on-site generation from renewable energy technologies could make to further reduce the carbon dioxide emissions in the proposed development. The following technologies have been assessed in terms of their technical feasibility and potential CO<sub>2</sub> emissions savings:

- Solar thermal water heating;
- Photovoltaics;
- Biomass heating;
- Building mounted and stand-alone wind turbines;
- Ground source heat pumps (GSHP); and
- > Air source heat pumps (ASHP).

Technology	Feasibility	Comments
Ground or Air Source Heat Pumps		
Canada Coptar Sealing	×	Heat Pumps typically meet a proportion of the heating and cooling loads and can be incorporated into the piles of a building structure. However, given that the CHP will provide a significant portion of the thermal demand, it is considered that ground and air source heat pumps being installed in addition would be duplication.



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Technology	Feasibility	Comments
Photovoltaics	<b>~</b>	The proposed development has a large area of flat or south facing roof and thus with the appropriate mounting systems can be very favourable for the installation of Photovoltaic panels. Photovoltaic cells would contribute to a proportion of the electrical load of the scheme and also benefit from the Feed in Tariff.
Solar Hot Water Systems	X	The hot water load is substantial in any residential scheme. In this case this has been addressed at the second step of the energy hierarchy through the Combined Heat and Power plant; therefore the solar thermal technology would not make a further contribution to the carbon dioxide emissions reduction and will not be considered further.
Biomass Heating	X	A communal biomass boiler would be unsuitable for the development due to its central London location and the associated implications of fuel deliveries. Furthermore, given the restricted space between buildings and regular pedestrian movements related to the Community Centre, fuel deliveries from large vehicles would be deemed to pose a significant safety risk. This will not be further considered.



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Technology	Feasibility	Comments
Wind (roof mounted)	×	Roof mounted wind turbines are not recommended for this site due to noise, flicker and vibration implications on the residential/non-domestic areas. Numerous inner city wind turbine trials have shown that such turbines' energy yields are significantly lower than manufacturers' estimations. This will not be further considered.
Wind (standalone)	×	Small-scale (10m mast), standalone turbines are not suitable for this development due to lack of space on the site and relatively low wind speeds that would be achieved in this very urban environment. This will not be further considered.



#### **6.2 Preferred Options for Renewables**

As the proposed development will not include structural piles, a ground source heat pump system is not proposed. The significant roof area is suitable for solar technology, and due to the presence of the CHP unit within the energy strategy, it is considered that a PV array is most suitable.

It is proposed that a 120 - 130 panel PV array is installed which will equate to 30 - 35 kWp, with active area of approximately 190m<sup>2</sup>. Please refer to Appendix A for an indicative PV layout.

Indicative details of the PV panels are listed below:

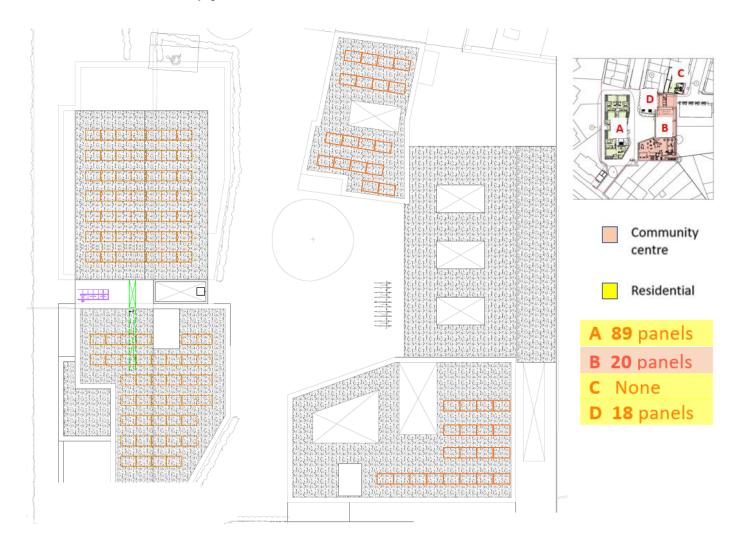
Solar PV Information Required		Units					
Model	Sanyo HIT-H250E01						
Efficiency	18	%					
Number of PV panels	127						
Area of PV panels	190	m <sup>2</sup>					
Total Capacity (Installed Power)	7	kWp					
Total Energy Output	26,130	kWh/year					
CO <sub>2</sub> Offset	13,560	kgCO <sub>2</sub>					
Emissions Reductions	15	%					
	This array would qualify for a Feed In tariff of 4.11p/kWh as taken from the 'Higher' rate for 10 - 50kW if accreditation achieved before 31/12/18.						
Additionally, FiT information can be provided	It should be noted that or 2018 the Department of Energy and Industrial Strate published a consultation in state their intention to closcheme to new applicants for 2019.	of Business tegy (BEIS) which they ose the FIT					



# APPENDIX A PROPOSED PV LAYOUT



The proposed PV array is shown on the roof plans below. All panels will be tilted at 30 degrees in order to maximise the electricity generated.





# APPENDIX B1 SAP OUTPUTS FOR SAMPLE UNITS "LEAN"

			lloor D	) otoilo:						
Assessor Name: Software Name:	Matthew Stainrod Stroma FSAP 201	User D	Strom Softwa	are Vei	0023501 on: 1.0.4.16					
Address	1F-3, Bertram Stree			Address	06-18-6	59419 1	F-3			
Address: 1. Overall dwelling dim	•	et, Londo	)TI							
1. Overall awelling aim	C11310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.4	(2a) =	169.8	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) 7	70.75	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	169.8	(5)
2. Ventilation rate:										
		econdar neating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	<b>]</b> + [	0	] = [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive vent	S					0	x	10 =	0	(7b)
Number of flueless gas						0	X	40 =	0	(7c)
rtamber et naereee gae	00				L					(,,,)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	Sa)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
	been carried out or is intend	ed, procee	d to (17), (	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	O OF for atoal or timbor	f=====================================	0.25 (0.				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
deducting areas of open		sporrainig to	o g. oa.		a (artor					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
ŭ	vs and doors draught s	tripped		0.05 (0.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	, q50, expressed in cul	nia matra	o por bo	. , , ,	, , ,	, , ,	, ,	aroa	0	(16)
If based on air permeab	• •		•	•	•	elle oi e	rivelope	alea	0.15	(17)
·	ies if a pressurisation test ha					is being u	sed		0.15	(10)
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind speed	d							1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7	•	•				•		•	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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	]	
						ь			1	

Adjusted infilt	ration rat	e (allow	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		•	rate for t	he appli	cable ca	se	•	•	•	•	•		(220)
			endix N (2	23h) <i>- (23</i> :	a) × Fmv (4	equation (I	NS)) othe	rwise (23h	) = (23a)			0.5	(23a)
	If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)  If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =									0.5	(23b) (23c)		
a) If balance		•	•	_					2h)m + (	23h) 🗴 [¹	1 <i>– (2</i> 3c)	79.9 ÷ 1001	(230)
(24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	. 100]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	л ЛV) (24t	p)m = (22)	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 ver	ntilation o	or positiv	e input	ventilatio	n from o	outside					
if (22b)r	m < 0.5 >	<b>(</b> 23b), 1	then (24	c) = (23k	o); other	wise (24	c) = (22h	b) m + 0.	.5 × (23b	)	,	•	
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)ı	ventilation m = 1, th								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)	-	-			
(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openir		Net Ar A ,r		U-val W/m2		A X U (W/l		k-value kJ/m²-l		X k J/K
Doors		( )			2.1	x	1.4		2.94	$\stackrel{\prime}{\Box}$			(26)
Windows Type	e 1				3.8	x1	/[1/( 1.4 )+	0.04] =	5.04	一			(27)
Windows Type	e 2				15.96	3 x1	/[1/( 1.4 )+	0.04] =	21.16				(27)
Walls Type1	47.6	64	21.8	6	25.78	3 X	0.15	= i	3.87		14	360.9	(29)
Walls Type2	8.0	2	0		8.02	X	0.14	<del>-</del>	1.13	T i	14	112.2	28 (29)
Total area of	elements	s, m²			55.66	3							(31)
Party wall					31.5	1 x	0	=	0		20	630.	2 (32)
Party floor					70.75	5					40	2830	(32a)
Party ceiling					70.75	5				Ī	30	2122	.5 (32b)
Internal wall *	*				105.6	3				Ī	9	950.	4 (32c)
* for windows and ** include the are						lated using	formula 1	1/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)	) + (32) =				34.13	(33)
Heat capacity	Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	7006.3	(34)
Thermal mass	s parame	eter (TMI	⊃ = Cm -	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			99.03	(35)
For design asses can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		_
Thermal bridg	es : S (L	.xY) cal	culated	using Ap	pendix l	K						5.36	(36)
if details of therm		are not kr	nown (36) :	= 0.15 x (3	31)								_
Total fabric he		, .						. ,	(36) =	·> :		39.5	(37)
Ventilation he	1	1	<u> </u>	<u> </u>	1	11	<b>1</b>	<del>- `                                   </del>	= 0.33 × (		_	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

										l			(00)
` '	14.56	14.38	13.49	13.31	12.42	12.42	12.24	12.78	13.31	13.67	14.03		(38)
Heat transfer co			50.00	50.04	54.00	54.00		· · · ·	= (37) + (37)	<del></del>			
(39)m= 54.24	54.06	53.88	52.99	52.81	51.92	51.92	51.74	52.27	52.81	53.17	53.52	52.94	(39)
Heat loss param	neter (H	ILP), W/	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 / 12=	52.94	(39)
(40)m= 0.77	0.76	0.76	0.75	0.75	0.73	0.73	0.73	0.74	0.75	0.75	0.76		<b>–</b> , .
Number of days	in mor	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	0.75	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heatir	ng ener	gy requi	rement:								kWh/ye	ar:	
Assumed occup	anay I	NI.											(40)
if TFA > 13.9, if TFA £ 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.26		(42)
Annual average	hot wa										<b>7</b> .97		(43)
Reduce the annual a							to achieve	a water us	se target o	f			
							Ι	0	0.1	NI.			
Jan Hot water usage in I	Feb litres per	Mar dav for ea	Apr ach month	May <i>Vd.m</i> = fa	Jun ctor from 7	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 96.77	93.25	89.73	86.22	82.7	79.18	79.18	82.7	86.22	89.73	93.25	96.77		
(44)111= 30.77	55.25	00.70	00.22	02.1	75.10	75.10	02.7			m(44) <sub>112</sub> =	<del></del>	1055.7	(44)
Energy content of he	ot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x E	OTm / 3600			· /	L		<b></b> ` ′
(45)m= 143.51	125.51	129.52	112.92	108.35	93.5	86.64	99.42	100.61	117.25	127.98	138.98		
If in atomton a cua was	tor booti	aa at naint	of upo (no	, hat water	· otorogo)	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	=	1384.18	(45)
If instantaneous wat								, ,					(40)
(46)m= 21.53 Water storage Id	18.83 OSS:	19.43	16.94	16.25	14.02	13	14.91	15.09	17.59	19.2	20.85		(46)
Storage volume		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	ating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage lo		adarad l	ooo foot	ar io kao		·/do./\							(40)
a) If manufacture  Temperature factors				DI IS KITO	WII (KVVI	i/uay).					0		(48)
Energy lost from				aar			(48) x (49)	١ _			0		(49)
b) If manufactur		-	-		or is not		(40) X (43)	_		1	10		(50)
Hot water storage	-			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community he	_		on 4.3								1		
Volume factor fr Temperature fac			2h							<b>—</b>	.03		(52) (53)
Energy lost from				oor			(47) v (51)	v (52) v (I	52) -		0.6		` '
Enter (50) or (5		_	, KVVII/ye	ai			(47) x (51)	) X (32) X (	55) =		.03		(54) (55)
Water storage lo	, ,	•	or each	month			((56)m = (	55) × (41)r	m		.00		(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains of												кH	(-2)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(= /			1							I			. ,

Primary circuit loss (annual) from Table 3	0	(58)								
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m										
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo	ostat)									
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26	(59)								
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m										
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)								
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m +$	(46)m + (57)m + (	(59)m + (61)m								
(62)m= 198.79 175.44 184.8 166.41 163.63 146.99 141.91 154.7 154.1 172.52	181.48 194.26	(62)								
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)										
(63)m= 0 0 0 0 0 0 0 0 0	0 0	(63)								
Output from water heater	<u> </u>									
(64)m= 198.79 175.44 184.8 166.41 163.63 146.99 141.91 154.7 154.1 172.52	181.48 194.26									
Output from water heate	<u> </u>	2035.02 (64)								
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m	` '									
(65)m= 91.94 81.68 87.29 80.34 80.25 73.88 73.03 77.28 76.25 83.21	85.35 90.43	i (65)								
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is f	rom community ne	aung								
5. Internal gains (see Table 5 and 5a):										
Metabolic gains (Table 5), Watts	T T - T									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec	(00)								
(66)m= 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21	113.21 113.21	(66)								
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5										
(67)m= 17.74 15.76 12.82 9.7 7.25 6.12 6.62 8.6 11.54 14.66	17.11 18.24	(67)								
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5										
(68)m= 199.04 201.11 195.9 184.82 170.83 157.69 148.91 146.84 152.05 163.13	177.11 190.26	(68)								
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5										
(69)m= 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32	34.32 34.32	(69)								
Pumps and fans gains (Table 5a)										
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0	(70)								
Losses e.g. evaporation (negative values) (Table 5)										
(71)m= -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57	-90.57 -90.57	(71)								
Water heating gains (Table 5)										
(72)m= 123.57 121.54 117.32 111.58 107.86 102.61 98.16 103.87 105.9 111.84	118.54 121.55	(72)								
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (70)m$	71)m + (72)m									
(73)m= 397.32 395.37 383 363.07 342.91 323.39 310.64 316.27 326.45 346.58	369.73 387.01	(73)								
6. Solar gains:										
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica	ble orientation.									
Orientation: Access Factor Area Flux g_	FF	Gains								
<b>0</b>	able 6c	(W)								
North 0.9x 0.77 x 3.8 x 10.63 x 0.558 x	0.7 =	10.94 (74)								
North 0.9x 0.77 x 3.8 x 20.32 x 0.558 x	0.7 =	20.9 (74)								
	<u> </u>	(` '/								

	_								_						_		
North	0.9x	0.77	x	:;	3.8	X	3	34.53	X		0.558	X	0.7	=	• <u>L</u>	35.52	(74)
North	0.9x	0.77	Х	; ;	3.8	X	5	55.46	X		0.558	X	0.7	-		57.05	(74)
North	0.9x	0.77	X	; ;	3.8	X	7	4.72	X		0.558	X	0.7	-		76.85	(74)
North	0.9x	0.77	Х	;	3.8	X	7	79.99	X		0.558	X	0.7	-		82.27	(74)
North	0.9x	0.77	х	;	3.8	x	7	4.68	X		0.558	X	0.7			76.81	(74)
North	0.9x	0.77	X	: ;	3.8	x	5	9.25	X		0.558	X	0.7			60.94	(74)
North	0.9x	0.77	×	: ;	3.8	x	4	1.52	X		0.558	X	0.7	=		42.7	(74)
North	0.9x	0.77	х	;	3.8	x	2	24.19	x		0.558	x	0.7	=		24.88	(74)
North	0.9x	0.77	х	; ;	3.8	x	1	3.12	x		0.558	x	0.7	-		13.49	(74)
North	0.9x	0.77	х	; ;	3.8	x		8.86	x		0.558	х	0.7	-		9.12	(74)
West	0.9x	0.77	х	1:	5.96	x	1	9.64	X		0.56	X	0.7			84.85	(80)
West	0.9x	0.77	×	1:	5.96	x	3	88.42	X		0.56	X	0.7		• [	165.98	(80)
West	0.9x	0.77	×	1:	5.96	x	6	3.27	x		0.56	x	0.7		• [	273.35	(80)
West	0.9x	0.77	×	1:	5.96	x	9	2.28	x		0.56	x	0.7	╗ -	· ┌	398.66	(80)
West	0.9x	0.77	×	1:	5.96	x	1	13.09	x		0.56	x	0.7	╡ =	- ┌	488.58	(80)
West	0.9x	0.77	×	1:	5.96	×	1	15.77	x		0.56	x	0.7	╡ =	•	500.15	(80)
West	0.9x	0.77	×	1:	5.96	x	1	10.22	х		0.56	x	0.7		Ē	476.16	(80)
West	0.9x	0.77	×	1:	5.96	x	9	94.68	x		0.56	x	0.7		Ē	409.01	(80)
West	0.9x	0.77	×	1:	5.96	x	7	73.59	x		0.56	x	0.7		▗▕▔	317.92	(80)
West	0.9x	0.77	×	1:	5.96	x	4	l5.59	x		0.56	x	0.7		┇	196.95	(80)
West	0.9x	0.77	×	1:	5.96	×	2	24.49	x		0.56	x	0.7	╡ -	· F	105.8	(80)
West	0.9x	0.77	×	1:	5.96	x	1	6.15	x		0.56	x	0.7	╡ =	┇	69.78	(80)
	_					•			•						_		_
Solar g	Solar gains in watts, calculated for each month $(83)m = Sum(74)m(82)m$																
(83)m=	95.79	186.88	308.87	455.71	565.43	3 5	82.42	552.97	469	.95	360.62	221.83	3 119.29	78.89			(83)
Total g	ains – i	nternal a	nd sola	r (84)m	= (73)n	n + (	83)m	, watts									
(84)m=	493.11	582.26	691.87	818.79	908.3	4 9	05.81	863.61	786	5.23	687.07	568.42	489.01	465.9			(84)
7. Mea	an inter	nal temp	erature	(heatir	g seaso	on)											
		during h					area	from Tal	ole 9	, Th1	(°C)				Г	21	(85)
Utilisa	tion fac	ctor for ga	ains for	living a	rea, h1,	m (s	ee Ta	ıble 9a)							_		_
	Jan	Feb	Mar	Apr	Ma	y T	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	;		
(86)m=	0.94	0.9	0.82	0.67	0.51		0.36	0.26	0.	3	0.5	0.76	0.9	0.95			(86)
Mean	interna	l tempera	ature in	living a	rea T1	(follo	ow ste	ps 3 to 7	7 in T	able	9c)		-				
(87)m=	19.7	19.98	20.37	20.73	20.91	<del>`</del>	20.98	21	20.		20.94	20.66	20.12	19.65			(87)
Temp	oraturo	during h	eating	nerinde	in rest (	of dv	uelling	from Ta	hla (	a Th	2 (°C)			!	_		
(88)m=	20.28	20.28	20.29	20.3	20.3	$\neg$	20.31	20.31	20.		20.31	20.3	20.3	20.29	П		(88)
L								<u> </u>	<u> </u>				1		_		
(89)m=	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93																
L		<u> </u>	0.8	0.65	<u> </u>		0.32	0.22			0.45	0.73	0.89	0.94			(55)
T T		l tempera		1		-	•	i	·		- 1		1 40 45	40.47	$\neg$		(00)
(90)m=	18.53	18.93	19.47	19.97	20.21		20.29	20.31	20.	31	20.25	19.89	19.15 ring area ÷ (4	18.47	+	0.05	(90)
											"	LA - LI\	ing area + (	<del>-,,                                   </del>	L	0.35	(91)

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$								
(92)m= 18.94 19.3 19.79 20.24 20.46 20.54 20.55 20.55 20.5 20.16 19.49 18.89	(92)							
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_							
(93)m= 18.94 19.3 19.79 20.24 20.46 20.54 20.55 20.55 20.16 19.49 18.89	(93)							
8. Space heating requirement								
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	3							
Utilisation factor for gains, hm:								
(94)m= 0.91 0.87 0.79 0.64 0.48 0.34 0.24 0.27 0.47 0.73 0.87 0.92	(94)							
Useful gains, hmGm , W = (94)m x (84)m								
(95)m= 450.78 506.49 543.95 527.39 439.31 303.51 204.1 213.06 319.76 413.59 427.41 430.7	7 (95)							
Monthly average external temperature from Table 8								
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)							
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]	$\neg$							
(97)m=	2 (97)							
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	$\neg$							
(98)m= 255.57 182.84 128 53.03 17.22 0 0 0 67.91 166.61 264.3	<del> </del>							
Total per year (kWh/year) = $Sum(98)_{15.912}$	= 1135.49 (98)							
Space heating requirement in kWh/m²/year	16.05 (99)							
9b. Energy requirements – Community heating scheme								
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0 (301)							
Fraction of space heat from 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 (303a)							
Fraction of total space heat from Community boilers (302) x (303a) =	1 (304a)							
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)							
Distribution loss factor (Table 12c) for community heating system	1.05 (306)							
Space heating	kWh/year_							
Annual space heating requirement	1135.49							
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1192.26 (307a)							
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308							
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (309)							
Water heating Annual water heating requirement	2035.02							
If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) =	2136.77 (310a)							
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)]	= 33.29 (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 dw mechanical ventilation - balanced, extra		137.24	(330a)							
warm air heating system fans		0	(330b)							
pump for solar water heating		0	(330g)							
Total electricity for the above, kWh/yea	r	=(330a) + (330b	o) + (330g) =		137.24	(331)				
Energy for lighting (calculated in Appen	dix L)				313.38	(332)				
12b. CO2 Emissions – Community heating scheme										
		Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year					
CO2 from other sources of space and v Efficiency of heat source 1 (%)	d fuel	89.5	(367a)							
CO2 associated with heat source 1	[(307b)	)+(310b)] x 100 ÷ (367b) x	=	803.43	(367)					
Electrical energy for heat distribution		[(313) x	0.52	=	17.28	(372)				
Total CO2 associated with community s	systems	(363)(366) + (368)(372	=	820.71	(373)					
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)				
CO2 associated with water from immer	sion heater or instantar	neous heater (312) x	0.22	=	0	(375)				
Total CO2 associated with space and w	vater heating	(373) + (374) + (375) =			820.71	(376)				
CO2 associated with electricity for pum	ps and fans within dwe	lling (331)) x	0.52	=	71.23	(378)				
CO2 associated with electricity for light	ing	(332))) x	0.52	=	162.64	(379)				
Total CO2, kg/year	Total CO2, kg/year sum of (376)(382) =									
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				14.91	(384)				

El rating (section 14)

(385)

87.79

			User_[	Details:						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20			Strom Softwa					0023501 on: 1.0.4.16	
				Address	: 06-18-6	69419 1	F-4			
Address :	1F-4, Bertram Stre	et, Londo	n							
1. Overall dwelling dim	ensions:		Δ	a ( 2)		Av. Ha	! or lo 4 / roo \		Value a/m²	n\
Ground floor				<b>a(m²)</b> 58.06	(1a) x		2.4	(2a) =	<b>Volume(m³</b> 139.34	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	58.06	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	139.34	(5)
2. Ventilation rate:										
Number of chimneys		secondar heating	'y □ + □	other 0	7 = 6	total	x	40 =	m³ per hou	ir 
Number of open flues			<b>」</b>		J _ L 7 = F		x	20 =		= ' '
·		0		0	J _	0			0	(6b)
Number of intermittent fa					<u>_</u>	0		10 =	0	(7a)
Number of passive vents	S				L	0	X	10 =	0	(7b)
Number of flueless gas	fires					0	X 4	40 =	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	evs. flues and fans =	(6a)+(6b)+(7	′a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has					continue fr	_		. (0) –		
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timbe present, use the value corre				•	ruction			0	(11)
deducting areas of open	ings); if equal user 0.35									
If suspended wooden	•	,	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draught	stripped		0.25 - [0.2	) v (1.4\ · .4	001 -			0	(14)
Window infiltration Infiltration rate				(8) + (10)	,	-	± (15) =		0	(15)
Air permeability value	a50 everessed in a	ihic metre	s nar h					area	0	(16)
If based on air permeab	•		•	•	•	cuc or c	лисюрс	arca	0.15	(18)
Air permeability value appli	•					is being u	sed		0.10	()
Number of sides shelter	ed								3	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified	for monthly wind spec	ed		,					7	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7						•		-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (2	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	7	
									_	

Adjusted infiltra	ation rate (allo	wing for sl	helter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.15	0.15 0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effect	_	e rate for i	the appli	cable ca	ise	•	•	•	•	•	<u>,</u>	— <sub>(00</sub>
If mechanica	i ventilation: at pump using Ap	onendiy N. (3	23h) - (23:	a) v Emy (4	aguation (	N5N othe	rwise (23h	n) – (23a)			0.5	(23a
	heat recovery: ef							) = (20a)			0.5	(23b
	-	-	_					Oh\m ı (	22h) v [	1 (226)	79.9	(230
(24a)m= 0.25	d mechanical 0.25 0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24	] <del>-</del> 100] ]	(24a
` '	d mechanical			ļ		<u> </u>	<u> </u>	ļ		0.24	J	(= :-
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	1	(24b
	ouse extract v										J	
	ouse extract v 1 < 0.5 × (23b)							.5 × (23b	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(240
d) If natural v	entilation or v	vhole hous	se positi	ve input	ventilati	on from	loft	<u>!</u>	<u>!</u>	<u> </u>	1	
,	1 = 1, then (24		•					0.5]			_	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	change rate -	enter (24a	a) or (24l	o) or (24	c) or (24	ld) in bo	x (25)				_	
(25)m= 0.25	0.25 0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25)
3. Heat losses	s and heat los	s paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value		X k J/K
Doors	aroa (m.)		•	2.1	 x	1.4		2.94		110/111		(26)
Windows Type	1			15.96	╡,	/[1/( 1.4 )+		21.16	=			(27)
Windows Type				2.4		/[1/( 1.4 )+		3.18	=			(27)
Floor	_				=		=			75	4354	— ` <i>`</i>
Walls Type1	20.04	00.4		58.06	=	0.2	_	11.612		75		=
Walls Type2	30.84	20.4	0	10.38	=	0.15	=	1.56		14	145.3	=
	24.12	0	_	24.12	<u> </u>	0.14	=	3.4	_	14		(29)
Walls Type3	9.6	0		9.6	X	0.15	=	1.44		14	134.	``
Total area of el	ements, m <sup>2</sup>			122.6	2							(31)
Party wall				16.32	2 X	0	=	0		20	326.	4 (32)
Party ceiling				58.06	5				إ	30	1741	.8 (32b
Internal wall **				81.6						9	734.	4 (320
* for windows and ** include the area					lated using	g formula 1	1/[(1/U-valı	ue)+0.04] á	as given in	n paragrapi	h 3.2	
Fabric heat los	s, $W/K = S (A)$	x U)				(26)(30	) + (32) =				45.29	(33)
Heat capacity (	$Cm = S(A \times k)$	)					((28).	(30) + (32	2) + (32a)	(32e) =	7774.5	(34)
Thermal mass	parameter (Tl	MP = Cm -	÷ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			133.9	(35)
<b></b>	ments where the	details of the	construct	tion are no	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		
can be used instead												
•	nd of a detailed ca	alculation.		pendix l	K						13.72	(36)
can be used instea	nd of a detailed ca es:S (L x Y) c I bridging are not	alculation. alculated	using Ap	•	K						13.72	(36)

Ventilation	n heat	t loss ca	alculated	monthly	y				(38)m	= 0.33 × (	25)m x (5)			
J	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 11	1.44	11.3	11.17	10.5	10.37	9.7	9.7	9.57	9.97	10.37	10.64	10.9		(38)
Heat trans	sfer co	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 70	0.45	70.31	70.18	69.51	69.38	68.71	68.71	68.58	68.98	69.38	69.64	69.91		
Heat loss	parar	neter (F	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	69.48	(39)
(40)m= 1	.21	1.21	1.21	1.2	1.19	1.18	1.18	1.18	1.19	1.19	1.2	1.2		
Number o	f days	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.2	(40
J	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water	heati	ng ener	gy requi	irement:								kWh/ye	ear:	
Assumed	occur	nancy I	N								1	93		(42
	· 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		93		(42
Annual av												.95		(43
Reduce the not more that		_				_	_	to achieve	a water us	se target o	f			
	. 1					i .	·	Ι.			l			
Hot water us	Jan   Sage in	Feb litres per	Mar day for ea	Apr	May $Vd m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
			81.55			1	1	· <i>'</i>	70.05	81.55	04.75	07.04		
(44)m= 87	7.94	84.75	61.55	78.35	75.15	71.95	71.95	75.15	78.35		84.75 m(44) <sub>112</sub> =	87.94	959.39	(44
Energy cont	ent of h	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600					939.39	(
(45)m= 13	0.42	114.07	117.7	102.62	98.46	84.97	78.73	90.35	91.43	106.55	116.31	126.3		
lf instantane	ous wa	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1257.91	(45
	9.56	17.11	17.66	15.39	14.77	12.75	11.81	13.55	13.71	15.98	17.45	18.95		(46
Water sto	_		والمرابع والمرابع			/\// IDO	_1			1			i I	
Storage v		,		•			_		ame ves	sei		0		(47
lf commur Otherwise Water sto	if no	stored			_			. ,	ers) ente	er '0' in (	47)			
a) If man	•		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48
Temperat	ure fa	ctor fro	m Table	2b								0		(49
Energy los	st fror	n water	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50
b) If man				-									1	
Hot water					e 2 (kW	h/litre/da	ıy)				0.	02		(51
f commur Volume fa	-	-		on 4.3								00		(E)
rolume la Temperati				2b								.6		(52 (53
Energy los					ear			(47) x (51)	x (52) x (	53) =				(54
Enter (50			_	, 12 VII/ y	<i>-</i> 41			(11) X (01)	, A (OL) A (	, -		03 03		(55
Water sto	,	, ,	•	for each	month			((56)m = (	55) × (41)	m	<u>'</u>			(50
	2.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56
32		20.02	02.01	50.50	02.01	50.30	02.01	1 02.01	50.50	02.01	1 50.30	02.01		(,

	contains	dedicate	d solar sto	rage, (57)i	u = (20)u	x [(50) - (	1111)] + (3	-,, (-	/ )III = (56)	iii wiieie (	H11) IS Tro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary	circuit	loss (an	nual) fro	m Table	3		•		•	•		0		(58)
Primary		`	,			59)m = (	(58) ÷ 36	55 × (41)	m				•	
(modif	fied by	factor fi	rom Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi lo	oss cal	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 he	at requ	ired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	185.7	163.99	172.98	156.11	153.74	138.46	134.01	145.63	144.92	161.83	169.8	181.58		(62)
Solar DHV	N input c	alculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add add	ditional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	€)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	rom wa	ater hea	ter										•	
(64)m=	185.7	163.99	172.98	156.11	153.74	138.46	134.01	145.63	144.92	161.83	169.8	181.58		
_								Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	1908.75	(64)
Heat gai	ins fron	n 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=	87.59	77.87	83.36	76.92	76.96	71.05	70.4	74.26	73.19	79.65	81.47	86.22		(65)
ے includ	le (57)n	n in calc	culation o	 of (65)m	only if c	vlinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	` '		Table 5	. ,	•							,	<u> </u>	
Metabol	Ĭ	,		·	,									
Metaboli	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	96.31	96.31	96.31	96.31	96.31	96.31	96.31	96.31	96.31	96.31	96.31	96.31		(66)
L ighting	nains (	'calcula	ted in Ar	nendix	equat	on I 9 or	. I Oo) o							
Ť	14.98	13.31	10.82	peridix	_, cquai		riyana	lso see <sup>-</sup>	Table 5					
` ' _			I IU.OZ I	8.19	6.12		<del></del>	7.26	i	12.37	14.44	15.4	1	(67)
дррнанс		ne (calc		8.19	6.12	5.17	5.59	7.26	9.75	12.37	14.44	15.4		(67)
(68)m=	<del></del> _	<u> </u>	ulated in	Append	dix L, eq	5.17 uation L	5.59 13 or L1	7.26 3a), alsc	9.75 see Ta	ble 5	<u> </u>			, ,
` ′ ∟	168.03	169.77	ulated in	Append 156.02	dix L, eq	5.17 uation L <sup>2</sup>	5.59 13 or L1 125.71	7.26 3a), also 123.96	9.75 see Ta 128.36	ble 5 137.71	14.44	15.4		(67) (68)
Cooking	168.03 gains	169.77 (calcula	ulated in 165.38 Ited in Ap	Append 156.02 Opendix	dix L, equat 144.22 L, equat	5.17 uation L <sup>2</sup> 133.12 ion L15	5.59 13 or L1 125.71 or L15a)	7.26 3a), also 123.96 , also se	9.75 see Ta 128.36 ee Table	ble 5 137.71 5	149.52	160.62		(68)
Cooking (69)m=	168.03 g gains 32.63	169.77 (calcula 32.63	ulated in 165.38 Ited in Ap 32.63	Appendix 156.02 opendix 32.63	dix L, eq	5.17 uation L <sup>2</sup>	5.59 13 or L1 125.71	7.26 3a), also 123.96	9.75 see Ta 128.36	ble 5 137.71	<u> </u>			, ,
Cooking (69)m=  Pumps a	168.03 g gains 32.63 and fan	169.77 (calcula 32.63 s gains	ulated in 165.38 Ited in Ap 32.63 (Table 5	Appendix 32.63	dix L, eq 144.22 L, equat 32.63	5.17 uation L <sup>2</sup> 133.12 ion L15 32.63	5.59 13 or L1 125.71 or L15a) 32.63	7.26 3a), also 123.96 , also se 32.63	9.75 see Ta 128.36 ee Table 32.63	ble 5 137.71 5 32.63	149.52 32.63	160.62 32.63		(68)
Cooking (69)m= Pumps a (70)m=	168.03 g gains 32.63 and fan	169.77 (calcula 32.63 s gains	ulated in 165.38 Ited in Ap 32.63 (Table 5	156.02 ppendix 32.63 5a)	144.22 L, equat 32.63	5.17 uation L <sup>2</sup> 133.12 ion L15 32.63	5.59 13 or L1 125.71 or L15a)	7.26 3a), also 123.96 , also se	9.75 see Ta 128.36 ee Table	ble 5 137.71 5	149.52	160.62		(68) (69)
Cooking (69)m=  Pumps a (70)m=  Losses a	168.03 g gains 32.63 and fan	169.77 (calcula 32.63 s gains	ulated in 165.38 Ited in Ap 32.63 (Table 5	156.02 ppendix 32.63 5a)	144.22 L, equat 32.63	5.17 uation L <sup>2</sup> 133.12 ion L15 32.63	5.59 13 or L1 125.71 or L15a) 32.63	7.26 3a), also 123.96 , also se 32.63	9.75 see Ta 128.36 ee Table 32.63	ble 5 137.71 5 32.63	149.52 32.63	160.62 32.63		(68) (69)
Cooking (69)m=  Pumps a (70)m=  Losses a (71)m=	gains 32.63 and fan 0 e.g. eva	169.77 (calcula 32.63 as gains 0 aporatio	ulated in 165.38 ted in Ap 32.63 (Table 5 o n (negat -77.05	Appendix 32.63 o tive value	dix L, equat 144.22 L, equat 32.63 0 es) (Tab	5.17  uation L <sup>2</sup> 133.12  ion L15 32.63  0  le 5)	5.59 13 or L1 125.71 or L15a) 32.63	7.26 3a), also 123.96 a, also se 32.63	9.75 see Ta 128.36 ee Table 32.63	ble 5 137.71 5 32.63	32.63 0	32.63 0		(68) (69) (70)
Cooking (69)m=  Pumps a (70)m=  Losses e (71)m=  Water he	gains 32.63 and fan 0 e.g. eva	169.77 (calcula 32.63 as gains 0 aporatio	ulated in 165.38 ted in Ap 32.63 (Table 5 o n (negat -77.05	Appendix 32.63 o tive value	144.22 L, equat 32.63 0 es) (Tab	5.17  uation L <sup>2</sup> 133.12  ion L15 32.63  0  le 5)	5.59 13 or L1 125.71 or L15a) 32.63	7.26 3a), also 123.96 a, also se 32.63	9.75 see Ta 128.36 ee Table 32.63	ble 5 137.71 5 32.63	32.63 0	32.63 0		(68) (69) (70)
Cooking (69)m=  Pumps a (70)m=  Losses e (71)m=  Water he	gains 32.63 and fan 0 e.g. eva -77.05 eating (	169.77 (calcula 32.63) s gains 0 aporatio -77.05 gains (T	ulated in 165.38 ated in Ap 32.63 (Table 5 on (negat -77.05 able 5) 112.04	156.02 opendix 32.63 5a) 0 tive value	144.22 L, equat 32.63 0 es) (Tab	5.17  uation L  133.12  ion L15  32.63  0  le 5)  -77.05	5.59 13 or L1 125.71 or L15a) 32.63  0  -77.05	7.26 3a), also 123.96 32.63 0 -77.05	9.75 128.36 128.36 128.36 0 0 -77.05	ble 5 137.71 5 32.63 0 -77.05	149.52 32.63 0 -77.05	160.62 32.63 0 -77.05		(68) (69) (70) (71)
Cooking (69)m=  Pumps a (70)m=  Losses a (71)m=  Water ha (72)m=  Total in	gains 32.63 and fan 0 e.g. eva -77.05 eating (	169.77 (calcula 32.63) s gains 0 aporatio -77.05 gains (T	ulated in 165.38 ated in Ap 32.63 (Table 5 on (negat -77.05 able 5) 112.04	156.02 opendix 32.63 5a) 0 tive value	144.22 L, equat 32.63 0 es) (Tab	5.17  uation L  133.12  ion L15  32.63  0  le 5)  -77.05	5.59 13 or L1 125.71 or L15a) 32.63  0  -77.05	7.26 3a), also 123.96 32.63 0 -77.05	9.75  9.75  see Ta  128.36  ee Table  32.63  0  -77.05	ble 5 137.71 5 32.63 0 -77.05	149.52 32.63 0 -77.05	160.62 32.63 0 -77.05		(68) (69) (70) (71)
Cooking (69)m=  Pumps a (70)m=  Losses a (71)m=  Water ha (72)m=  Total in	168.03 gains 32.63 and fan 0 e.g. eva -77.05 eating g 117.72 ternal g 352.63	169.77 (calcula 32.63) s gains 0 aporatio -77.05 gains (T 115.88 gains =	ulated in 165.38 ted in Ap 32.63 (Table 5 on (negat -77.05) Table 5)	156.02 opendix 32.63 5a) 0 tive value -77.05	0 es) (Tab	5.17  uation L  133.12  ion L15  32.63  0  le 5)  -77.05  98.68  (66)	5.59 13 or L1 125.71 or L15a) 32.63  0  -77.05  94.62 m + (67)m	7.26 3a), also 123.96 1, also se 32.63 0 -77.05 99.82	9.75  9.75  9.75  9.75  128.36  9.75  128.36  0  -77.05  101.66  (69)m + (69)m	ble 5 137.71 5 32.63 0 -77.05 107.06 (70)m + (7	149.52 32.63 0 -77.05 113.15 1)m + (72)	160.62 32.63 0 -77.05		(68) (69) (70) (71) (72)
Cooking (69)m=  Pumps a (70)m=  Losses a (71)m=  Water ha (72)m=  Total in (73)m=  6. Sola	gains 32.63 and fan 0 e.g. eva -77.05 eating g 117.72 ternal s 352.63	169.77 (calcula 32.63) s gains 0 aporatio -77.05 gains (T 115.88 gains = 350.85	ulated in 165.38 ted in Ap 32.63 (Table 5 on (negat -77.05) Table 5)	156.02 opendix 32.63 5a) 0 tive value -77.05	0 es) (Tab -77.05	5.17  uation L  133.12  ion L15  32.63  0  le 5)  -77.05  98.68  (66)  288.86	5.59 13 or L1 125.71 or L15a) 32.63  0  -77.05  94.62 m + (67)m 277.81	7.26 3a), also 123.96 3, also se 32.63  0  -77.05  99.82 1+(68)m+ 282.93	9.75 2 see Ta 128.36 2 ee Table 32.63  0  -77.05  101.66 109m+0 291.66	ble 5 137.71 5 32.63 0 -77.05 107.06 (70)m + (7 309.03	149.52 32.63 0 -77.05 113.15 1)m + (72) 329	160.62 32.63 0 -77.05 115.88		(68) (69) (70) (71) (72)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_									-			_					_
North	0.9x	0.77		X	2.4	1	X	1	0.63	X	(	0.558	X	0.7		=	6.91	(74)
North	0.9x	0.77		X	2.4	1	X	2	0.32	X	(	0.558	X	0.7		=	13.2	(74)
North	0.9x	0.77		X	2.4	1	X	3	4.53	X	(	0.558	X	0.7		=	22.43	(74)
North	0.9x	0.77		X	2.4	1	X	5	5.46	X	(	0.558	X	0.7		=	36.03	(74)
North	0.9x	0.77		x	2.4	1	x	7	4.72	X	(	0.558	X	0.7		=	48.54	(74)
North	0.9x	0.77		x	2.4	1	x	7	9.99	X	(	0.558	X	0.7		=	51.96	(74)
North	0.9x	0.77		x	2.4	1	x	7	4.68	X	(	0.558	X	0.7		=	48.51	(74)
North	0.9x	0.77		x	2.4	1	х	5	9.25	X	(	0.558	X	0.7		=	38.49	(74)
North	0.9x	0.77		x	2.4	1	х	4	1.52	X	(	0.558	X	0.7		=	26.97	(74)
North	0.9x	0.77		x	2.4	1	х	2	4.19	X	(	0.558	X	0.7		=	15.71	(74)
North	0.9x	0.77		x	2.4	1	х	1	3.12	X	(	0.558	X	0.7		=	8.52	(74)
North	0.9x	0.77		x	2.4	1	х	8	3.86	X	(	0.558	X	0.7		=	5.76	(74)
East	0.9x	1		x	15.9	96	x	1	9.64	X	(	0.56	X	0.7		=	84.85	(76)
East	0.9x	1		x	15.9	96	x	3	8.42	X	(	0.56	x	0.7		=	165.98	(76)
East	0.9x	1		x	15.9	96	х	6	3.27	X	(	0.56	X	0.7		=	273.35	(76)
East	0.9x	1		x	15.9	96	x	9	2.28	X	(	0.56	x	0.7		=	398.66	(76)
East	0.9x	1		x	15.9	96	x	1	13.09	X	(	0.56	x	0.7		=	488.58	(76)
East	0.9x	1		x	15.9	96	x	1	15.77	X	(	0.56	X	0.7		=	500.15	(76)
East	0.9x	1		x	15.9	96	x	1	10.22	X	(	0.56	×	0.7		=	476.16	(76)
East	0.9x	1		x	15.9	96	x	9	4.68	X	(	0.56	x	0.7		=	409.01	(76)
East	0.9x	1		x	15.9	96	x	7	3.59	X	(	0.56	×	0.7		=	317.92	(76)
East	0.9x	1		x	15.9	96	x	4	5.59	X	(	0.56	×	0.7		=	196.95	(76)
East	0.9x	1		x	15.9	96	x	2	4.49	X	(	0.56	×	0.7		=	105.8	(76)
East	0.9x	1		x	15.9	96	x	1	6.15	X	(	0.56	X	0.7		=	69.78	(76)
							•			_						•		
		watts, ca								_		n(74)m						
(83)m=	91.76	179.18	295.	.78	434.7	537.12	2 5	52.11	524.67	447	7.5	344.89	212.6	7 114.32	75.5	3		(83)
Total g	ains – i	nternal a	nd s	olar	(84)m =	: (73)n	า + (	83)m	, watts									
(84)m=	444.38	530.03	635.	.92	757.63	842.79	8	40.97	802.48	730	.43	636.54	521.7	443.32	419.	32		(84)
7. Me	an inter	nal temp	erati	ure (	heating	seaso	n)											
Temp	erature	during h	eatir	ng pe	eriods in	the li	ving	area f	from Tal	ble 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for g	ains	for li	ving are	a, h1,	m (s	ee Ta	ble 9a)							'		
	Jan	Feb	M	ar	Apr	Ma	/	Jun	Jul	Α	ug	Sep	Oct	Nov	De	ЭС		
(86)m=	0.97	0.94	0.9	9	0.79	0.65		0.49	0.37	0.4	11	0.64	0.86	0.95	0.9	7		(86)
Mean	interna	l temper	ature	in li	ving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able	9c)			-			
(87)m=	19.13	19.41	19.8	$\overline{}$	20.39	20.75	<del>`</del>	20.92	20.98	20.		20.82	20.31	19.62	19.0	)7		(87)
Temn	erature	during h	eatir	na ne	eriode in	rest	of du	elling	from Ta	ahla (	a Tha	2 (°C)		<u>'</u>			l	
(88)m=	19.91	19.91	19.9	<del></del>	19.92	19.92	_	9.93	19.93	19.	$\overline{}$	19.93	19.92	19.92	19.9	2		(88)
																		•
(89)m=	0.96	tor for ga	0.8	-	0.76	velling 0.59	$\overline{}$	,m (se <sub>0.42</sub>	e Table 0.28	9a) 0.3	32 T	0.57	0.83	0.94	0.9	7		(89)
														0.94	L 0.9	'		(00)
Mean	interna	I temper	ature	in t	he rest	of dwe	lling	T2 (fo	ollow ste	eps 3	to 7 i	in Table	e 9c)					

(90)m= 17.44 17.85 18.5 19.22 19.67 19.87 19.92	19.92 19.77	19.13	18.16	17.36		(90)
(30)1112 17.44 17.05 10.0 10.07 10.07 10.07		fLA = Livin		<u> </u>	0.49	(91)
Macon internal temperature (for the whole dwelling) of A w T1	(4 fl A) TO					` ′
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (92)m = 18.26   18.61   19.17   19.79   20.19   20.39   20.44  $	$\frac{(1-1LA) \times 12}{20.43}$ 20.29	19.71	18.87	18.2		(92)
Apply adjustment to the mean internal temperature from Table 4		opriate				
(93)m= 18.26 18.61 19.17 19.79 20.19 20.39 20.44	20.43 20.29	19.71	18.87	18.2		(93)
8. Space heating requirement						
Set Ti to the mean internal temperature obtained at step 11 of T	able 9b, so tha	at Ti,m=(	76)m an	d re-calc	ulate	
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul	Aug Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:	7.009   00P					
(94)m= 0.95 0.92 0.86 0.75 0.61 0.45 0.32	0.37 0.59	0.82	0.92	0.96		(94)
Useful gains, hmGm , W = (94)m x (84)m	· · · · · · · · · · · · · · · · · · ·	1			· I	
	267.63 375.83	428.59	409.68	400.79		(95)
Monthly average external temperature from Table 8  (96)m=	16.4 14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x			7.1	4.2		(30)
	276.22 426.63	631.9	819.89	978.45		(97)
Space heating requirement for each month, kWh/month = 0.024	x [(97)m – (95	5)m] x (4 <sup>2</sup>	1)m			
(98)m= 417.96 320.25 253.67 133.7 57.19 0 0	0 0	151.26	295.35	429.78		_
	Total per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2059.16	(98)
Space heating requirement in kWh/m²/year					35.47	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating. Fraction of space heat from secondary/supplementary heating (T.			unity sch	neme.	0	(301)
Fraction of space heat from secondary/supplementary heating (T			unity sch	neme.	0	(301)
Fraction of space heat from secondary/supplementary heating (Traction of space heat from community system $1 - (301) =$	able 11) '0' if n	one	·		1	<b>=</b>  ` `
Fraction of space heat from secondary/supplementary heating (To Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See	able 11) '0' if n	one	·		1	(302)
Fraction of space heat from secondary/supplementary heating (To Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all	able 11) '0' if n	one	·		1	<b>=</b>  ` `
Fraction of space heat from secondary/supplementary heating (To Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See	able 11) '0' if n	one up to four d	·	sources; t	1 he latter	(302)
Fraction of space heat from secondary/supplementary heating (Tour Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers	able 11) '0' if nows for CHP and the Appendix C.	one up to four o	other heat	sources; t	1 he latter	(302) (303a)
Fraction of space heat from secondary/supplementary heating (Tour Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers	able 11) '0' if nows for CHP and the Appendix C.	one up to four o	other heat	sources; t	1 he latter 1	(302) (303a) (304a)
Fraction of space heat from secondary/supplementary heating (Tour Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community	able 11) '0' if nows for CHP and the Appendix C.	one up to four o	other heat	sources; t	1 he latter  1 1	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating (Tour Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system	able 11) '0' if nows for CHP and the Appendix C.	one up to four o	other heat	sources; t	1	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating (Tour Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating	able 11) '0' if nows for CHP and the Appendix C.	one up to four o	other heat 02) x (303	sources; ta	1 1 1 1 1 1.05 kWh/yea	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating (Terraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system   Space heating  Annual space heating requirement	able 11) '0' if nows for CHP and the Appendix C.  ity heating sys	up to four of (3) stem	02) x (303) 5) x (306) =	sources; ta	1 1 1 1 1.05  kWh/yea 2059.16	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating (Terraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers	able 11) '0' if nows for CHP and the Appendix C.  ity heating sys  (98) x (3)	up to four of (3) stem	02) x (303) 5) x (306) =	sources; ta	1 1 1 1 1.05  kWh/yea 2059.16 2162.12	(302) (303a) (304a) (305) (306) <b>ar</b>
Fraction of space heat from secondary/supplementary heating (Topical Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system  Water heating	able 11) '0' if nows for CHP and the Appendix C.  ity heating sys  (98) x (3)	(30 tetem	02) x (303) 5) x (306) =	sources; ta	1 1 1 1 1.05 <b>kWh/yea</b> 2059.16 2162.12 0 0	(302) (303a) (304a) (305) (306) <b>ar</b> (307a) (308
Fraction of space heat from secondary/supplementary heating (Topical Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system  Water heating  Annual water heating requirement	able 11) '0' if nows for CHP and the Appendix C.  ity heating sys  (98) x (3)	(30 tetem	02) x (303) 5) x (306) =	sources; ta	1 1 1 1 1 1.05  kWh/yea 2059.16 2162.12 0	(302) (303a) (304a) (305) (306) <b>ar</b> (307a) (308
Fraction of space heat from secondary/supplementary heating (Topical Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system  Water heating	able 11) '0' if nows for CHP and the Appendix C.  ity heating system (98) x (3) Table 4a or Am (98) x (3)	(30 tetem	5) x (306) = E) - (308) =	sources; to	1 1 1 1 1.05 <b>kWh/yea</b> 2059.16 2162.12 0 0	(302) (303a) (304a) (305) (306) <b>ar</b> (307a) (308
Fraction of space heat from secondary/supplementary heating (Topical Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system  Water heating  Annual water heating requirement  If DHW from community scheme:	able 11) '0' if nows for CHP and the Appendix C.  ity heating system (98) x (3) Table 4a or Am (98) x (3)	(3) (3) (4a) × (305) (5) (5) (6) (7) (7) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	5) x (306) = (308) =	sources; to	1 1 1 1 1.05 <b>kWh/yea</b> 2059.16 2162.12 0 0	(302) (303a) (304a) (305) (306)  ar (307a) (308 (309)

Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling s	system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwe	• · · · · · ·					٦
mechanical ventilation - balanced, extrac	t or positive input from c	outside		L	112.62	(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) =		112.62	(331)
Energy for lighting (calculated in Appendi	ix L)				264.55	(332)
12b. CO2 Emissions – Community heating	ng scheme					
		Energy	Emission fac			
		kWh/year	kg CO2/kWh	ΚÇ	g CO2/year	
CO2 from other sources of space and wa Efficiency of heat source 1 (%)	• · · · · · · · · · · · · · · · · · · ·	two fuels repeat (363) to	(366) for the secon	d fuel	89.5	(367a)
CO2 associated with heat source 1	[(307b)+(3	310b)] x 100 ÷ (367b) x	0.22	=	1005.5	(367)
Electrical energy for heat distribution	)]	313) x	0.52	=	21.62	(372)
Total CO2 associated with community sy	stems (3	363)(366) + (368)(372	)	=	1027.12	(373)
CO2 associated with space heating (second	ondary) (3	309) x	0	=	0	(374)
CO2 associated with water from immersion	on heater or instantaned	ous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ter heating (3	373) + (374) + (375) =			1027.12	(376)
CO2 associated with electricity for pumps	s and fans within dwellin	ng (331)) x	0.52	=	58.45	(378)
CO2 associated with electricity for lighting	g (3	332))) x	0.52	=	137.3	(379)
Total CO2, kg/year	sum of (376)(382) =				1222.88	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				21.06	(384)

El rating (section 14)

(385)

84.1

			lloor F	) otoilo:						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
Address	2F-5, Bertram Stre		· ·	Address	06-18-6	59419 2	F-5			
Address: 1. Overall dwelling dim	•	et, Londo	)I I							
1. Overall awelling aim	C11310113.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				<u> </u>	(1a) x		2.4	(2a) =	121.08	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) <u> </u>	50.45	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	121.08	(5)
2. Ventilation rate:										
Number of chimneys	heating	secondar heating	'y □ + □	other	7 <sub>=</sub> [	total		40 =	m³ per hou	_
Number of chimneys		0	╛╘	0	╛╘	0			0	(6a)
Number of open flues	0 +	0	_	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vent	s					0	X	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	x	40 =	0	(7c)
					_					
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =		0		÷ (5) =	0	(8)
	been carried out or is intend	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			_
Number of storeys in Additional infiltration	the dwelling (ns)						[(0)	410.4	0	(9)
	0.25 for steel or timber	frame or	. 0 35 fo	r masoni	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
	present, use the value corre				•	dollon			0	(11)
deducting areas of open	• / .									_
·	floor, enter 0.2 (unsea	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
• •	nter 0.05, else enter 0	اد د دانده							0	(13)
Window infiltration	vs and doors draught s	strippea		0.25 - [0.2	x (14) ± 1	001 -			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
	, q50, expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	3	(17)
If based on air permeab			•	•	•				0.15	(18)
Air permeability value appli	ies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	red								3	(19)
Shelter factor				(20) = 1 -		[9)] =			0.78	(20)
Infiltration rate incorpora	-			(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified	<del></del>	1	<del></del>	Ι.			1	<del></del>	1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	·	1		T			T	<u>-</u>	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	J	
Wind Factor (22a)m = (2	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	]	
									-	

djusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effecture of the control o		•	rate for t	he appli	cable ca	se						0.5	(23
If exhaust air h			endix N. (2	3b) = (23a	a) x Fmv (e	eguation (I	N5)) . othe	rwise (23b	) = (23a)			0.5	(23
If balanced with									, (200)			0.5	(23
a) If balance		-	•	_					2h)m + (	23h) 🗴 ['	 1 <i>– (2</i> 3c)	79.9 ÷ 1001	(2\
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24	+ 100j	(24
b) If balance	<u> </u>	L anical ve	<u> </u>		heat red	covery (N	ļ	$\lim_{n \to \infty} \frac{1}{(2n)^n} = \frac{(2n)^n}{(2n)^n}$	2b)m + (:	L 23h)	ļ	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					.5 × (23b	))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation ventilation			•					0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)	•		•		
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losse	s and he	at loss i	naramet	≏r·									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-ł		
Ooors					2.1	x	1.4		2.94				(20
Vindows Type	e 1				12.17	7 x1	/[1/( 1.4 )+	0.04] =	16.13	=			(27
Vindows Type	2				1.68	x1	/[1/( 1.4 )+	0.04] =	2.23				(2
Valls Type1	30.2	27	15.9	5	14.32	2 X	0.15	i	2.15		14	200.48	(2
Valls Type2	34.0	)6	0		34.06	3 x	0.14	<b>=</b>	4.8	<b>=</b>	14	476.84	(2
otal area of e	elements	 , m²	L		64.33	=							` (3
arty wall					10.8	=	0		0	<b>—</b> [	20	216	) (3
arty floor					50.45	=					40	2018	(3
arty ceiling					50.45	=					30	1513.5	=
nternal wall **					76.8	=				_ Г	9	691.2	(3
for windows and include the area	roof wind				alue calcui		g formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in			(°
abric heat los							(26)(30)	) + (32) =				28.25	(3
leat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =	5116.02	
hermal mass		,	c = Cm ÷	- TFA) ir	n kJ/m²K	,		= (34)	÷ (4) =			101.41	) (3
or design assess an be used inste	sments wh	ere the de	tails of the	•			ecisely the	e indicative	e values of	TMP in Ta	able 1f		`
hermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	K						5.65	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)								_
otal fabric he									(36) =			33.9	(3
entilation hea	at loss ca	alculated	d monthly	<b>/</b>					= 0.33 × (	25)m x (5)	) 	I	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

			1		1			ı			ı			4
(38)m=	9.94	9.82	9.71	9.13	9.01	8.43	8.43	8.31	8.66	9.01	9.24	9.47		(38)
		coefficier							· · · ·	= (37) + (	<del>_</del>	T 1		
(39)m=	43.84	43.72	43.61	43.03	42.91	42.33	42.33	42.22	42.56	42.91	43.14	43.38	40	(39)
Heat Ic	ss para	meter (F	HLP), W	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	43	(39)
(40)m=	0.87	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		_
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.85	(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. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Δeeum	ed occu	ipancy, I	NI									<del>-</del> 1		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.7		(42)
		,	ater usag	ge in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		74	1.65		(43)
		•			5% if the d ater use, h	-	-	to achieve	a water us	se target o	f			
not more			<i>'</i>			_		ı .			·			
Hot wate	Jan er usage in	Feb	Mar day for ea	Apr	May Vd,m = fa	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
								. /	72.16	76.15	70.12	02.12		
(44)m=	82.12	79.13	76.15	73.16	70.18	67.19	67.19	70.18	73.16	76.15	79.13 m(44) <sub>112</sub> =	82.12	895.86	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /		093.00	(++)
(45)m=	121.78	106.51	109.91	95.82	91.94	79.34	73.52	84.37	85.37	99.49	108.61	117.94		
15.						, ,				Γotal = Su	m(45) <sub>112</sub> =	=	1174.61	(45)
It instant				of use (no	not water	storage),	enter 0 ın	boxes (46,	) to (61)					
(46)m= Water	18.27 storage	15.98	16.49	14.37	13.79	11.9	11.03	12.65	12.81	14.92	16.29	17.69		(46)
	_		includin	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Ū		` ,		•	elling, e		Ū					<u> </u>		( )
	•	_			-			mbi boil	ers) ente	er '0' in (	47)			
	storage													
•					or is kno	wn (kWh	n/day):					0		(48)
•			m Table									0		(49)
			storage	-	ear loss fact	or ic not		(48) x (49)	) =		1	10		(50)
,				•	e 2 (kWl						0	.02		(51)
		_	ee secti		`		,							` '
Volum	e factor	from Tal	ble 2a								1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
• • • • • • • • • • • • • • • • • • • •			storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(54)
	. ,	(54) in (5	•								1.	.03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n				
(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)
It cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	u), else (5	/)m = (56)	m where (	H11) is fro	m Append	хН	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div (59)$ m = $(58)$	365 × (41)m
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	3     23.26     22.51     23.26     22.51     23.26     (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	
(61)m= 0 0 0 0 0 0 0	0 0 0 0 0 (61)
Total heat required for water heating calculated for each month	th $(62)$ m = $0.85 \times (45)$ m + $(46)$ m + $(57)$ m + $(59)$ m + $(61)$ m
(62)m= 177.06 156.44 165.19 149.32 147.22 132.83 128.8	
Solar DHW input calculated using Appendix G or Appendix H (negative quan	
(add additional lines if FGHRS and/or WWHRS applies, see A	
(63)m= 0 0 0 0 0 0 0	0 0 0 0 0 (63)
Output from water heater	
(64)m= 177.06 156.44 165.19 149.32 147.22 132.83 128.8	3 139.64 138.87 154.77 162.1 173.22
(**************************************	Output from water heater (annual) <sub>112</sub> 1825.45 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	` '
(65)m= 84.71 75.36 80.77 74.66 74.79 69.18 68.67	
include (57)m in calculation of (65)m only if cylinder is in the	a dwelling or not water is from community neating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec
(66)m= 85.17 85.17 85.17 85.17 85.17 85.17 85.17	85.17 85.17 85.17 85.17 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5
(67)m= 13.23 11.75 9.56 7.23 5.41 4.57 4.93	6.41 8.61 10.93 12.76 13.6 (67)
Appliances gains (calculated in Appendix L, equation L13 or L	-13a), also see Table 5
(68)m= 148.4 149.94 146.06 137.8 127.37 117.57 111.03	2 109.48 113.36 121.62 132.05 141.85 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15	ia), also see Table 5
(69)m= 31.52 31.52 31.52 31.52 31.52 31.52 31.52	2 31.52 31.52 31.52 31.52 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0	0 0 0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -68.13 -68.13 -68.13 -68.13 -68.13 -68.13 -68.13	3 -68.13 -68.13 -68.13 -68.13 (71)
Water heating gains (Table 5)	
(72)m= 113.86 112.14 108.56 103.69 100.53 96.08 92.29	97.14 98.86 103.9 109.59 112.15 (72)
	')m + (68)m + (69)m + (70)m + (71)m + (72)m
(73)m= 324.05 322.38 312.73 297.27 281.86 266.76 256.8	
6. Solar gains:	10.100   100.100   100.100   0.10.10
Solar gains are calculated using solar flux from Table 6a and associated eq	uations to convert to the applicable orientation.
Orientation: Access Factor Area Flux	g_ FF Gains
Table 6d m² Table 6a	Table 6b Table 6c (W)
North 0.9x 0.77 x 1.68 x 10.63	x 0.558 x 0.7 = 4.84 (74)
North 0.9x 0.77 x 1.68 x 20.32	x 0.558 x 0.7 = 9.24 (74)
20.02	

	_											_					_
North	0.9x	0.77	X	1.6	88	X	3	34.53	X		0.558	X	0.7		=	15.7	(74)
North	0.9x	0.77	X	1.6	68	X	5	55.46	X		0.558	X	0.7		=	25.22	(74)
North	0.9x	0.77	Х	1.6	88	X	7	4.72	X		0.558	X	0.7		=	33.98	(74)
North	0.9x	0.77	Х	1.6	88	X	7	79.99	X		0.558	X	0.7		=	36.37	(74)
North	0.9x	0.77	X	1.6	88	X	7	4.68	X		0.558	X	0.7		=	33.96	(74)
North	0.9x	0.77	Х	1.6	68	X	5	9.25	X		0.558	X	0.7		=	26.94	(74)
North	0.9x	0.77	Х	1.6	68	X	4	1.52	x		0.558	X	0.7		=	18.88	(74)
North	0.9x	0.77	X	1.6	88	X	2	24.19	X		0.558	x	0.7		=	11	(74)
North	0.9x	0.77	Х	1.6	68	X	1	3.12	x		0.558	x	0.7		=	5.97	(74)
North	0.9x	0.77	х	1.6	68	X		8.86	x		0.558	x	0.7		=	4.03	(74)
East	0.9x	1	X	12.	17	X	1	9.64	x		0.56	x	0.7		=	64.7	(76)
East	0.9x	1	X	12.	17	X	3	88.42	x		0.56	x	0.7		=	126.57	(76)
East	0.9x	1	X	12.	17	X	6	3.27	x		0.56	×	0.7		=	208.44	(76)
East	0.9x	1	X	12.	17	X	9	2.28	x		0.56	×	0.7		=	303.99	(76)
East	0.9x	1	X	12.	17	X	1	13.09	x		0.56	×	0.7		=	372.56	(76)
East	0.9x	1	X	12.	17	X	1	15.77	x		0.56	×	0.7		=	381.38	(76)
East	0.9x	1	X	12.	17	X	1	10.22	x		0.56	×	0.7		=	363.09	(76)
East	0.9x	1	Х	12.	17	X	9	94.68	x		0.56	x	0.7		=	311.89	(76)
East	0.9x	1	X	12.	17	X	7	73.59	x		0.56	×	0.7		=	242.42	(76)
East	0.9x	1	X	12.	17	X	4	l5.59	x		0.56	x	0.7		=	150.18	(76)
East	0.9x	1	X	12.	17	X	2	24.49	x		0.56	x	0.7	一	=	80.67	(76)
East	0.9x	1	X	12.	17	X	1	6.15	x		0.56	×	0.7		=	53.21	(76)
	_						-		-								
Solar g	ains in	watts, ca	alculate	d for eac	h montl	า			(83)m	n = Su	m(74)m .	(82)m					
(83)m=	69.54	135.81	224.14	329.22	406.53		17.75	397.05	338	.83	261.3	161.1	86.64	57.	24		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (	83)m	, watts									
(84)m=	393.58	458.19	536.87	626.49	688.39	6	84.51	653.85	600	.42	530.69	446.1	389.59	373	.39		(84)
7. Mea	an inter	nal temp	erature	(heating	seaso	n)											
Temp	erature	during h	eating p	periods i	n the liv	ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	D	ес		
(86)m=	0.93	0.89	0.82	0.69	0.53		0.38	0.28	0.3	32	0.51	0.76	0.89	0.9	94		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	follo	w ste	ps 3 to 7	in T	able	9c)			-			
(87)m=	19.58	19.85	20.25	20.65	20.87	_	20.97	20.99	20.		20.92	20.58	20.02	19.	52		(87)
Temp	erature	during h	eating r	periods in	n rest o	f dw	elling	from Ta	hle (	 9 Th	2 (°C)		<b>!</b>	•		l	
(88)m=	20.19	20.2	20.2	20.21	20.21		20.22	20.22	20.		20.22	20.21	20.21	20	.2		(88)
			<u> </u>					<u> </u>			!						
(89)m=	0.92	0.88	0.8	rest of d	weiling, 0.5		,m (se 0.34	0.23	9a) 0.2	<sub>27</sub> T	0.46	0.73	0.88	0.9	33		(89)
								<u> </u>					1 0.00	1 0.8			(55)
Г		· ·		the rest	i — —	Ť		i	·		1		40.00	1 45	00	1	(00)
(90)m=	18.29	18.68	19.24	19.78	20.07	2	20.19	20.21	20.	21	20.14	19.72		18.	22	0.50	(90)
											I	∟∧ = LI\	ving area ÷ (	<b>→</b> ) =		0.53	(91)

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.97 19.3 19.77 20.24 20.49 20.6 20.62 20.62 20.55 20.17 19.5	18.91 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m= 18.97 19.3 19.77 20.24 20.49 20.6 20.62 20.62 20.55 20.17 19.5	18.91 (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 the utilisation factor for gains using Table 9a	re-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains, hm:	
(94)m= 0.91 0.86 0.79 0.66 0.51 0.36 0.26 0.29 0.49 0.73 0.87	0.92 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	341.9 (95)
Monthly average external temperature from Table 8	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 642.99 629.51 578.65 487.85 377.3 253.92 170.25 178.1 274.35 410.78 535.12	637.89 (97)
(97)m= 642.99 629.51 578.65 487.85 377.3 253.92 170.25 178.1 274.35 410.78 535.12 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	637.89 (97)
	220.21
Total per year (kWh/year) = Sum(98)	
Space heating requirement in kWh/m²/year	
· · · · · · · · · · · · · · · · · · ·	19.53 (99)
9b. Energy requirements – Community heating scheme	om o
This part is used for space heating, space cooling or water heating provided by a community sche Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	o (301)
Fraction of space heat from community system $1 - (301) =$	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat so	cources; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	(2020)
Fraction of heat from Community boilers	1 (303a)
Fraction of total space heat from Community boilers (302) x (303a)	) = 1 (304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year_
Annual space heating requirement	985.44
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1034.71 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (309)
Water heating Annual water heating requirement	1825.45
If DHW from community scheme:	(0.00)
Water heat from Community boilers $ (64) \times (303a) \times (305) \times (306) = $ Electricity used for heat distribution $ 0.01 \times [(307a)(307e) + (310a)(307e) + $	
•	
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 dw mechanical ventilation - balanced, extra	• · · · · · · · · · · · · · · · · · · ·	m outside			97.86	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year	•	=(330a) + (330b	b) + (330g) =		97.86	(331)
Energy for lighting (calculated in Appen	dix L)				233.65	(332)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission factors kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and v	vator heating (not CUD	•			<b>9 ,</b>	
Efficiency of heat source 1 (%)	<b>3</b> \	ing two fuels repeat (363) to	(366) for the secon	d fuel	89.5	(367a)
CO2 associated with heat source 1	[(307b)	)+(310b)] x 100 ÷ (367b) x	0.22	=	712.3	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	15.32	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	2)	=	727.62	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			727.62	(376)
CO2 associated with electricity for pum	ps and fans within dwe	lling (331)) x	0.52	=	50.79	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	121.26	(379)
Total CO2, kg/year	sum of (376)(382) =				899.67	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				17.83	(384)

El rating (section 14)

(385)

87.37

			User D	etails:							
Assessor Name: Software Name:											
		Р	roperty .	Address	06-18-6	69419 21	F-6				
Address :	2F-6, Bertram S	Street, Londo	n								
1. Overall dwelling dime	ensions:										
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	3)	
Ground floor			7	3.35	(1a) x	2	2.4	(2a) =	176.04	(38	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	1) 7	3.35	(4)						
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	176.04	(5)	
2. Ventilation rate:											
	main heating	secondar heating	у	other		total			m³ per hou	ır	
Number of chimneys		+ 0	<b>]</b> + [	0	] = [	0	X	40 =	0	(6a	
Number of open flues	0	+ 0	╡ᆠ┝	0	] <sub>=</sub> [	0	X	20 =	0	(6b	
Number of intermittent fa					J			10 =	<u> </u>	╡`	
					Ļ	0			0	(7a	
Number of passive vents	5					0	X	10 =	0	(7t	
Number of flueless gas f	ires					0	X	40 =	0	(70	
								A ir ah	angaa nar ha		
		(O-) - (Ob) - (7	z - \ . ( <del>   </del>   \ . (	<b>7</b> -\	_				anges per ho	_	
nfiltration due to chimne	•				ontinus fr	0		÷ (5) =	0	(8)	
If a pressurisation test has leading to the Number of storeys in t		iteriaea, procee	a to (17), (	otnerwise (	ontinue ir	om (9) to (	(16)		0	(9)	
Additional infiltration	ric awciirig (ris)						[(9)	-1]x0.1 =	0	-	
Structural infiltration: 0	.25 for steel or tim	ber frame or	0.35 for	r masonr	v constr	uction	[(0)	. j	0	=\(\)	
if both types of wall are p					•				<u> </u>	`	
deducting areas of openi	= :									_	
If suspended wooden	•	,	.1 (seale	ed), else	enter 0				0	(12	
If no draught lobby, en									0	(13	
Percentage of window Window infiltration	s and doors draug	int stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14	
Infiltration rate				(8) + (10)	. ,	_	± (15) =		0	= (15	
Air permeability value,	aEO expressed in	oubic motro	s par ha					oroo	0	(16	
f based on air permeabi			•	•	•	elle ol e	rivelope	alea	3	= (17	
Air permeability value applie	-					is beina u	sed		0.15	(18	
Number of sides shelter				, poi	wanty				3	(19	
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.78	(20	
nfiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.12	(21	
nfiltration rate modified	for monthly wind s	peed									
Jan Feb	Mar Apr N	/lay Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp	peed from Table 7								•		
(22)m= 5.1 5		.3 3.8	3.8	3.7	4	4.3	4.5	4.7			
						•	•	•	1		
Wind Factor (22a)m = (2	2)m ÷ 4										

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ition rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calcul <del>ate effec</del> If mechanica		•	rate for t	пе арріі	саріе са	ise						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	very: effici	iency in %	allowing f	or in-use f	actor (fror	n Table 4h	) =				79.9	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recov	ery (MV	HR) (24a	a)m = (2)	2b)m + (2	23b) × [	1 – (23c)	÷ 100]	<b>-</b>
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	covery (I	MV) (24b	o)m = (22	2b)m + (2	23b)	-	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v					•				0.5]			'	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change i	rate - en	iter (24a	) or (24k	o) or (24	c) or (24	ld) in bo	x (25)				-	
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losses	and he	at loss p	paramete	er:									
LEMENT	Gros area	_	Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-l		X k /K
Doors					2.1	x	1.4	=	2.94				(2
Vindows					15.96	<sub>5</sub> x1	/[1/( 1.4 )+	0.04] =	21.16				(2
Valls Type1	33.84	4	18.00	6	15.78	3 X	0.15	=	2.37		14	220.92	2 (2
Valls Type2	13.5	1	0		13.5′	1 x	0.14	=	1.9		14	189.14	4 (2
Valls Type3	13.82	2	0		13.82	<u>x</u>	0.15	=	2.07		14	193.48	8 (2
otal area of el	ements,	, m²			61.17	7							(3
arty wall					21.19	) x	0	=	0		20	423.8	(3
arty floor					73.35	5					40	2934	(3
Party ceiling					73.35	5				Ī	30	2200.5	5 (3
nternal wall **					105.6	3				Ī	9	950.4	(3
for windows and a						lated using	g formula 1	/[(1/U-valu	ıе)+0.04] а	s given in	paragraph	1 3.2	_
abric heat los	s, W/K =	= S (A x	U)				(26)(30	) + (32) =				30.44	(3
leat capacity (	2m = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	7112.24	(3
hermal mass	paramet	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			96.96	(3
or design assessi an be used instea				construct	ion are no	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	•	,		• .	•	K						6.02	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)			(22) -	(26)		ĺ		<b></b> ,_
otal fabric hea	ม เบรร							(33) +	(36) =			36.46	(3
entilation hea	t loop on	ا معامده	manthi	,				(20)	= 0.33 × (	25)m + (F)	`		

(00)		T											(00)
(38)m= 14.45	14.28	14.11	13.27	13.1	12.25	12.25	12.09	12.59	13.1	13.44	13.77		(38)
Heat transfer of			10.70	10.50	10.70	10.70	10.55	· · ·	= (37) + (	<del></del>			
(39)m= 50.91	50.74	50.57	49.73	49.56	48.72	48.72	48.55	49.05	49.56	49.9	50.23	49.69	(39)
Heat loss para	meter (I	HLP), W	/m²K	•	i	•			= (39)m ÷	Sum(39)₁ · (4)	12 / 1 Z=	49.69	(39)
(40)m= 0.69	0.69	0.69	0.68	0.68	0.66	0.66	0.66	0.67	0.68	0.68	0.68		<b>–</b> 1
Number of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.68	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requ	irement:								kWh/ye	ar:	
Assumed occu	ıpancv.	N								2	.32		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.02		(12)
Annual averag	je hot wa										).41		(43)
Reduce the annua							to achieve	a water us	se target o	f			
						<u> </u>	Ι Δα	Con	Oct	Nov	Doo		
Jan Hot water usage i	Feb n litres pe	Mar r day for ea	Apr ach month	May $Vd, m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 98.35	94.77	91.2	87.62	84.05	80.47	80.47	84.05	87.62	91.2	94.77	98.35		
(11)=	0 7	01.2	07.02	01.00	00.11	00.11	0 1.00	l		m(44) <sub>112</sub> =		1072.92	(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)		<b>_</b>
(45)m= 145.85	127.56	131.63	114.76	110.12	95.02	88.05	101.04	102.25	119.16	130.07	141.25		
If instantaneous w	vater heati	na at noint	of use (no	n hot water	r storaga)	enter () in	hoves (16		Γotal = Su	m(45) <sub>112</sub> =	=	1406.77	(45)
	ı		,	ı		ı		` '	47.07	10.54			(46)
(46)m= 21.88 Water storage	19.13 loss:	19.75	17.21	16.52	14.25	13.21	15.16	15.34	17.87	19.51	21.19		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufact		aclarad l	nee fact	nr ie kna	wn (k\//k	J(day).					_		(48)
Temperature f				JI 13 KI10	WII (ICVVI	ı, day).					0		(49)
Energy lost fro				ear			(48) x (49)	) =			10		(50)
b) If manufact		_	-		or is not		(10)11(10)				10		(00)
Hot water stor	•			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	•		on 4.3										(50)
Temperature f			2b							-	.6		(52) (53)
Energy lost fro				≏ar			(47) x (51)	) x (52) x (	53) =		==		(54)
Enter (50) or (		_	, 12 VII/ y C	Jui			( 11 ) X (O1)	, A ( <del>52)</del> A (			.03		(54) (55)
Water storage	` , , ,	•	for each	month			((56)m = (	55) × (41)ı	m				, ,
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												¢Η	•
(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)
L	•	•	•	•		•	•			•			

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	<u> </u>
(61)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 201.13 177.49 186.91 168.25 165.39 148.52 143.33 156.32 155.74 174.44	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	dion to water neating)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 201.13 177.49 186.91 168.25 165.39 148.52 143.33 156.32 155.74 174.44	183.57 196.53
Output from water heat	<del></del>
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>
(65)m= 92.72 82.36 87.99 80.95 80.84 74.39 73.5 77.82 76.79 83.84	86.04 91.19 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23	116.23 116.23 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 18.29 16.24 13.21 10 7.48 6.31 6.82 8.86 11.9 15.11	17.63 18.8 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 204.99 207.11 201.75 190.34 175.94 162.4 153.35 151.23 156.59 168	182.4 195.94 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<u> </u>
(69)m= 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62	34.62 34.62 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99	-92.99 -92.99 (71)
Water heating gains (Table 5)	
(72)m= 124.62 122.55 118.27 112.43 108.65 103.32 98.79 104.59 106.66 112.69	119.51 122.56 (72)
	<u> </u>
	· · · · · · · · · · · · · · · · · · ·
	377.41 395.17 (73)
<ol><li>Solar gains:</li><li>Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the application.</li></ol>	able orientation
	FF Gains
<u>0</u>	Table 6c (W)
w	
3.50 G.77 A 13.50 A 13.54 A 0.50 A	0.7 = 84.85 (80)
West 0.9x 0.77 × 15.96 × 38.42 × 0.56 ×	0.7 = 165.98 (80)

	_									_									_
West	0.9x	0.77		X	15.9	96	X	6	3.27	X		0.56	)		0.7		=	273.35	(80)
West	0.9x	0.77		X	15.9	96	X	9	2.28	X		0.56	)	· [	0.7		=	398.66	(80)
West	0.9x	0.77		X	15.9	96	X	1	13.09	X		0.56	)	· [	0.7		=	488.58	(80)
West	0.9x	0.77		x	15.9	96	X	1	15.77	x		0.56	)	· [	0.7		=	500.15	(80)
West	0.9x	0.77		x	15.9	96	X	1	10.22	x		0.56	)		0.7		=	476.16	(80)
West	0.9x	0.77		x	15.9	96	X	9	4.68	X		0.56	)		0.7		=	409.01	(80)
West	0.9x	0.77		x	15.9	96	X	7	3.59	x		0.56	)		0.7		=	317.92	(80)
West	0.9x	0.77		х	15.9	96	X	4	5.59	x		0.56	)		0.7		=	196.95	(80)
West	0.9x	0.77		X	15.9	96	X	2	4.49	x		0.56	)		0.7		=	105.8	(80)
West	0.9x	0.77		X	15.9	96	X	1	6.15	х		0.56	<u> </u>	· [	0.7		=	69.78	(80)
	_													_					_
Solar g	ains in	watts, ca	alculate	ed	for each	n montl	า			(83)m	n = Si	um(74)m .	(82)	m					
(83)m=	84.85	165.98	273.35	5	398.66	488.58	5	00.15	476.16	409	.01	317.92	196	.95	105.8	69.7	78		(83)
Total g	ains – i	nternal a	nd sol	ar	(84)m =	(73)m	+ (	83)m	, watts				•		•			-	
(84)m=	490.61	569.76	664.45	<u> </u>	769.31	838.51	8	30.04	792.99	731	.57	650.93	550	.62	483.21	464.	.95		(84)
7 Me	an inter	nal temp	eratur	e (	heating	seaso	n)												
		during h						area f	from Tal	ole 9	Th	1 (°C)						21	(85)
•		tor for g	•	•			-			010 0	,	. ( 0)						21	
	Jan	Feb	Mar	$\neg$	Apr	May	Ť	Jun	Jul	Α	ug	Sep		ct	Nov	D	ec	]	
(86)m=	0.94	0.9	0.82	+	0.68	0.52	+	0.37	0.27	0.3	Ť	0.5	0.7		0.9	0.9			(86)
` ′ [		<u> </u>			!				<u> </u>										, ,
ī		l temper	1	$\overline{}$					i e	T T				74	T 00 00	1 40		1	(07)
(87)m=	19.84	20.1	20.44		20.77	20.93		20.98	21	20.	99	20.95	20.	/1	20.23	19.	8		(87)
r		during h	r	$\overline{}$	eriods in	rest o	f dw	elling	from Ta	able 9	9, Tł	n2 (°C)			1			Ī	
(88)m=	20.35	20.35	20.35	$\perp$	20.36	20.36	2	20.37	20.37	20.	37	20.37	20.	36	20.36	20.3	35		(88)
Utilisa	ation fac	tor for g	ains fo	r re	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.93	0.89	0.8		0.66	0.49		0.33	0.23	0.2	26	0.46	0.7	73	0.89	0.9	4		(89)
Mean	interna	l temper	ature i	n tl	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c	)		-			
(90)m=	18.78	19.14	19.63	_	20.07	20.28	Ť	20.36	20.37	20.		20.32	20.		19.35	18.7	72		(90)
L			ļ		!				<u>I</u>			f	LA =	Livir	ig area ÷ (4	4) =		0.39	(91)
N4				c	حاد د محالا د		. 11!	\ £1	. A <b>T</b> 4	. /4	£I	۸) <b>T</b> O							_
Г		l temper 19.52	19.95	$\overline{}$	20.35	20.53	_	g) = 11 20.6	20.62	<del>r`</del>			20	20	10.60	10.	1.5	1	(92)
(92)m=	19.2		<u> </u>	_					!	20.		20.57	20.		19.69	19.	15		(32)
(93)m=	19.2	nent to tl	19.95	_	20.35	20.53	_	20.6	20.62	20.		20.57	20.		19.69	19.	1.5	1	(93)
				_	20.33	20.55	<u> </u>	20.6	20.02	20.	02	20.57	20.	20	19.69	19.	15		(33)
		ting requ			norotur	o obtoi	<b>500</b>	l ot ot	on 11 of	Tobl	ام ۸	o oo tho	4 T: .	~ <i>(</i>	76)m on	d ro	مماد	vuloto	
		mean int factor fo					nea	al Sie	<del>з</del> р п ог	rabi	ie st	o, so ma	ll 11,1	11=(	76)III an	a re-	Calc	culate	
	Jan	Feb	Mar	$\neg$	Apr	May	T	Jun	Jul	Α	ug	Sep	Го	ct	Nov	D	ec		
ı Utilisa		tor for g	l	_											1			l	
(94)m=	0.91	0.87	0.79	Т	0.65	0.5	1	0.35	0.25	0.2	28	0.47	0.7	73	0.87	0.9	2		(94)
ւ Usefu	ıl gains,	hmGm .	. W = (	94	 )m x (84	4)m	-		<u> </u>				!		!			l	
(95)m=	448.62	496.91	526.11	_	503.74	417.4	2	88.49	194.83	203	.36	305.48	401	.09	422.3	429.	.92		(95)
	nly aver	age exte	rnal te	mr	erature	from 7	abl	e 8	<u> </u>									ı	
(96)m=	4.3	4.9	6.5	Ť	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10	.6	7.1	4.2	2		(96)
L	I					I			1									1	

	22) (22)					
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(97)m= $\frac{1}{758.56}$ 741.69 680.03 569.2 437.81 292.5 195.66 20	93)m- (96)m <sub>94.66</sub> 317.42	479.97	628.4	750.83	1	(97)
Space heating requirement for each month, kWh/month = $0.024 \text{ x}$				700.00	]	()
(98)m= 230.59 164.49 114.52 47.13 15.19 0 0	0 0	58.69	148.39	238.76	]	
	Total per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1017.76	(98)
Space heating requirement in kWh/m²/year					13.88	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab			unity scł	neme.	0	(301)
Fraction of space heat from community system $1 - (301) =$					1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		up to four o	other heat	sources;		
Fraction of heat from Community boilers					1	(303a)
Fraction of total space heat from Community boilers			02) x (303	a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	y heating sys	stem			1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating Annual space heating requirement					kWh/yea	r ¬
	(09) v /2	040) v (206	E) v (206)		1017.76	
Space heat from Community boilers		04a) x (305		_	1068.65	(307a)
Efficiency of secondary/supplementary heating system in % (from			,		0	(308
Space heating requirement from secondary/supplementary system	(98) x (3	01) x 100 ÷	÷ (308) =		0	(309)
Water heating Annual water heating requirement					2057.61	7
If DHW from community scheme: Water heat from Community boilers	(64) x (3	03a) x (305	5) x (306)	=	2160.49	(310a)
Electricity used for heat distribution	0.01 × [(307a)	(307e) +	(310a)	(310e)] =	32.29	(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 out	tside				142.28	(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) =		142.28	(331)
Energy for lighting (calculated in Appendix L)					322.98	(332)
12b. CO2 Emissions – Community heating scheme						
	Energy kWh/year		mission g CO2/k		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	o fuels repeat (3	863) to (366	6) for the s	econd fue	89.5	(367a)

CO2 associated with heat source 1	[(307)	b)+(310b)] x 100 ÷ (367b) x	0.22	=	779.32	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	16.76	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372)		=	796.08	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			796.08	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	73.85	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	167.63	(379)
Total CO2, kg/year	sum of (376)(382) =				1037.55	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				14.15	(384)
El rating (section 14)					88.25	(385)

		User	Details:						
Assessor Name:	Matthew Stainrod		Strom	a Num	ber		STRO	023501	
Software Name:	Stroma FSAP 2012	2	Softwa					n: 1.0.4.16	
		Propert	y Address:	06-18-6	69419 31	F-7			
Address :	3F-7, Bertram Street	, London							
1. Overall dwelling dime	nsions:	Δr	ea(m²)		Av Ha	ight(m)		Volume(m³	١
Ground floor				(1a) x		2.4	(2a) =	130.75	) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	54.48	(4)			_		
Dwelling volume		. ,			)+(3c)+(3c	d)+(3e)+	.(3n) =	130.75	(5)
2. Ventilation rate:									
		condary eating	other		total			m³ per hou	r
Number of chimneys	0 +	0 +	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	Ī = [	0	x	20 =	0	(6b)
Number of intermittent fa	ns				0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				_				_	_
				_			Air ch	anges per ho	our —
Infiltration due to chimney  If a pressurisation test has be	, -			continuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		a, proceed to (17)	, ouriel wise t	orianae m	om (9) to (	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.				•	uction			0	(11)
if both types of wall are prideducting areas of opening	resent, use the value corresp ngs); if equal user 0.35	onding to the gre	ater wall are	a (atter					
If suspended wooden f		ed) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	aco avaraged in sub-		(8) + (10)				0.00	0	(16)
Air permeability value,  If based on air permeabili	•	•	•	•	etre or e	rivelope	area	3	(17)
Air permeability value applie	•				is being u	sed		0.15	(10)
Number of sides sheltere	d							3	(19)
Shelter factor			(20) = 1 -	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified for	<del></del>				·			1	
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp					1		<u> </u>	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate	e (allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m				_	
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effect If mechanica		•	rate for t	ne appıı	cable ca	ise						0.5	(23
If exhaust air he			endix N, (2	(23a) = (23a	a) × Fmv (	equation (	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23
If balanced with	heat reco	very: effic	eiency in %	allowing t	for in-use f	actor (fro	n Table 4h	ı) =				79.9	(23
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2:	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24
b) If balance	d mecha	anical ve	entilation	without	heat red	covery (	MV) (24k	m = (22)	2b)m + (2	23b)	-	•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n									0.5]			'	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	ld) in bo	x (25)				_	
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losse	s and he	at loss p	paramet	er:									
LEMENT	Gros area	S	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		X k /K
Ooors					2.1	X	1.4	=	2.94				(2
Vindows					12.15	5 x1	/[1/( 1.4 )+	0.04] =	16.11				(2
Valls Type1	31.3	2	14.2	5	17.07	7 X	0.15	=	2.56		14	238.98	3 (2
Valls Type2	25.0	8	0		25.08	3 x	0.14	=	3.53		14	351.12	2 (2
Valls Type3	12.6	6	0		12.6	X	0.13	=	1.67		14	176.4	. (2
otal area of e	lements	, m²			69								(3
arty wall					10.78	3 x	0	=	0		20	215.6	(3
arty floor					54.48	3					40	2179.2	2 (3
Party ceiling					54.48	3				[	30	1634.4	4 (3
nternal wall **					57.6					Ī	9	518.4	. (3
for windows and * include the area						lated usin	g formula 1	l/[(1/U-valu	ue)+0.04] a	as given in	paragraph	1 3.2	_
abric heat los	s, W/K =	= S (A x	U)				(26)(30	) + (32) =				26.81	(3
leat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5314.1	(3
hermal mass	parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			= (34)	) ÷ (4) =			97.54	(3
or design assess an be used inste	ad of a det	tailed calc	ulation.			·	recisely the	e indicative	e values of	TMP in Ta	able 1f		_
hermal bridge	,	•			•	K						5.74	(3
details of thermatoric he		are not kn	own (36) =	= 0.15 x (3	31)			(33) ±	- (36) =			20.54	
entilation hea		alculated	nonthly	./					n = 0.33 × (	25)m v (5)	)	32.54	(3
	11 1000 60	มเบนเสเซเ	a 1110111111	y				(JOJIII	. – v.uu x (	LUMII A (O.	,		

(00)	1 40 04	10.40	0.05	0.70	0.4		0.00	0.05	0.70		40.00		(20)
(38)m= 10.73	10.61	10.48	9.85	9.73	9.1	9.1	8.98	9.35	9.73	9.98	10.23		(38)
Heat transfer (39)m= 43.27	43.15	nt, W/K 43.02	42.4	42.27	41.64	41.64	41.52	(39)m 41.9	42.27	38)m 42.52	42.77		
(39)111= 43.27	45.15	43.02	42.4	42.21	41.04	41.04	41.32			Sum(39) <sub>1</sub>	<u> </u>	42.37	(39)
Heat loss para	ameter (l	HLP), W/	m²K			_	_		= (39)m ÷			.2.0.	` ′
(40)m= 0.79	0.79	0.79	0.78	0.78	0.76	0.76	0.76	0.77	0.78	0.78	0.79		_
Number of da	vs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	0.78	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
											<u>.                                    </u>		
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occ	inancy	NI											(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		82		(42)
if TFA £ 13.	•	otor ucoc	ao io litro	o por da	w Vd ov	orogo –	(25 v NI)	. 26					(40)
Annual average Reduce the annu									se target o		7.48		(43)
not more that 125	litres per	person per	day (all w	ater use, h	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	· ·					1	. /			ī			
(44)m= 85.22	82.12	79.02	75.93	72.83	69.73	69.73	72.83	75.93	79.02	82.12	85.22	000.7	7(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	<u> </u>	929.7	(44)
(45)m= 126.38	110.54	114.06	99.44	95.42	82.34	76.3	87.55	88.6	103.25	112.71	122.39		
									Γotal = Su	m(45) <sub>112</sub> =	=	1218.98	(45)
If instantaneous v			,			1							()
(46)m= 18.96 Water storage	16.58 loss:	17.11	14.92	14.31	12.35	11.44	13.13	13.29	15.49	16.91	18.36		(46)
Storage volum		) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufac		eclared l	oss facto	or is kno	wn (kWh	n/day).					0		(48)
Temperature f				J. 10 11.10	(	"uay).					0		(49)
Energy lost from				ear			(48) x (49)	=			10		(50)
b) If manufac			-										
Hot water stor If community I	•			e 2 (kWl	n/litre/da	ıy)				0.	.02		(51)
Volume factor	•		JII 4.5							1.	03		(52)
Temperature t	factor fro	m Table	2b							<b>—</b>	.6		(53)
Energy lost fro	om watei	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated f	or each	month		_	((56)m = (	55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendix	¢Н	
(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 (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	nostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m	
(62)m= 181.66 160.46 169.34 152.94 150.69 135.83 131.57 142.83 142.09 158.53	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contrib	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	dion to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 181.66 160.46 169.34 152.94 150.69 135.83 131.57 142.83 142.09 158.53	3 166.2 177.67
Output from water hea	<del></del>
Heat gains from water heating, kWh/month 0.25 $^{\circ}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)r (65)m= $\frac{86.24}{76.69}$   $\frac{76.69}{82.15}$   $\frac{75.86}{75.95}$   $\frac{75.95}{70.17}$   $\frac{70.17}{69.59}$   $\frac{73.33}{73.33}$   $\frac{72.25}{78.55}$	<del></del>
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11	91.11 91.11 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 14.16 12.58 10.23 7.74 5.79 4.89 5.28 6.86 9.21 11.7	13.65 14.55 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 158.84 160.49 156.34 147.5 136.33 125.84 118.83 117.19 121.34 130.18	3 141.34 151.84 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11	32.11 32.11 (69)
Pumps and fans gains (Table 5a)	<del></del>
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -72.88 -7	3 -72.88 -72.88 (71)
Water heating gains (Table 5)	
(72)m= 115.92 114.13 110.41 105.36 102.08 97.46 93.54 98.57 100.35 105.58	3 111.49 114.14 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m +$	, ,
(73)m= 339.26 337.53 327.31 310.93 294.53 278.52 267.98 272.95 281.24 297.79	· · · · · · · · · · · · · · · · · · ·
6. Solar gains:	310.02 330.00
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applic	able orientation
	FF Gains
<del>-</del>	Table 6c (W)
West 0.9x 0.77 x 12.15 x 19.64 x 0.56 x	
0.00 A 10.04 A 0.00 A	
West 0.9x 0.77	0.7 = 126.36 (80)

	_									_									_
West	0.9x	0.77		X	12.	15	X	6	3.27	X		0.56	X		0.7		=	208.09	(80)
West	0.9x	0.77		X	12.	15	X	9	2.28	X		0.56	X		0.7		=	303.49	(80)
West	0.9x	0.77		X	12.	15	X	1	13.09	X		0.56	X		0.7		=	371.94	(80)
West	0.9x	0.77		X	12.	15	X	11	15.77	x		0.56	X		0.7		=	380.75	(80)
West	0.9x	0.77		X	12.	15	X	1	10.22	x		0.56	X		0.7		=	362.49	(80)
West	0.9x	0.77		x	12.	15	X	9	4.68	X		0.56	X		0.7		=	311.37	(80)
West	0.9x	0.77		x	12.	15	X	7	3.59	x		0.56	X		0.7		=	242.02	(80)
West	0.9x	0.77		x	12.	15	X	4	5.59	x		0.56	X		0.7		=	149.94	(80)
West	0.9x	0.77		x	12.	15	X	2	4.49	x		0.56	X		0.7		=	80.54	(80)
West	0.9x	0.77		x	12.	15	X	1	6.15	х		0.56	X		0.7		=	53.12	(80)
	_																		_
Solar g	ains in	watts, ca	alculat	ed	for eacl	n month	1			(83)m	ı = Sı	um(74)m .	(82)ı	n					
(83)m=	64.59	126.36	208.0	9	303.49	371.94	3	80.75	362.49	311	.37	242.02	149.	94	80.54	53.	12		(83)
Total g	ains – i	nternal a	nd so	ar	(84)m =	(73)m	+ (	83)m	, watts						•			•	
(84)m=	403.85	463.89	535.4	1	614.43	666.48	6	59.27	630.47	584	.32	523.26	447.	73	397.36	383	.98		(84)
7 Me	an inter	nal temp	peratur	e (	heating	seasor	n)												
		during h						area f	from Tal	ole 9	Th	1 (°C)						21	(85)
•		tor for g	_	•			_			010 0	,	. ( 0)						21	
	Jan	Feb	Ma	$\neg$	Apr	May	Ť	Jun	Jul	Α	ug	Sep	0	nt .	Nov	D	ec		
(86)m=	0.93	0.89	0.82	$\dashv$	0.7	0.54	+	0.39	0.29	0.3	<del>-  </del>	0.52	0.7		0.89	0.9			(86)
` ′ [		ļ	<u> </u>								!								. ,
ī		l temper	1	n II						T T			-00.4			I 40.		1	(07)
(87)m=	19.68	19.93	20.3		20.67	20.88		20.97	20.99	20.	99	20.93	20.6	)2	20.1	19.0	53		(87)
r	erature	during h	r	$\overline{}$	eriods ir	rest of	fdw	elling	from Ta	able 9	9, Tł	n2 (°C)				,		•	
(88)m=	20.26	20.26	20.26	5	20.27	20.27	2	20.28	20.28	20.	29	20.28	20.2	27	20.27	20.2	27		(88)
Utilisa	ation fac	tor for g	ains fo	r re	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.92	0.88	0.8		0.67	0.51		0.35	0.24	0.2	27	0.47	0.7	3	0.88	0.9	3		(89)
Mean	interna	l temper	ature i	n t	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)		-			•	
(90)m=	18.48	18.84	19.36	_	19.87	20.14	┰	20.26	20.28	20.		20.21	19.8		19.09	18.4	42		(90)
` ′ [		l	<u> </u>									f	LA = I	ivin	g area ÷ (4	4) =		0.45	(91)
																		0.10	┛`′
Г		l temper		Ì			_	<del>-</del>		<del>r`</del>					10.54	1 40.		1	(02)
(92)m=	19.02	19.34	19.78	L	20.23	20.48		20.58	20.6	20	!	20.53	20.		19.54	18.9	97		(92)
		nent to t	i	_			_		1	1			i –		10.54	100		1	(02)
(93)m=	19.02	19.34	19.78		20.23	20.48	2	20.58	20.6	20	.6	20.53	20.1	8	19.54	18.9	97		(93)
		ting requ							44 . 6	T	- 01			. (	70)			Lata	
		mean int factor fo			•		ned	at ste	ep 11 of	rabi	e 9t	o, so tha	t II,n	า=(	76)m an	d re-	calc	culate	
	Jan	Feb	Ma	$\neg$	Apr	May	T	Jun	Jul	Α	ug	Sep	0	nt .	Nov	D	ec		
l Utilisa		tor for g	l	_		iviay		oun	Oui		ug j	ОСР			1101			l	
(94)m=	0.9	0.86	0.79	T	0.67	0.52	Т	0.37	0.26	0.2	29	0.49	0.7	3	0.86	0.9	1		(94)
		hmGm	<u> </u>	<u> </u>									• • • •					l	, ,
(95)m=	365.09	401.07	423.5	<del>`                                    </del>	409.75	345.57	2	43.05	165.22	172	.25	254.47	326.	43	343.37	350.	.97		(95)
		age exte		_										_	L			1	. ,
(96)m=	4.3	4.9	6.5	T	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10.	6	7.1	4.2	2		(96)
` ′ [		I			-			•							I			I	. ,

(98)m= 202.35 149.05 110.07 50.92 18.91 0 0	0 0 58.52	2 133.78 208.7	9	_
	Total per year (kWh/y	ear) = Sum(98) <sub>15,912</sub>	= 932.39	(98)
Space heating requirement in kWh/m²/year			17.11	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heat Fraction of space heat from secondary/supplementary heating (	• .	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 procedure	allows for CHP and up to fo	ur other heat sources	s; the latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. Fraction of heat from Community boilers	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 commu	ınity heating system	(002) x (0000) =	1	(305)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating			kWh/yea	
Annual space heating requirement			932.39	
Space heat from Community boilers	(98) x (304a) x (	305) x (306) =	979.01	(307a
Efficiency of secondary/supplementary heating system in % (fro	m Table 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supplementary syst	em (98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating				_
Annual water heating requirement			1869.82	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (	305) x (306) =	1963.32	(310a
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] :	= 29.42	(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):	. (-11-			_ 
mechanical ventilation - balanced, extract or positive input from	outside		105.68	(330a
warm air heating system fans			0	(330b
pump for solar water heating	(222.)	) (000 )	0	(330g
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	105.68	(331)
Energy for lighting (calculated in Appendix L)  12b. CO2 Emissions – Community heating scheme			250.09	(332)

If there is CHP using two fuels repeat (363) to (366) for the second fuel

Efficiency of heat source 1 (%)

89.5

(367a)

CO2 associated with heat source 1	[(307	7b)+(310b)] x 100 ÷ (367b) x	0.22	= [	710.1	(367)
Electrical energy for heat distribution		[(313) x	0.52	= [	15.27	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(372)		= [	725.37	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	= [	0	(374)
CO2 associated with water from immer	sion heater or instant	aneous heater (312) x	0.22	= [	0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =		[	725.37	(376)
CO2 associated with electricity for pur	ips and fans within dw	velling (331)) x	0.52	= [	54.85	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	= [	129.8	(379)
Total CO2, kg/year	sum of (376)(382) =				910.02	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				16.7	(384)
El rating (section 14)					87.74	(385)

			llser I	Details:						
Accessor Names	Matthew St	toinrad	—— <del>0361</del> L		o Nives	hor.		CTD (	023501	
Assessor Name:	Stroma FS				a Num are Ve				on: 1.0.4.16	
Software Name:	Stioma ro	AP 2012	Duonout				F 0	versic	)II. 1.0. <del>4</del> .10	
A daluga e .	2E 9 Portro	m Stroot Lo	Property	Address	: 06-18-0	09419 3	F-8			
Address: 1. Overall dwelling dime	•	m Street, Loi	Idon							
1. Overall dwelling diffic	ensions.		Aro	a(m²)		۸۷ ۵۰	iaht/m\		Volume(m <sup>3</sup>	RN.
Ground floor				66.7	(1a) x		eight(m) 2.4	(2a) =	160.08	(3a)
	-) . (45) . (4 -) . (	'A -1\ . /A -\ .			<u> </u>		<u> </u>	(2a) -	160.06	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1a)+(1e)+	.(1h)	66.7	(4)					_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	160.08	(5)
2. Ventilation rate:										
	main heating	secon heatir		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	= [	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					0	x	10 =	0	(7a)
Number of passive vents	3					0	x	10 =	0	(7b)
•					L		$\dashv$ ,	40 =		Ⅎ .
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	we fluce and fa	anc – (6a)+(6h	)+(7a)+(7h)+	(7c) =	Г					_
If a pressurisation test has	•				continue fr	0 rom (9) to	(16)	÷ (5) =	0	(8)
Number of storeys in t			,,			0 (0) 10	(10)		0	(9)
Additional infiltration	3 (	,					[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0	).25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p			ng to the grea	ter wall are	a (after					
deducting areas of open If suspended wooden	• / .		r 0 1 (spal	ad) alsa	antar ()					7(12)
If no draught lobby, er		,	i U. i (Seai	eu), eise	CITICI U				0	(12)
Percentage of window	•		d						0	(14)
Window infiltration	3 and doors an	augiit strippo	ď	0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(15)
Infiltration rate				_	+ (11) + (	_	+ (15) =		0	(16)
Air permeability value,	a50. expresse	d in cubic me	etres per h					e area	3	(17)
If based on air permeabi			•	•	•				0.15	(18)
Air permeability value appli	es if a pressurisatio	on test has been	done or a de	gree air pe	rmeability	is being u	sed			` ′
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified	for monthly win	d speed							1	
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 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 (00.)										
Wind Factor $(22a)m = (2a)m =$	:∠)m ÷ 4	1.00	F 0.05	T 0.00		T		_	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltration rate (allowing for shelt	ter and wind s	:need) – (21a) v	(22a)m					
	0.14 0.12	0.12 $0.12$	0.13	0.14	0.14	0.15		
Calculate effective air change rate for the	applicable ca	1 1		<u> </u>				_
If mechanical ventilation:							0.5	(23a)
If exhaust air heat pump using Appendix N, (23b)				o) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allo	owing for in-use f	actor (from Table 4	n) =				79.9	(23c)
a) If balanced mechanical ventilation wi		<del>, , , , , , , , , , , , , , , , , , , </del>	<del>í `</del>	<del>- ^ `</del>	<del> </del>	<del>1 ` ´</del>	÷ 100]	(5.4.)
` '	0.24 0.22	0.22 0.22	0.23	0.24	0.24	0.25		(24a)
b) If balanced mechanical ventilation wi		· · · · · ·	<del>í `</del>	<del>-                                    </del>	<del>-                                    </del>	T -		(0.41-)
(24b)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation or p if (22b)m < 0.5 x (23b), then (24c) =	•			.5 × (23b	))			
(24c)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24c)
d) If natural ventilation or whole house p if (22b)m = 1, then (24d)m = (22b)m				0.5]				
(24d)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24d)
Effective air change rate - enter (24a) o	or (24b) or (24	c) or (24d) in bo	x (25)	•				
(25)m= 0.26 0.26 0.26 0.24 0	0.24 0.22	0.22 0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losses and heat loss parameter:								
<b>ELEMENT</b> Gross Openings area (m²) m²	Net Ar A ,r			A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-l		
Doors	2.1			2.04				(00)
D0013	2.1	X 1.4	=	2.94				(26)
Windows Type 1	3.82			5.06				(26)
		x1/[1/( 1.4 )	+ 0.04] =					` '
Windows Type 1	3.82	x1/[1/( 1.4 )· x1/[1/( 1.4 )·	+ 0.04] = + 0.04] =	5.06				(27)
Windows Type 1 Windows Type 2	3.82 8.35	x1/[1/(1.4)· x1/[1/(1.4)·	+ 0.04] = + 0.04] = + 0.04] =	5.06 11.07		14	432.6	(27) (27)
Windows Type 1 Windows Type 2 Windows Type 3	3.82 8.35 7.63	x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x 0.15	+ 0.04] = + 0.04] = + 0.04] = = =	5.06 11.07 10.12		14	432.6	(27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  52.8  21.9	3.82 8.35 7.63 30.9	x1/[1/(1.4) x1/[1/(1.4) x1/[1/(1.4) x1/[1/(1.4) x 0.15 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = =	5.06 11.07 10.12 4.64			╡	(27) (27) (27) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Walls Type2  10.39  0	3.82 8.35 7.63 30.9	x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x 0.15 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = =	5.06 11.07 10.12 4.64			╡	(27) (27) (27) (27) ](29)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Walls Type2  Total area of elements, m²	3.82 8.35 7.63 30.9 10.39 63.19	x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)·	+ 0.04] = + 0.04] = + 0.04] = = = =	5.06 11.07 10.12 4.64 1.46		14	145.46	(27) (27) (27) (29) (29) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Walls Type2  Total area of elements, m² Party wall	3.82 8.35 7.63 30.9 10.39 63.19 20.53	x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x 0.15 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = =	5.06 11.07 10.12 4.64 1.46		20	145.46	(27) (27) (27) (29) (29) (31) (32)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Walls Type2  Total area of elements, m² Party wall Party floor	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7	x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x 0.15 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = =	5.06 11.07 10.12 4.64 1.46		20 40	145.46 410.6 2668	(27) (27) (27) (29) (29) (31) (32) (32a)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Walls Type2  Total area of elements, m <sup>2</sup> Party wall Party floor Party ceiling	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calcul	x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x1/[1/(1.4)· x 0.15 x 0.14 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = = = =	5.06 11.07 10.12 4.64 1.46	] [	14 20 40 30 9	145.46 410.6 2668 2001 864	(27) (27) (27) (29) ](29) (31) ](32) ](32a) ](32b)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Solution 52.8  Walls Type2  10.39  Total area of elements, m² Party wall Party floor Party ceiling Internal wall ** * for windows and roof windows, use effective windows	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calcul	x1/[1/(1.4) x1/[1/(1.4) x1/[1/(1.4) x 0.15 x 0.14 3 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = = = =	5.06 11.07 10.12 4.64 1.46	] [	14 20 40 30 9	145.46 410.6 2668 2001 864	(27) (27) (27) (29) ](29) (31) ](32) ](32a) ](32b)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Solution 52.8  Walls Type2  10.39  Total area of elements, m² Party wall Party floor Party ceiling Internal wall **  * for windows and roof windows, use effective windows include the areas on both sides of internal walls are	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calcul	x1/[1/(1.4) x1/[1/(1.4) x1/[1/(1.4) x 0.15 x 0.14 3 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = = = = = = = = = = =	5.06 11.07 10.12 4.64 1.46		14 20 40 30 9	145.46 410.6 2668 2001 864	(27) (27) (27) (29) (29) (31) (32) (32a) (32b) (32c)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Solution 52.8  Walls Type2  Total area of elements, m <sup>2</sup> Party wall Party floor Party ceiling Internal wall **  * for windows and roof windows, use effective windows include the areas on both sides of internal walls at Fabric heat loss, W/K = S (A x U)	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calculated partitions	x1/[1/(1.4): x1/[1/(1.4): x1/[1/(1.4): x1/[1/(1.4): x 0.15 x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = = = = = = = = = = =	5.06 11.07 10.12 4.64 1.46 0		14 20 40 30 9	145.46 410.6 2668 2001 864 35.29	(27) (27) (27) (29) (29) (31) (32) (32a) (32b) (32c)
Windows Type 1 Windows Type 2 Windows Type 3 Walls Type1  Solution 52.8  Walls Type2  10.39  Total area of elements, m² Party wall Party floor Party ceiling Internal wall **  * for windows and roof windows, use effective windows include the areas on both sides of internal walls at Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k)	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calculated partitions	x1/[1/(1.4) x1/[1/(1.4) x1/[1/(1.4) x 0.15 x 0.14 x 0.15 x 0.14 y x 0.14 y x 0.14 y x 0.14	+ 0.04] = + 0.04] = + 0.04] = = = = = = = ((28).	5.06 11.07 10.12 4.64 1.46 0 0 (30) + (32) ÷ (4) =	2) + (32a).	14 20 40 30 9 9 paragraph	145.46 410.6 2668 2001 864 3.2 35.29 6521.66	(27) (27) (27) (29) (29) (31) (32) (32a) (32b) (32c)
Windows Type 2 Windows Type 3 Walls Type 1  Walls Type 2  Walls Type 2  Total area of elements, m <sup>2</sup> Party wall  Party floor  Party ceiling  Internal wall **  * for windows and roof windows, use effective windo  ** include the areas on both sides of internal walls at  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ The  For design assessments where the details of the contents	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calculated partitions FA) in kJ/m²K	x1/[1/(1.4): x1/[1/(1.4): x1/[1/(1.4): x1/[1/(1.4): x 0.15 x 0.14 x 0.15 x 0.16	+ 0.04] = + 0.04] = + 0.04] = = = = = = = ((28).	5.06 11.07 10.12 4.64 1.46 0 0 (30) + (32) ÷ (4) =	2) + (32a).	14 20 40 30 9 9 paragraph	145.46 410.6 2668 2001 864 3.2 35.29 6521.66	(27) (27) (27) (29) (29) (31) (32) (32a) (32b) (32c)
Windows Type 2 Windows Type 3 Walls Type1  S2.8  Walls Type2  Total area of elements, m <sup>2</sup> Party wall  Party floor  Party ceiling  Internal wall **  * for windows and roof windows, use effective windo  ** include the areas on both sides of internal walls at  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ Ti  For design assessments where the details of the concan be used instead of a detailed calculation.	3.82 8.35 7.63 30.9 10.39 63.19 20.53 66.7 66.7 96 ow U-value calculated partitions  FA) in kJ/m²K instruction are not any Appendix k	x1/[1/(1.4): x1/[1/(1.4): x1/[1/(1.4): x1/[1/(1.4): x 0.15 x 0.14 x 0.15 x 0.16	+ 0.04] = + 0.04] = + 0.04] = + 0.04] = = = = = = = = ((28). = (34)	5.06 11.07 10.12 4.64 1.46 0 0 (30) + (32) ÷ (4) =	2) + (32a).	14 20 40 30 9 9 paragraph	145.46 410.6 2668 2001 864 3.2 35.29 6521.66 97.78	(27) (27) (27) (29) (31) (32) (32a) (32b) (32c)  (33) (34) (35)

Ventila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	13.9	13.73	13.56	12.72	12.55	11.71	11.71	11.54	12.04	12.55	12.89	13.22		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m=	55.06	54.89	54.73	53.88	53.71	52.87	52.87	52.7	53.21	53.71	54.05	54.39		
Heat lo	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	53.84	(39)
(40)m=	0.83	0.82	0.82	0.81	0.81	0.79	0.79	0.79	0.8	0.81	0.81	0.82		
Numbe	er of day	s in moi	nth (Tab	le 1a)			•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.81	(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	ter heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		16		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by	5% if the $a$	lwelling is	designed			se target o		.58		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	_		_	_		
(44)m=	94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14		
Energy c	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1026.98	(44)
(45)m=	139.61	122.1	126	109.85	105.4	90.95	84.28	96.71	97.87	114.06	124.5	135.2		
If instant	aneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1346.53	(45)
(46)m=	20.94	18.32	18.9	16.48	15.81	13.64	12.64	14.51	14.68	17.11	18.68	20.28		(46)
	storage		منالم مال مالات		-1 \	/\// IDC	_1	isladadaa aa		1			` I	\
If comn	nunity h	eating a	includin and no ta hot wate	nk in dw	velling, e	nter 110	litres in	(47)				0		(47)
•			eclared l		or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage eclared o	-		or is not		(48) x (49)	) =		1	10		(50)
		_	factor free section		e 2 (kW	h/litre/da	ay)				0.	02		(51)
		from Ta									1.	03		(52)
•			m Table								0	.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
	` ' '	(54) in (5 loss cal	ວວ <i>ງ</i> culated f	or each	month			((56)m = (	55) × (41)	m	1.	03		(55)
(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)
,,	01		1 -2.01	1	I	1 -0.00	I	I'	1 -0.00	1 -2.01	L -0.00	1 -2.0		(-3)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 194.88 172.03 181.27 163.34 160.68 144.45 139.56 151.99 151.36 169.33 178 190.48	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 194.88 172.03 181.27 163.34 160.68 144.45 139.56 151.99 151.36 169.33 178 190.48	_
Output from water heater (annual) <sub>112</sub> 1997.37	(64)
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + $(61)$ m] + 0.8 $\times (46)$ m + $(57)$ m + $(59)$ m]	
(65)m= 90.64 80.54 86.12 79.32 79.27 73.04 72.24 76.38 75.34 82.15 84.19 89.18	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17 108.17	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 16.89 15 12.2 9.24 6.9 5.83 6.3 8.19 10.99 13.95 16.29 17.36	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 189.48 191.44 186.49 175.94 162.62 150.11 141.75 139.78 144.74 155.29 168.6 181.12	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 33.82 33.82 33.82 33.82 33.82 33.82 33.82 33.82 33.82 33.82 33.82 33.82	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54 -86.54	(71)
Water heating gains (Table 5)	
(72)m= 121.83 119.85 115.75 110.17 106.54 101.44 97.1 102.66 104.63 110.41 116.93 119.86	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 383.65 381.75 369.89 350.79 331.52 312.83 300.6 306.08 315.81 335.1 357.27 373.79	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	

Southeast <sub>0.9x</sub>	0.77	X	7.63	x	36.	79	X	C	).56	x	0.7	=	75.99	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	x	62.	67	x	C	).56	x	0.7	_ =	129.44	(77)
Southeast <sub>0.9x</sub>	0.77	X	7.63	x	85.	75	x	C	).56	×	0.7	=	177.11	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	x	106	.25	x	О	).56	×	0.7	╡ =	219.44	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	x	119	.01	X	C	).56	x	0.7		245.8	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	x	118	.15	X	C	).56	×	0.7	=	244.02	(77)
Southeast 0.9x	0.77	x	7.63	X	113	.91	x	C	).56	×	0.7		235.26	(77)
Southeast <sub>0.9x</sub>	0.77	×	7.63	X	104	.39	x	C	).56	×	0.7	_ =	215.6	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	X	92.	85	x	C	).56	×	0.7	_ =	191.77	(77)
Southeast 0.9x	0.77	×	7.63	X	69.:	27	x	C	).56	i x	0.7	<del>-</del>	143.06	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	X	44.	07	x	C	).56	×	0.7	_ =	91.02	(77)
Southeast <sub>0.9x</sub>	0.77	x	7.63	X	31.	49	x	C	).56	×	0.7		65.03	(77)
South 0.9x	0.77	×	3.82	X	46.	75	X	C	).56	i x	0.7	<b>=</b>	48.34	(78)
South 0.9x	0.77	x	3.82	X	76.	57	x	C	).56	×	0.7	_ =	79.17	(78)
South 0.9x	0.77	x	3.82	X	97.	53	x	C	).56	×	0.7		100.85	(78)
South 0.9x	0.77	×	3.82	j×	110	.23	x	C	).56	j x	0.7	_ =	113.98	(78)
South 0.9x	0.77	x	3.82	x	114	.87	x	C	).56	X	0.7	=	118.78	(78)
South 0.9x	0.77	x	3.82	x	110	.55	X	C	).56	×	0.7	=	114.31	(78)
South 0.9x	0.77	x	3.82	x	108	.01	x	C	).56	X	0.7	=	111.69	(78)
South 0.9x	0.77	x	3.82	x	104	.89	X	C	).56	x	0.7	=	108.46	(78)
South 0.9x	0.77	x	3.82	x	101	.89	X	C	).56	X	0.7	=	105.35	(78)
South 0.9x	0.77	x	3.82	x	82.	59	x	C	).56	×	0.7		85.4	(78)
South 0.9x	0.77	x	3.82	x	55.	42	X	C	).56	x	0.7	=	57.3	(78)
South <sub>0.9x</sub>	0.77	x	3.82	x	40.	4	x	C	).56	X	0.7	<del>=</del>	41.77	(78)
West 0.9x	0.77	x	8.35	x	19.	64	x	C	).56	X	0.7	╡ =	44.39	(80)
West 0.9x	0.77	X	8.35	x	38.	42	x	C	).56	x	0.7		86.84	(80)
West 0.9x	0.77	x	8.35	x	63.	27	x	C	).56	X	0.7	=	143.01	(80)
West 0.9x	0.77	X	8.35	x	92.	28	X	C	).56	x	0.7	=	208.57	(80)
West 0.9x	0.77	X	8.35	x	113	.09	x	C	).56	x	0.7	=	255.62	(80)
West 0.9x	0.77	X	8.35	x	115	.77	x	C	).56	x	0.7	=	261.67	(80)
West 0.9x	0.77	X	8.35	x	110	.22	X	C	).56	x	0.7	=	249.12	(80)
West 0.9x	0.77	X	8.35	x	94.	68	X	C	).56	x	0.7	=	213.99	(80)
West 0.9x	0.77	x	8.35	x	73.	59	X	C	).56	x	0.7	=	166.33	(80)
West 0.9x	0.77	X	8.35	x	45.	59	X	C	).56	x	0.7	=	103.04	(80)
West 0.9x	0.77	X	8.35	x	24.	49	x	C	).56	X	0.7	=	55.35	(80)
West 0.9x	0.77	X	8.35	x	16.	15	x	C	).56	X	0.7	=	36.51	(80)
Solar gains in									n(74)m				1	(55)
(83)m= 168.73		120.97	542 620.1			596.07	538.	.05 4	63.45	331.5	203.67	143.31	]	(83)
Total gains – i			<del>`                                    </del>	<u> </u>	<del></del>		044	44   7	770.06	666.6	560.0F	F17.1	1	(94)
(84)m= 552.37		790.86	892.8 951.7		32.83	396.67	844	.14   /	79.26	666.6	560.95	517.1	]	(84)
7. Mean inter		,					, -	<b>—</b> .	(a. <b>a</b> .)					
Temperature	•	٠.		_			ole 9,	Th1	(°C)				21	(85)
Utilisation fac	<del></del> _			Ť					Co. I	O : 1	NI -	<b>D</b>	1	
Stroma FSA 201	<u>ll2 VEr\$lon¦ 1.</u>	<u>d.4.96 (s</u>	SAP 9.921 - http://	Xww.	stromal.co	Mul	<u> A</u>	ug	Sep	Oct	Nov	Dec	Pag	e 5 of 7

(86)m=	0.91	0.85	0.76	0.63	0.49	0.35	0.26	0.28	0.45	0.69	0.86	0.92		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	' in Table	e 9c)					
(87)m=	19.72	20.06	20.42	20.73	20.9	20.98	20.99	20.99	20.95	20.7	20.17	19.66		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
(88)m=	20.23	20.23	20.24	20.25	20.25	20.26	20.26	20.26	20.26	20.25	20.24	20.24		(88)
Utilis	ation fac	tor for a	ains for	rest of d	wellina.	h2,m (se	e Table	9a)						
(89)m=	0.9	0.84	0.74	0.61	0.46	0.32	0.21	0.24	0.41	0.66	0.85	0.92		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ens 3 to 7	7 in Tabl	e 9c)		!	l.	
(90)m=	18.53	19	19.5	19.93	20.14	20.24	20.26	20.26	20.2	19.9	19.18	18.44		(90)
						Į.			1	LA = Livin	g area ÷ (	4) =	0.45	(91)
Mear	interna	l temner	ature (fo	r the wh	ole dwe	lling) = fl	Δ <b>ν</b> Τ1	+ (1 – fl	Δ) <b>v</b> T2					_
(92)m=	19.07	19.48	19.91	20.29	20.49	20.57	20.59	20.59	20.54	20.26	19.63	18.99		(92)
	adjustn	nent to tl	ne mean	interna	L I temper	ature fro	m Table	4e, whe	re appro	L opriate	<u> </u>	ļ		
(93)m=	19.07	19.48	19.91	20.29	20.49	20.57	20.59	20.59	20.54	20.26	19.63	18.99		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the u		factor fo						Δ.	0	0.1	N			
l Itilie	Jan	Feb tor for g	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.88	0.82	0.73	0.61	0.47	0.33	0.23	0.26	0.42	0.66	0.83	0.9		(94)
		hmGm												, ,
(95)m=	<u> </u>	556.14	579.83	542.31	446.34	309.75	209.56	218.79	329.19	441.15	465.65	464.46		(95)
Mont	hly 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						Lm , W =				ī —		1	l	
(97)m=	813.3	800.32	734.08	613.88	472.03	315.76	210.96	220.77	342.68	519.01	677.18	804.57		(97)
		g require 164.09				Wh/mont				T .		050.04		
(98)m=	241.89	164.09	114.76	51.53	19.12	0	0	0	0	57.92	152.3	253.04	4054.00	(98)
					.,			rota	ı per year	(kWh/year	r) = Sum(9	8)15,912 =	1054.66	=
Spac	e heatin	g require	ement in	kVVh/m²	<sup>2</sup> /year								15.81	(99)
						scheme								
						ing or wa nentary l					unity sch	neme.	0	(301)
	•			•		-		Table 1	1, 0 11 11	Onc				╡``
	•			•	•	1 – (301	,						1	(302)
	-					rces. The p from power				up to four (	other heat	sources; to	he latter	
		at from C	_			. от рото	otation or						1	(303a)
Fraction	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
		•			•	4c(3)) fo	r commi	ınity had	itina eve		, ,	,		(305)
					,			•	iling sys	leiii			1	╡
			(Table 1	(2c) for (	commun	ity heatii	ng syste	m				,	1.05	(306)
_	heating	_										1	kWh/yea	r 
Annua	space	heating	equiren	ient									1054.66	

Chase heat from Community heilers		(09) v (2040) v	(20E) × (20E) -		4407.00	(307a)
Space heat from Community boilers	handan and a color of the	(98) x (304a) x		Ļ	1107.39	
Efficiency of secondary/supplementary	`		,	Ļ	0	(308
Space heating requirement from secon	dary/supplementary syste	em (98) x (301) x 1	00 ÷ (308) =		0	(309)
Water heating						7
Annual water heating requirement  If DHW from community scheme:					1997.37	
Water heat from Community boilers		(64) x (303a) x	(305) x (306) =		2097.24	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	e) + (310a)(310e	)] =	32.05	(313)
Cooling System Energy Efficiency Ratio	)				0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra	· ,	outside			129.38	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330l	b) + (330g) =		129.38	(331)
Energy for lighting (calculated in Appen	dix L)			Ē	298.32	(332)
12b. CO2 Emissions - Community hea	ting scheme					
12b. CO2 Emissions – Community hear	ting scheme	Energy kWh/vear	Emission fac			
	<u> </u>	Energy kWh/year	Emission fac		missions g CO2/year	
CO2 from other sources of space and verificiency of heat source 1 (%)	vater heating (not CHP)		kg CO2/kWh	kç		(367a)
CO2 from other sources of space and v	vater heating (not CHP)  If there is CHP using	kWh/year	kg CO2/kWh	kç	g CO2/year	(367a) (367)
CO2 from other sources of space and v Efficiency of heat source 1 (%)	vater heating (not CHP)  If there is CHP using ((307b)+(3	kWh/year two fuels repeat (363) to	kg CO2/kWh	<b>kç</b> d fuel	89.5	⊒ ` ¬
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	vater heating (not CHP)  If there is CHP using ((307b)+(3))	<b>kWh/year</b> two fuels repeat (363) to 810b)] x 100 ÷ (367b) x	(366) for the second  0.22  0.52	<b>k</b> ç d fuel =	89.5 773.41	(367)
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  [(307b)+(3)]  [(307b)+(3)]  [(307b)+(3)]  [(307b)+(3)]  [(307b)+(3)]  [(307b)+(3)]	kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x 313) x	(366) for the second  0.22  0.52	kç d fuel = =	89.5 773.41 16.63	(367)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community services.	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  [(307b)+	kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(372	(366) for the second 0.22 0.52	kç d fuel = = =	89.5 773.41 16.63 790.04	(367) (372) (373)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  [(307b)+	kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(372	(366) for the second  0.22  0.52  0	kç d fuel = = = =	89.5 773.41 16.63 790.04	(367) (372) (373) (374)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sources CO2 associated with space heating (see	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  [(307b)+	kWh/year  two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x (312) x (312) x (373) + (374) + (375) =	(366) for the second  0.22  0.52  0	kç d fuel = = = =	89.5 773.41 16.63 790.04 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sources CO2 associated with space heating (see CO2 associated with water from immersorated CO2 associated with space and we compared to the control of the	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  Eystems (3)  condary) (3)  sion heater or instantaneous vater heating (3)  ps and fans within dwelling (3)	kWh/year  two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x (312) x (312) x (373) + (374) + (375) =	kg CO2/kWh  (366) for the second  0.22  0.52  0  0.22	kç d fuel = = = = =	89.5 773.41 16.63 790.04 0	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sources CO2 associated with space heating (see CO2 associated with water from immersorated CO2 associated with space and we CO2 associated with electricity for pumpores.	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  Eystems (3)  condary) (3)  sion heater or instantaneous vater heating (3)  ps and fans within dwelling (3)	kWh/year  two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x (312) x (373) + (374) + (375) = (331)) x	kg CO2/kWh  (366) for the second  0.22  0.52  0  0.22	kç d fuel = = = = =	89.5 773.41 16.63 790.04 0 790.04 67.15	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community second control con	vater heating (not CHP)  If there is CHP using to [(307b)+(3)]  [(307b)+	kWh/year  two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x (312) x (373) + (374) + (375) = (331)) x	kg CO2/kWh  (366) for the second  0.22  0.52  0  0.22	kç d fuel = = = = =	89.5 773.41 16.63 790.04 0 790.04 67.15 154.83	(367) (372) (373) (374) (375) (376) (378) (379)

			lloor D	) otoilo:						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
A diducaci	4F-10, Bertram Str			Address	06-18-6	69419 4	F-10			
Address: 1. Overall dwelling dim	·	eet, Lond	IOH							
1. Overall dwelling diff	1011310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.4	(2a) =	207.74	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	36.56	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	207.74	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	+ [	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī <b>-</b> [	0	x :	20 =	0	(6b)
Number of intermittent f	ans				, <u> </u>	0	x -	10 =	0	(7a)
Number of passive vent	ts					0	x	10 =	0	(7b)
Number of flueless gas					L F	0	x	40 =	0	(7c)
rumber er naerece gae									U U	(10)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	00-6						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre-				•	uction			0	(11)
	nings); if equal user 0.35	sportaing to	rile great	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unsea	ıled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2			(45)		0	(15)
Infiltration rate		L:t		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeab	e, q50, expressed in cultivity value, then $(18) = 10$		•	•	•	etre or e	envelope	area	3	(17)
·	lies if a pressurisation test ha					is beina u	sed		0.15	(18)
Number of sides shelter				, ,	,	3			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spee	d							•	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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 <i>∸ 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	1	
(-20/11)	25   1.1   1.00	1 0.00	L 3.55	1 0.02		L	I ''' <sup>2</sup>	Lo	J	

	Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
If mechanical ventilation:	I	' '		· ·	-	I -	· ·	0.12	0.13	0.14	0.14	0.15	]	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =     Tys.			•	ial <del>e</del> ioi l	пе аррп	cable ca	3E						0.5	(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100]	If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
24a)m 0.26 0.26 0.26 0.24 0.24 0.22 0.22 0.22 0.23 0.24 0.24 0.25   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	If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				79.9	(23
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	a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(24
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)			
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24d)m	24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d)m = 0	,				•	•				.5 × (23b	o)			
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d/m=	24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  25)m= 0.26  0.26  0.26  0.24  0.24  0.22  0.22  0.22  0.23  0.24  0.24  0.25  3. Heat losses and heat loss parameter:  ELEMENT Gross Parameter:  ELEMENT Gross Parameter:  Windows Type 1  Windows Type 1  Windows Type 1  Windows Type 2  Walls Type1  52.25  25.67  26.58  x  0.15  =  3.99  14  372.12  Walls Type2  17.09  0  17.09  x  0.14  =  2.41  14  239.26  Roof  86.56  0  86.56  x  0.11  =  9.52  9  779.04  Fotal area of elements, m²  Party wall Party floor  88.56  40  346.24  The rindows and roof windows, use effective window U-value calculated using formula 1/f(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)  Heat capacity Cm = S(A x k)  (26)(30) + (32) =  50.1  (30) + (32) =  50.1  (40) 36.45  (50) 36.45  (50) 36.45  (50) 36.56  (50) 36.56  (70) 3	,				•					0.5]				
3. Heat losses and heat loss parameter:  ELEMENT Gross Openings Met Area W/m2K (W/K) k-value kJ/m²-K k	24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
3. Heat losses and heat loss parameter:  ELEMENT Gross A, m² U-value (W/K) k-value (M/K) kJ/m²-K kJ/m²	Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
Net Area   U-value   A X U   K-value   KJ/m²-K   KJ/m²	(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25
area (m²) m² A ,m² W/m2K (W/K) kJ/m²-K	3. Heat losse	s and he	at loss p	paramet	er:									
Windows Type 1    15.22   x1/[1/(1.4) + 0.04] =   20.18	LEMENT		_	•	=						<b>〈</b> )			X k J/K
Windows Type 2  Walls Type1 52.25 25.67 26.58 × 0.15 = 3.99 14 372.12  Walls Type2 17.09 0 17.09 × 0.14 = 2.41 14 239.26  Roof 86.56 0 86.56 × 0.11 = 9.52 9 779.04  Total area of elements, m² 155.9  Party wall 32.95 × 0 = 0 20 659  Party floor 86.56 40 3462.4  Internal wall ** 163.2 9 1468.8  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) = 50.1  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 6980.62  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 80.64  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K (12.37)  Fortal fabric heat loss (33) + (36) = 62.47	Doors					2.1	x	1.4	=	2.94				(20
Walls Type1       52.25       25.67       26.58       x       0.15       =       3.99       14       372.12         Walls Type2       17.09       0       17.09       x       0.14       =       2.41       14       239.26         Roof       86.56       0       86.56       x       0.11       =       9.52       9       779.04         Fortal area of elements, m²       155.9       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       2       0	Nindows Type	e 1				15.22	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	20.18				(27
Nalls Type2	Nindows Type	2				8.35	x1	/[1/( 1.4 )+	0.04] =	11.07				(27
Roof 86.56 0 86.56 $\times$ 0.11 = 9.52 9 779.04  Fotal area of elements, m² 155.9  Party wall 32.95 $\times$ 0 = 0 20 659  Party floor 86.56 40 3462.4  Internal wall ** 163.2 9 1468.8  If or windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  If or windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  Fabric heat loss, W/K = S (A $\times$ U) (26)(30) + (32) = 50.1  Heat capacity Cm = S(A $\times$ K) ((28)(30) + (32) + (32a)(32e) = 6980.62  Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 80.64  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the same be used instead of a detailed calculation.  Thermal bridges: S (L $\times$ Y) calculated using Appendix K  If details of thermal bridging are not known (36) = 0.15 $\times$ (31)  Fotal fabric heat loss (33) + (36) = 62.47	Walls Type1	52.2	5	25.6	7	26.58	3 x	0.15	<b>-</b>	3.99		14	372.1	2 (2
Fotal area of elements, $m^2$	Walls Type2	17.0	9	0		17.09	) x	0.14	<u> </u>	2.41		14	239.2	6 (2
Party wall  32.95 $\times$ 0 = 0 20 659  Party floor  86.56 40 3462.4  Internal wall **  163.2 9 1468.8  If 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  The particulation are not known precisely the indicative values of TMP in Table 1fternal bridges: S (L x Y) calculated using Appendix K  Intermal bridges: S (L x Y) calculated using Appendix K  Intermal bridging are not known (36) = 0.15 x (31)  Intertal fabric heat loss  (33) + (36) = 62.47	Roof	86.5	6	0		86.56	3 x	0.11	<u> </u>	9.52		9	779.0	4 (3
Party floor  Internal wall **  It 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  If 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  In the areas on both sides of internal walls and partitions  In the areas on both sides of interna	Total area of e	elements	, m²			155.9	)							(3
Internal wall **  Internal wal	Party wall					32.95	5 X	0	=	0		20	659	(3:
** 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) =  (28)(30) + (32) + (32a)(32e) =  (34) ÷ (4) =  (34) ÷ (4) =  (35) **  ** include the areas on both sides of internal walls and partitions  ** include the areas on both sides of internal walls and partitions  (26)(30) + (32) =  (32) **  (32) **  (32) **  (33) + (36) =  (34) ÷ (4) =  (35) **  (36) **  (37) **  (37) **  (38) **	Party floor					86.56	3					40	3462.	4 (32
The remainder of the areas on both sides of internal walls and partitions abric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  ((26)(30) + (32) = 50.1  ((28)(30) + (32) + (32a)(32e) = 6980.62  The rmal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K  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.  The rmal bridges: S (L x Y) calculated using Appendix K  If details of the rmal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	nternal wall **	:				163.2	2				Ī	9	1468.	8 (3:
Heat capacity Cm = S(A x k) $((28)(30) + (32) + (32a)(32e) = 6980.62$ Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K $= (34) \div (4) = 80.64$ 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 x (31)  Total fabric heat loss $(33) + (36) = 62.47$							ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	1 3.2	
Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 80.64  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 x (31)  Total fabric heat loss (33) + (36) = 62.47	abric heat los	ss, W/K =	= S (A x	U)				(26)(30)	) + (32) =				50.1	(3:
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  I details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	6980.62	(34
Thermal bridges: S (L x Y) calculated using Appendix K  I details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			80.64	(3
f details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) = 62.47	J				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Fotal fabric heat loss $(33) + (36) = 62.47$	_	,	•		• .	•	<						12.37	(3
<u> </u>			are not kn	own (36) =	= 0.15 x (3	31)			(22) -	(26) -				
continuon near 1055 Calculated monthly (30/iii = 0.33 x (25/iii x (5)			aloulotos	1 manthl	.,						25\m v (F)	\	62.47	(3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		r 1		· ·		lı	li d	۸	· · ·	<u> </u>	<del></del>	_	]	

(38)m= 18.03	17.82	17.6	16.5	16.29	15.19	15.19	14.98	15.63	16.29	16.72	17.16		(38)
Heat transfer of			10.5	10.29	15.19	13.19	14.90		= (37) + (37)	<u> </u>	17.10		(00)
(39)m= 80.51	80.29	80.07	78.98	78.76	77.67	77.67	77.45	78.11	78.76	79.2	79.64		
Heat loss para	meter (l	-II D) \\\/	m2K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	78.92	(39)
(40)m= 0.93	0.93	0.93	0.91	0.91	0.9	0.9	0.89	0.9	0.91	0.91	0.92		
( )								,	Average =	Sum(40) <sub>1</sub>	<del></del>	0.91	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/atau   a a a											1-10/1- /		
4. Water heat	ing ene	rgy requ	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.58		(42)
if TFA £ 13.9 Annual average	,	ater usad	ne in litre	es ner da	ıv Vd av	erane –	(25 x N)	+ 36		05	5.37		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	welling is	designed t			se target o		0.37		(40)
not more that 125		· ·	, ,			<u> </u>	1			1			
Jan Hot water usage ii	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 1c v	Aug	Sep	Oct	Nov	Dec		
	101.09	97.28	93.46	89.65	85.83	85.83	89.65	93.46	97.28	101.09	104.91		
(44)m= 104.91	101.09	97.20	93.46	69.00	00.00	65.63	69.00	l		m(44) <sub>112</sub> =	<del></del>	1144.46	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		
(45)m= 155.58	136.07	140.41	122.41	117.46	101.36	93.92	107.78	109.06	127.1	138.74	150.67		
If instantaneous w	ator hoati	na at noint	of use (no	n hot water	· storage)	enter∩in	hoves (46		Γotal = Su	m(45) <sub>112</sub> =	=	1500.57	(45)
(46)m= 23.34	20.41	21.06	18.36	17.62	15.2	14.09	16.17	16.36	19.07	20.81	22.6		(46)
Water storage	_	21.00	10.30	17.02	13.2	14.09	10.17	10.30	19.07	20.01	22.0		(40)
Storage volum	e (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			, ,			`			
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								00		(51)
If community h	_			IC Z (KVV	ii/iiti <del>c</del> /ua	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	. , .	•	or oach	manth			//EG\~~ /	EE) (44):	~	1.	.03		(55)
Water storage					20.00		((56)m = (			20.00	20.04		(EC)
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 om Appendix	кH	(56)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	•	(57)
(57)m= 32.01	20.92	JZ.U1	30.96	32.01	30.96	32.01	32.01	30.96	32.01	30.96	32.01		(37)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 210.85 186 195.69 175.91 172.74 154.85 149.2 163.05 162.56 182.38	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	and to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	1
(64)m= 210.85 186 195.69 175.91 172.74 154.85 149.2 163.05 162.56 182.38	192.24 205.94
Output from water heat	<del></del>
· · · · · · · · · · · · · · · · · · ·	
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>
(65)m= 95.95 85.18 90.91 83.5 83.28 76.5 75.45 80.06 79.06 86.48	88.93 94.32 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78	128.78 128.78 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 20.74 18.42 14.98 11.34 8.48 7.16 7.73 10.05 13.49 17.13	19.99 21.31 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 232.6 235.02 228.94 215.99 199.64 184.28 174.02 171.6 177.68 190.63	206.98 222.34 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<del></del>
(69)m= 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88	35.88 35.88 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -103.03	3 -103.03 -103.03 (71)
	100.00
Water heating gains (Table 5)	123.51 126.77 (72)
(72)m= 128.97   126.76   122.19   115.97   111.93   106.24   101.41   107.6   109.8   116.24	
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (68)m$	
(73)m= 443.94 441.83 427.74 404.93 381.68 359.32 344.8 350.89 362.61 385.64	412.12 432.06 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux flux flux flux flux flux flux flux	
Orientation: Access Factor Area Flux g_ Table 6d m <sup>2</sup> Table 6a Table 6b	FF Gains Table 6c (W)
North 0.9x 0.77 × 8.35 × 10.63 × 0.558 ×	0.7 = 24.03 (74)
North 0.9x 0.77 x 8.35 x 20.32 x 0.558 x	0.7 = 45.93 (74)

North 0.9x 0.77		_									-			_					_
North	North	0.9x	0.77	<u> </u>		8.35		X	3	34.53	X		0.558	X	0.7		=	78.05	(74)
North	North	0.9x	0.77	)		8.35		X	5	5.46	X		0.558	X	0.7		=	125.36	(74)
North	North	0.9x	0.77	)		8.35		X	7	4.72	X		0.558	X	0.7		=	168.87	(74)
North	North	0.9x	0.77	)		8.35		X	7	9.99	X		0.558	X	0.7		=	180.79	(74)
North	North	0.9x	0.77	)		8.35		X	7	4.68	X		0.558	X	0.7		=	168.79	(74)
North	North	0.9x	0.77	)		8.35		X	5	9.25	X		0.558	X	0.7		=	133.91	(74)
North	North	0.9x	0.77	)		8.35		X	4	1.52	X		0.558	x	0.7		=	93.84	(74)
North	North	0.9x	0.77	)		8.35		X	2	4.19	x		0.558	x	0.7		=	54.67	(74)
Solid	North	0.9x	0.77	)		8.35		X	1	3.12	x		0.558	x	0.7		=	29.65	(74)
East	North	0.9x	0.77	)		8.35		X		3.86	x		0.558	×	0.7		=	20.04	(74)
East	East	0.9x	1	)		15.22		X	1	9.64	X		0.56	x	0.7		=	80.91	(76)
East	East	0.9x	1	)	(	15.22		X	3	8.42	X		0.56	x	0.7		=	158.29	(76)
East	East	0.9x	1	)		15.22		x	6	3.27	x		0.56	×	0.7		=	260.68	(76)
East	East	0.9x	1	)		15.22		x	9	2.28	x		0.56	×	0.7		=	380.18	(76)
East	East	0.9x	1	,		15.22		x	1	13.09	x		0.56	×	0.7		=	465.92	(76)
East	East	0.9x	1	<u> </u>		15.22		X	1	15.77	x		0.56	×	0.7		=	476.96	(76)
East 0.9x 1 x 15.22 x 73.59 x 0.56 x 0.7 = 303.18 (76)  East 0.9x 1 x 15.22 x 45.59 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 66.54 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m (62)m  (83)m= 104.95 204.22 338.72 505.54 634.8 657.74 622.87 523.96 397.01 242.49 130.54 86.58 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	East	0.9x	1	,		15.22		X	1	10.22	x		0.56	×	0.7		=	454.08	(76)
East 0.9x 1 x 15.22 x 45.59 x 0.56 x 0.7 = 187.82 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 66.54 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m= 104.95 204.22 338.72 505.54 634.8 657.74 622.87 523.96 397.01 242.49 130.54 86.58 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	East	0.9x	1	,		15.22		X	9	4.68	x		0.56	×	0.7		=	390.05	(76)
East	East	0.9x	1	)		15.22		X	7	3.59	x		0.56	×	0.7		=	303.18	(76)
East	East	0.9x	1	)		15.22		X	4	5.59	х		0.56	×	0.7		=	187.82	(76)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 104.95   204.22   338.72   505.54   634.8   657.74   622.87   523.96   397.01   242.49   130.54   86.58    Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 548.89   646.05   766.46   910.47   1016.48   1017.06   967.66   874.85   759.63   628.13   542.66   518.64    7. Mean internal temperature (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 = 0.94   0.91   0.85   0.74   0.6   0.45   0.34   0.38   0.59   0.81   0.91   0.95   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.88   19.2   19.7   20.28   20.88   20.89   20.96   20.95   20.77   20.21   19.44   18.83   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.14   20.14   20.15   20.16   20.16   20.17   20.17   20.17   20.17   20.16   20.15   20.15   (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.93   0.9   0.84   0.72   0.56   0.4   0.28   0.32   0.54   0.79   0.9   0.94   (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 17.29   17.74   18.45   19.26   19.8   20.07   20.14   20.13   19.93   19.18   18.11   17.21   (90)	East	0.9x	1	)		15.22		X	2	4.49	x		0.56	×	0.7		=	100.89	(76)
(83)m=	East	0.9x	1	)		15.22		X	1	6.15	х		0.56	×	0.7		=	66.54	(76)
(83)m=		_												_					_
Total gains — internal and solar (84)m = (73)m + (83)m , watts  (84)m = 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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 = 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.88 19.2 19.7 20.28 20.88 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Solar g	ains in	watts, ca	alculate	d for e	ach m	onth	1			(83)m	n = Si	um(74)m .	(82)m					
(84)m=       548.89       646.05       766.46       910.47       1016.48       1017.06       967.66       874.85       759.63       628.13       542.66       518.64       (84)         7. Mean internal temperature (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=         0.94       0.91       0.85       0.74       0.6       0.45       0.34       0.38       0.59       0.81       0.91       0.95       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       18.88       19.2       19.7       20.28       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.17       20.17       20.17	` '										523	.96	397.01	242.4	9 130.54	. 86	.58		(83)
7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Total g	ains – ii	nternal a	nd sola	ır (84)	m = (7	'3)m	+ (	83)m	, watts								•	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	(84)m=	548.89	646.05	766.46	910	47 10	16.48	10	17.06	967.66	874	.85	759.63	628.1	3 542.66	518	3.64		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	7. Me	an inter	nal temp	erature	(hea	ing se	asor	n)											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Temp	erature	during h	eating	period	s in th	e livi	ing	area	from Tal	ole 9	, Th	1 (°C)					21	(85)
(86)m=       0.94       0.91       0.85       0.74       0.6       0.45       0.34       0.38       0.59       0.81       0.91       0.95         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=         18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.17       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	Utilisa	ition fac	tor for g	ains for	living	area,	h1,n	า (ร	ee Ta	ble 9a)									_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)		Jan	Feb	Mar	A	or I	May		Jun	Jul	А	ug	Sep	Oc	t Nov		Эес		
(87)m=       18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.16       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	(86)m=	0.94	0.91	0.85	0.7	4 (	0.6		0.45	0.34	0.3	38	0.59	0.81	0.91	0.	95		(86)
(87)m=       18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.16       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	Mean	interna	l temper	ature in	living	area -	T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	e 9c)						
(88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	(87)m=	18.88	19.2	19.7	20.	.8 20	0.68	2	20.89	20.96	20.	95	20.77	20.2	19.44	18	.83		(87)
(88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Temp	erature	durina h	eating	nerio	s in re	est of	. dw	ellina	from Ta	able 9	——. 9 Th	n2 (°C)		•	- <b>!</b>			
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	· .							_		i	1		<u> </u>	20.10	6 20.15	20	.15		(88)
(89)m=     0.93     0.9     0.84     0.72     0.56     0.4     0.28     0.32     0.54     0.79     0.9     0.94       Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)m=     17.29     17.74     18.45     19.26     19.8     20.07     20.14     20.13     19.93     19.18     18.11     17.21     (90)			tor for a	oina far	root	f dural	lina	<u>ь</u>	m (00	L Toblo	0e/	!			<b>!</b>	_!			
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	1		Ť	1	1			1	•	i	T –	32	0.54	0.79	1 0 9	1 0	94		(89)
(90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)					<u> </u>					<u> </u>					1 0.5		J-i		(==)
	I				1			Ť			·		i		1 40.44	1 4-	. 04	1	(00)
$ILA = Living area \div (4) = 0.28 \tag{91}$	(90) <b>m</b> =	17.29	17.74	18.45	19.	.ο   1	9.8	<u> </u>	20.07	∠0.14	20.	13					.∠1	0.00	_
													'	_/ \ — LI	ing ar <del>c</del> a ∓	(¬) -		0.28	(al)

Mean in	nternal temper	ature (fo	or the wh	ole dwe	lling) – f	ΙΔ <b>ν</b> Τ1	<b>⊥</b> (1 _ fl	Δ) <b>~</b> T2					
	17.73 18.14	18.8	19.55	20.04	20.3	20.37	20.36	20.17	19.47	18.48	17.66		(92)
` ′	I djustment to t	L he mear	n interna		L ature fro	m Table	4e, whe	ere appro	L opriate				
· · · · -	17.73 18.14	18.8	19.55	20.04	20.3	20.37	20.36	20.17	19.47	18.48	17.66		(93)
8. Spac	e heating req	uirement	t										
	o the mean inte		•		ed at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
 Utilisatio	on factor for g	L	<u> </u>	ay	_ oun	1 00.							
	0.91 0.87	0.81	0.7	0.56	0.41	0.29	0.34	0.54	0.76	0.88	0.92		(94)
Useful g	gains, hmGm	, W = (9	4)m x (8	4)m				ı				l	
(95)m= 4	98.31 563.31	618.37	633.32	564.9	414	284.33	294.23	411.81	479.05	475.16	475.68		(95)
Monthly	average exte	rnal tem	perature	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)
	ss rate for me	i e	<del> </del>	i	Lm , W =	1 '	<del>- `                                   </del>	– (96)m	]			l	
( - /	081.22 1063.43		840.83	657.14	442.6	292.9	306.62	473.72	698.45	901.19	1071.87		(97)
	neating require	r	1		I	1			<del> </del>	r e	T 1		
(98)m= 4	33.69 336.08	272.64	149.41	68.63	0	0	0	0	163.24	306.74	443.57		7,000
							Tota	ıl per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	2173.98	(98)
Space h	neating require	ement in	kWh/m²	²/year								25.12	(99)
	gy requiremer		· ·	Ĭ									
	is used for sp of space heat									unity sch	neme.	0	(301)
Fraction	of space heat	from co	mmunity	system	1 – (30	1) =						1	(302)
	unity scheme ma								up to four	other heat	sources; ti	he latter	
	oilers, heat pump				rom powe	r stations.	See Appe	ndix C.			ı		7(000-)
	of heat from (		•									1	(303a)
Fraction	of total space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor fo	r control and	charging	method	l (Table 4	4c(3)) fo	or commu	unity hea	ating sys	tem			1	(305)
Distributi	on loss factor	(Table 1	12c) for (	commun	ity heati	ng syste	m					1.05	(306)
Space h	eating											kWh/yea	<u>.                                    </u>
Annual s	pace heating	requiren	nent									2173.98	
Space he	eat from Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	2282.68	(307a)
Efficienc	y of secondar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space he	eating require	ment fro	m secon	ıdary/sur	oplemen	itary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water he	eating vater heating i	equirem	nent									2151.41	7
	rom communi	•											_ _
	eat from Comr	•						(64) x (30	03a) x (30	5) x (306) :	=	2258.98	(310a)
Electricity	y used for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	45.42	(313)
Cooling S	System Energ	y Efficie	ncy Rati	0								0	(314)
Space co	ooling (if there	is a fixe	ed coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)

Electricity for pumps and fans within dwelling (Table 4f):	rom outoido		407.04	7(2200)
mechanical ventilation - balanced, extract or positive input f	rom outside		167.91	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	167.91	(331)
Energy for lighting (calculated in Appendix L)			366.22	(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 CI Efficiency of heat source 1 (%)	HP) using two fuels repeat (363) to	(366) for the second fue	el 89.5	(367a)
CO2 associated with heat source 1 [(30	07b)+(310b)] x 100 ÷ (367b) x	0.22	1096.09	(367)
Electrical energy for heat distribution	[(313) x	0.52	23.57	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	1119.66	(373)
CO2 associated with space heating (secondary)	(309) x	0	0	(374)
CO2 associated with water from immersion heater or instan	taneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		1119.66	(376)
CO2 associated with electricity for pumps and fans within d	welling (331)) x	0.52	87.14	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	190.07	(379)
Total CO2, kg/year sum of (376)(382) =			1396.87	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			16.14	(384)
El rating (section 14)			85.77	(385)

			User	Details:						
Assessor Name:	Matthew St	tainrad	OSCI I	Strom	o Nives	hor:		STD (	0023501	
Software Name:	Stroma FS			Softwa					on: 1.0.4.16	
Software Name:	Stroma FS	AP 2012	Duonout				ГО	versio	)II. 1.0. <del>4</del> .10	
Address .	4E 0 Portro	m Street, Lo	Property	Address	: 06-18-0	09419 4	F-9			
Address: 1. Overall dwelling dime		m Street, Loi	laon							
1. Overall dwelling diffie	ensions.		۸۳۵	o(m²)		۸۷ ۵۰	iaht/m\		Volume(m <sup>3</sup>	31
Ground floor				ea(m²) 86.56	(1a) x		eight(m) 2.4	(2a) =	207.74	) (3a)
	a) . (4b) . (4a) . (	4 -1) . (4 -) .					2.4	(24) =	207.74	(34)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1u)+(1e)+	.(111)	86.56	(4)			<i>i</i>		_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	207.74	(5)
2. Ventilation rate:										
	main heating	secon heatir		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	=	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0		0	X	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vents	<b>S</b>				F	0	X	10 =	0	(7b)
Number of flueless gas fi					Ļ		<u> </u>	40 =		= ' '
Trumber of flueless gas in	li es				L	0	^		0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a)+(6b	))+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	•				continue fr		(16)	÷ (5) =	U	(6)
Number of storeys in t			( ),			(-)	( -/		0	(9)
Additional infiltration	<b>.</b> .	,					[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame	or 0.35 fc	r mason	ry consti	ruction			0	(11)
if both types of wall are p			ng to the grea	ter wall are	a (after					_
deducting areas of openial If suspended wooden to	• / .		ır N 1 (spal	ad) alsa	enter ()					7(12)
If no draught lobby, en		•	11 U. 1 (Seal	eu), eise	CITICI U				0	(12)
Percentage of window	•		d						0	= ' '
Window infiltration	s and doors die	augiit strippe	u	0.25 - [0.2	) x (14) ÷ 1	1001 =			0	(14)
Infiltration rate				(8) + (10)	` '	_	+ (15) =		0	(16)
Air permeability value,	a50 expresse	d in cubic me	etres per h					e area	3	(17)
If based on air permeabil			-		•	0110 01 0	on voiop	o aroa	0.15	(18)
Air permeability value applie	,					is being u	ısed		0.15	(10)
Number of sides sheltere						•			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified f	for monthly win	d speed							_	
Jan Feb	Mar Apr	May Ju	ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
		•							-	
Wind Factor $(22a)m = (2$	2)m ÷ 4							_	-	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate (allow	ing for she	elter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16 0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effec	_	rate for th	e appli	cable ca	se	!	!	!	!	1	J	_
If mechanica		andiv N. (22)	h) - (22a	) v Emy (c	aguation (I	VEVV otho	muioo (22h	v) = (33a)			0.5	(23a)
	at pump using App							)) = (23a)			0.5	(23b)
	heat recovery: effi	-	_					Ol- \ /	005) [	4 (00-)	79.9	(23c)
· -	d mechanical v 0.26 0.26		0.24	0.22	0.22	HR) (248	a)m = (2) 0.23	2b)m + ( 0.24	23b) × [ 0.24	1 – (23c) 0.25	i ÷ 100] I	(24a)
(24a)m= 0.26		0.24					<u> </u>	ļ		0.25		(24a)
(24b)m= 0	d mechanical v	entilation v	o I	neat rec		0 (240 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	26)m + (. T 0	230)	0	1	(24b)
( ',	ouse extract ve	<u> </u>										(210)
,	$< 0.5 \times (23b)$ ,		•	•				.5 × (23h	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural v	entilation or wl	hole house	positiv	e input	ventilati	on from	loft	<u> </u>		Į	ı	
,	= 1, then (24d		•	•				0.5]			_	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change rate - e	nter (24a)	or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.26	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losses	and heat loss	parameter	r:									
ELEMENT	Gross area (m²)	Opening m <sup>2</sup>	S	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		X k /K
Doors	( )			2.1	x	1.4		2.94				(26)
Windows Type	1			15.22		/[1/( 1.4 )+	- 0.04] =	20.18	Ħ			(27)
Windows Type	2			8.35		/[1/( 1.4 )+	- 0.04] =	11.07	=			(27)
Walls Type1	51.14	25.67	$\neg$	25.47	7 X	0.15	=	3.82		14	356.58	(29)
Walls Type2	8.21	0	=	8.21	x	0.14	=	1.16	Ħ i	14	114.94	(29)
Walls Type3	9.98	0		9.98	x	0.13	<del>-</del>	1.32		14	139.72	(29)
Roof	86.56	0		86.56	3 x	0.11	=	9.52	i i	9	779.04	(30)
Total area of el	ements, m <sup>2</sup>			155.8	9							(31)
Party wall				32.95	5 X	0	=	0		20	659	(32)
Party floor				86.56	5					40	3462.4	(32a)
Internal wall **				163.2	2					9	1468.8	(32c)
* for windows and i					lated using	g formula 1	1/[(1/U-valu	ue)+0.04] á	as given in	paragraph	1 3.2	_
Fabric heat loss	s, W/K = S (A >	(U)				(26)(30	) + (32) =				50.01	(33)
Heat capacity C	Cm = S(A x k)						((28).	(30) + (32	2) + (32a)	(32e) =	6980.48	(34)
Thermal mass	naramatar /TM	D 0	TEA) in	l 1/m2l/			- (34)	) ÷ (4) =			80.64	(35)
man mass	parameter (Tivi	$P = Cm \div$	11 7) 111	I KJ/III~K			- (34)	( -)			00.04	(/
For design assessi	ments where the d	etails of the c	,			recisely the	` '		TMP in T	able 1f	00.04	(==)
For design assessi	ments where the d ad of a detailed cal	etails of the c	constructi	ion are no	t known pi	recisely the	` '		TMP in T	able 1f	12.37	(36)
For design assessi can be used instea	ments where the dand of a detailed calces: S (L x Y) call bridging are not k	etails of the c culation. Ilculated us	constructi	on are not	t known pi	recisely the	` '		TMP in T	able 1f		

Ventila	tion hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.03	17.82	17.6	16.5	16.29	15.19	15.19	14.98	15.63	16.29	16.72	17.16		(38)
Heat tr	ansfer c	oefficier	nt, W/K	•	•	•	•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	80.41	80.19	79.97	78.88	78.66	77.57	77.57	77.35	78.01	78.66	79.1	79.54		
Heat Ic	ss para	meter (H	HLP), W	m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> · (4)	12 /12=	78.83	(39)
(40)m=	0.93	0.93	0.92	0.91	0.91	0.9	0.9	0.89	0.9	0.91	0.91	0.92		
Numbe	er of day	s in moi	nth (Tab	le 1a)		•	•	•	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.91	(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	iter heat	ing enei	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	pancy, l	N								2	.58		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.				` '
								(25 x N)				5.37		(43)
		-	not water person pei	• .		-	-	to achieve	a water us	se target o	Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	Oct	INOV	Dec		
(44)m=	104.91	101.09	97.28	93.46	89.65	85.83	85.83	89.65	93.46	97.28	101.09	104.91		
( - 1,111									<u> </u>		m(44) <sub>112</sub> =	l	1144.46	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	155.58	136.07	140.41	122.41	117.46	101.36	93.92	107.78	109.06	127.1	138.74	150.67		
lf instant	taneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1500.57	(45)
1			· ·	·				· · ·	. , ,	40.07	00.04	00.0		(46)
(46)m= Water	23.34 storage	20.41 loss:	21.06	18.36	17.62	15.2	14.09	16.17	16.36	19.07	20.81	22.6		(46)
	_		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)					l	
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage			(		- (1.14/1	. / .1 \						l	
•			eclared I		or is kno	wn (kvvr	n/day):					0		(48)
			m Table					(10)				0		(49)
			storage eclared o			or is not		(48) x (49)	) =		1	10		(50)
			factor fr								0.	.02		(51)
			ee secti											
	e factor										1.	.03		(52)
			m Table									.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
	(50) or (	, ,	•					(/EC) :	==\		1.	.03		(55)
vvater:			culated 1					((56)m = (	55) × (41)ı	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)

•	ains 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= 32.0	1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	uit loss (ar	nnual) fro	m Table	 e 3						!	0		(58)
Primary circ	•	,			59)m = (	(58) ÷ 36	65 × (41)	m				'	
(modified	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= 23.2	6 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss	calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water he	eating ca	alculated	I for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 210.	85 186	195.69	175.91	172.74	154.85	149.2	163.05	162.56	182.38	192.24	205.94		(62)
Solar DHW inp	ut calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 210.	85 186	195.69	175.91	172.74	154.85	149.2	163.05	162.56	182.38	192.24	205.94		
	•						Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2151.41	(64)
Heat gains	from 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= 95.9	5 85.18	90.91	83.5	83.28	76.5	75.45	80.06	79.06	86.48	88.93	94.32		(65)
include (5	57)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic g				,									
Ja		1											
	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 128.		Mar 128.78	Apr 128.78	May 128.78	Jun 128.78	Jul 128.78	Aug 128.78	Sep 128.78	Oct 128.78	Nov 128.78	Dec 128.78		(66)
<u> </u>	78 128.78	128.78	128.78	128.78	128.78	128.78	128.78	128.78	<b>-</b>	-			(66)
(66)m= 128.	78 128.78 ns (calcula	128.78	128.78	128.78	128.78	128.78	128.78	128.78	<b>-</b>	-			(66) (67)
(66)m= 128. Lighting gai	78 128.78 ns (calcula 74 18.42	128.78 ted in Ap 14.98	128.78 opendix 11.34	128.78 L, equat 8.48	128.78 ion L9 oi 7.16	128.78 r L9a), a 7.73	128.78 Iso see	128.78 Table 5	128.78 17.13	128.78	128.78		
(66)m= 128. Lighting gai (67)m= 20.7	78 128.78 ns (calcula 4 18.42 gains (calc	128.78 ted in Ap 14.98	128.78 opendix 11.34	128.78 L, equat 8.48	128.78 ion L9 oi 7.16	128.78 r L9a), a 7.73	128.78 Iso see	128.78 Table 5	128.78 17.13	128.78	128.78		
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232	ns (calcula 4 18.42 gains (calc 6 235.02	128.78 ted in Ap 14.98 culated in 228.94	128.78 opendix 11.34 n Append 215.99	128.78 L, equat 8.48 dix L, eq 199.64	128.78 ion L9 or 7.16 uation L	128.78 r L9a), a 7.73 13 or L1 174.02	128.78 Iso see 10.05 3a), also	128.78 Table 5 13.49 see Tal 177.68	128.78 17.13 ble 5 190.63	128.78	128.78 21.31		(67)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances	ns (calcula 4 18.42 gains (calc 6 235.02 ins (calcula	128.78 ted in Ap 14.98 culated in 228.94	128.78 opendix 11.34 n Append 215.99	128.78 L, equat 8.48 dix L, eq 199.64	128.78 ion L9 or 7.16 uation L	128.78 r L9a), a 7.73 13 or L1 174.02	128.78 Iso see 10.05 3a), also	128.78 Table 5 13.49 see Tal 177.68	128.78 17.13 ble 5 190.63	128.78	128.78 21.31		(67)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8	128.78 ns (calcula 14 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88	128.78  tted in Ap 14.98 culated in 228.94 ated in Ap 35.88	128.78  ppendix  11.34  Append  215.99  ppendix  35.88	128.78 L, equat 8.48 dix L, eq 199.64 L, equat	128.78 ion L9 of 7.16 uation L 184.28 ion L15	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a)	128.78 lso see 10.05 3a), also 171.6	128.78 Table 5 13.49 see Tal 177.68 ee Table	128.78 17.13 ble 5 190.63 5	128.78 19.99 206.98	128.78 21.31 222.34		(67) (68)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and	128.78 ns (calcula 14 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88	128.78  tted in Ap 14.98 culated in 228.94 ated in Ap 35.88	128.78  ppendix  11.34  Append  215.99  ppendix  35.88	128.78 L, equat 8.48 dix L, eq 199.64 L, equat	128.78 ion L9 of 7.16 uation L 184.28 ion L15	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a)	128.78 lso see 10.05 3a), also 171.6	128.78 Table 5 13.49 see Tal 177.68 ee Table	128.78 17.13 ble 5 190.63 5	128.78 19.99 206.98	128.78 21.31 222.34		(67) (68)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0	ns (calcula 4 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88 fans gains	128.78  ted in Ap 14.98 culated in 228.94 ated in Ap 35.88 c (Table 5	128.78  ppendix 11.34  Append 215.99  ppendix 35.88  5a)  0	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78 17.13 ble 5 190.63 5 35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatio	ted in Ap 14.98 culated in 228.94 ated in Ap 35.88 c (Table 5	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5)	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78 17.13 ble 5 190.63 5 35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103.	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatic 03 -103.03	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  c (Table 5 0  on (negation)	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78  17.13 ble 5  190.63  5  35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69) (70)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and (70)m= 0  Losses e.g. (71)m= -103.  Water heati	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatio 03 -103.03 ng gains (7	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  c (Table 5 0  on (negation)	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0	128.78  17.13 ble 5  190.63 5  35.88  0	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128.	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7 97   126.76	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  In (negation of the context)  122.19	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88 0 -103.03	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88 0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03	128.78 19.99 206.98 35.88 0 -103.03	128.78 21.31 222.34 35.88 0 -103.03		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr	128.78  ns (calcular 18.42  gains (calcular 235.02  ns (calcular 8 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7 126.76  nal gains =	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  (Table 5 0 on (negation of the color) 122.19	128.78 ppendix 11.34 Appendix 215.99 ppendix 35.88 5a) 0 tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 le 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0  -103.03  101.41 m + (67)m	128.78 lso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88  0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7	128.78 19.99 206.98 35.88 0 -103.03 123.51 1)m + (72)	128.78  21.31  222.34  35.88  0  -103.03		(67) (68) (69) (70) (71) (72)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr (73)m= 443.	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7  126.76  nal gains =	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  In (negation of the context)  122.19	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88 0 -103.03	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88 0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03	128.78 19.99 206.98 35.88 0 -103.03	128.78 21.31 222.34 35.88 0 -103.03		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 8 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7  126.76  nal gains = 94 441.83  iins:	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  (Table 5 0 on (negated in 103.03)  Table 5) 122.19	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03  115.97	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03  111.93	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03  106.24 (66) 359.32	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0  -103.03  101.41 m + (67)m 344.8	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03  107.6 1+(68)m+ 350.89	128.78 Table 5 13.49 See Tal 177.68 See Table 35.88  0 -103.03  109.8 + (69)m	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7  385.64	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72) 412.12	128.78  21.31  222.34  35.88  0  -103.03  126.77		(67) (68) (69) (70) (71) (72)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr (73)m= 443. 6. Solar ga	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporatio 3 -103.03  ng gains (7  97   126.76  nal gains = 94   441.83  ins: re calculated	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  In (negation of the context) 122.19  427.74  Using sola	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03  115.97	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03  111.93	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03  106.24 (66) 359.32	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0 -103.03  101.41 m + (67)m 344.8	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03  107.6 1+(68)m+ 350.89	128.78 Table 5 13.49 See Tal 177.68 See Table 35.88  0 -103.03  109.8 + (69)m	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7  385.64	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72) 412.12	128.78  21.31  222.34  35.88  0  -103.03  126.77	Gains	(67) (68) (69) (70) (71) (72)

North	0.9x	0.77		x	8.3	5	x	1	0.63	1 x		0.558	7 x	0.7			24.03	(74)
North	0.9x	0.77		x	8.3		X	=	0.32	] x		0.558	X	0.7	= =		45.93	(74)
North	0.9x	0.77		x	8.3		x		4.53	] x	_	0.558	] x	0.7	= =		78.05	(74)
North	0.9x	0.77	$\equiv$	x	8.3		x		5.46	] ]	<b>—</b>	0.558	」 기 x	0.7	╡.	$\vdash$	125.36	(74)
North	0.9x	0.77		X	8.3		x	_	4.72	] ]	<b>-</b>	0.558	X	0.7	╡.		168.87	(74)
North	0.9x	0.77		x	8.3		x	<u> </u>	9.99	] ] x		0.558	X	0.7	= =		180.79	(74)
North	0.9x	0.77		x	8.3		х	_	4.68	)   x		0.558	X	0.7		. –	168.79	(74)
North	0.9x	0.77		x	8.3	5	х	5	9.25	X		0.558	X	0.7			133.91	(74)
North	0.9x	0.77		x	8.3	5	x	4	1.52	x		0.558	x	0.7	= =		93.84	(74)
North	0.9x	0.77		x	8.3	5	х	2	4.19	x		0.558	x	0.7			54.67	(74)
North	0.9x	0.77		x	8.3	5	х	1	3.12	x		0.558	X	0.7	_ =		29.65	(74)
North	0.9x	0.77		x	8.3	5	x	8	3.86	x		0.558	x	0.7			20.04	(74)
West	0.9x	0.77		x	15.2	22	x	1	9.64	x		0.56	x	0.7			80.91	(80)
West	0.9x	0.77		x	15.2	22	x	3	8.42	x		0.56	x	0.7			158.29	(80)
West	0.9x	0.77		x	15.2	22	x	6	3.27	X		0.56	х	0.7	=		260.68	(80)
West	0.9x	0.77		x	15.2	22	x	9	2.28	x		0.56	x	0.7			380.18	(80)
West	0.9x	0.77		x	15.2	22	x	1	13.09	x		0.56	x	0.7	-		465.92	(80)
West	0.9x	0.77		x	15.2	22	x	1	15.77	X		0.56	X	0.7	=		476.96	(80)
West	0.9x	0.77		x	15.2	22	x	1	10.22	X		0.56	X	0.7	-		454.08	(80)
West	0.9x	0.77		x	15.2	22	x	9	4.68	X		0.56	X	0.7	=		390.05	(80)
West	0.9x	0.77		x	15.2	22	x	7	3.59	X		0.56	X	0.7	=		303.18	(80)
West	0.9x	0.77		x	15.2	22	x	4	5.59	X		0.56	X	0.7	=		187.82	(80)
West	0.9x	0.77		x	15.2	22	x	2	4.49	X		0.56	X	0.7	=		100.89	(80)
West	0.9x	0.77		x	15.2	22	X	1	6.15	X	(	0.56	X	0.7	=		66.54	(80)
Ť		watts, ca					1	F7 74		r	-	n(74)m		2 1 400 54	00.50	7		(02)
(83)m=   Total o		1 204.22 nternal a	338.		505.54 (84)m =	634.8 (73)m		57.74 83\m	622.87	523	.96	397.01	242.4	9 130.54	86.58			(83)
(84)m=	548.89	646.05	766.		910.47	, ,	<u> </u>	03)111	967.66	874	. 85	759.63	628.1	3 542.66	518.64	П		(84)
` ′ [		L .						711100	007.00	<u> </u>	.00		020	7 0 .2.00	0.0.0			
		nal temp during h			Ĭ			oroo f	rom Tok	olo O	Th1	(°C)						7(05)
•		ctor for ga		٠.			·			JIE 9	, 1111	( C)					21	(85)
	Jan	Feb	M	-	Apr	May	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec			
(86)m=	0.94	0.91	0.8	$\rightarrow$	0.74	0.6	_	0.45	0.34	0.3	<del>-</del>	0.59	0.81	0.91	0.95			(86)
L	intorno	ıl tempera	aturo	Lin li	ving or	22 T1 /	(follo	w cto	nc 3 to 7	I 7 in T		00)						
(87)m=	18.89	19.2	19.	$\overline{}$	20.28	20.68	<del>`</del>	20.9	20.96	20.		20.77	20.21	19.45	18.83			(87)
				!								<u> </u>			10100			, ,
(88)m=	20.14	during h	20.	<del></del> -	20.16	20.16	$\neg$	20.17	20.17	20.		20.17	20.16	20.16	20.15	7		(88)
							_!_				''	20.17	20.10	20.10	20.10			(55)
ı		ctor for ga		-			i, h2 T			T	, T	0.54	0.70		0.04	1		(89)
(89)m=	0.93	0.9	0.8		0.72	0.56		0.4	0.28	0.3		0.54	0.79	0.9	0.94			(03)
Mean	interna	ıl tempera	ature	in tl	he rest	of dwe	lling	T2 (fo	ollow ste	eps 3	3 to 7	in Table	9c)					

(90)m= 17.29 17.74 18.46 19.27 19.8 20.07 20.14 2	20.13 19.93	19.19	18.11	17.21	1	(90)
(90)m= 17.29 17.74 18.46 19.27 19.8 20.07 20.14 2		LA = Living			0.28	(91)
Many internal terroproperture (for the sub-planck planck) (fl. A. v. T.4. v.		·	`	,	0.20	(0.7)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (92)m = 17.73   18.15   18.8   19.55   20.05   20.3   20.37 $	20.36 $20.17$	19.47	18.48	17.66		(92)
Apply adjustment to the mean internal temperature from Table 46						
	20.36 20.17	19.47	18.48	17.66		(93)
8. Space heating requirement						
Set Ti to the mean internal temperature obtained at step 11 of Ta	ble 9b, so tha	t Ti,m=(7	76)m an	d re-calc	culate	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul	Aug Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:	7.ug   00p		1407			
(94)m= 0.91 0.87 0.81 0.7 0.56 0.41 0.29	0.34 0.54	0.76	0.88	0.92		(94)
Useful gains, hmGm , W = (94)m x (84)m						
	93.98 411.58	478.95	475.13	475.67		(95)
Monthly average external temperature from Table 8  (96)m=	16.4 14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [i			7.1	4.2		(30)
	306.3 473.24	697.8	900.37	1070.9		(97)
Space heating requirement for each month, kWh/month = 0.024	x [(97)m – (95	)m] x (41	)m		l	
(98)m= 432.98 335.46 272.03 148.97 68.36 0 0	0 0	162.83	306.17	442.85		
	Total per year	(kWh/year)	) = Sum(9	8) <sub>15,912</sub> =	2169.64	(98)
Space heating requirement in kWh/m²/year					25.07	(99)
Oh Fransızia i Garanızia başlırı						
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating			unity sch	neme.	0	(301)
			unity sch	neme.	0	(301)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system $1 - (301) =$	ble 11) '0' if no	one	·		1	= ' '
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowing includes boilers, heat pumps, geothermal and waste heat from power stations. See	ble 11) '0' if no	one	·		1	(302)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowed to the several sources of the several sources.	ble 11) '0' if no	one	·		1	= ' '
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowing includes boilers, heat pumps, geothermal and waste heat from power stations. See	ble 11) '0' if no	one up to four c	·	sources; t	1 he latter	(302)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers	ible 11) '0' if no	one up to four d	other heat	sources; t	1 he latter	(302) (303a)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers	ible 11) '0' if no	one up to four d	other heat	sources; t	1 he latter 1	(302) (303a) (304a)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community	ible 11) '0' if no	one up to four d	other heat	sources; t	1 he latter  1 1	(302) (303a) (304a) (305) (306)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community boilers Distribution loss factor (Table 12c) for community heating system	ible 11) '0' if no	one up to four d	other heat	sources; t	1 he latter  1 1 1 1 1.05	(302) (303a) (304a) (305) (306)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating	ble 11) '0' if no	one up to four d	other heat 02) x (303	sources; t	1 he latter  1 1 1 1 1.05 kWh/yea	(302) (303a) (304a) (305) (306)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement	ty heating syst	(30 tem	other heat 02) x (303	sources; t	1 he latter  1 1 1 1.05 kWh/yea 2169.64	(302) (303a) (304a) (305) (306)
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers	ws for CHP and to Appendix C.  ty heating syst  (98) x (30)	(30 tem	i) x (306) = E)	sources; t	1 he latter  1 1 1 1.05 kWh/yea 2169.64 2278.13	(302) (303a) (304a) (305) (306) <b>Ar</b>
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system)  Water heating	ws for CHP and to Appendix C.  ty heating syst  (98) x (30)	(30 tem	i) x (306) = E)	sources; t	1 he latter  1 1 1 1.05 kWh/yea 2169.64 2278.13 0 0	(302) (303a) (304a) (305) (306)  (307a) (308
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system  Water heating  Annual water heating requirement	ws for CHP and to Appendix C.  ty heating syst  (98) x (30)	(30 tem	i) x (306) = E)	sources; t	1 he latter  1 1 1 1.05 kWh/yea 2169.64 2278.13 0	(302) (303a) (304a) (305) (306)  (307a) (308
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tale Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system)  Water heating	ty heating system (98) x (30)  Table 4a or A  (98) x (30)	(30 tem	other heat 02) x (303) 6) x (306) = E) • (308) =	sources; t	1 he latter  1 1 1 1.05 kWh/yea 2169.64 2278.13 0 0	(302) (303a) (304a) (305) (306)  (307a) (308
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allowincludes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system  Water heating  Annual water heating requirement  If DHW from community scheme:	ty heating system (98) x (30)  Table 4a or A  (98) x (30)	(30) tem (305) ppendix (305) (305) (305)	i) x (306) = E) (308) =	sources; to	1 he latter  1 1 1 1.05 kWh/yea 2169.64 2278.13 0 0	(302) (303a) (304a) (305) (306)  ar (307a) (308 (309)

Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwe	<u> </u>			_		7
mechanical ventilation - balanced, extra	ct or positive input from	outside		L	167.91	(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) =		167.91	(331)
Energy for lighting (calculated in Append	lix L)			Ī	366.22	(332)
12b. CO2 Emissions – Community heati	ng scheme					
		Energy	Emission fac			
		kWh/year	kg CO2/kWh	Κį	g CO2/year	
CO2 from other sources of space and was Efficiency of heat source 1 (%)	<b>O</b> \ ,	g two fuels repeat (363) to	(366) for the second	d fuel	89.5	(367a)
CO2 associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	0.22	=	1094.99	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	23.55	(372)
Total CO2 associated with community sy	/stems	(363)(366) + (368)(372	2)	=	1118.54	(373)
CO2 associated with space heating (sec	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	ion heater or instantan	eous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =			1118.54	(376)
CO2 associated with electricity for pump	s and fans within dwell	ing (331)) x	0.52	=	87.14	(378)
CO2 associated with electricity for lighting	g	(332))) x	0.52	=	190.07	(379)
Total CO2, kg/year	sum of (376)(382) =				1395.75	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			Ē	16.12	(384)

El rating (section 14)

(385)

85.78

		l Iser I	Details:						
Assessor Name: Software Name:	Matthew Stainrod Stroma FSAP 2012	<u> </u>	Strom Softwa					0023501 on: 1.0.4.16	
Software Name.		Property	Address			F-1	VEISIC	лі. т.ט. <del>4</del> .то	
Address :	GF-1, Bertram Street, Lond		Madress	00 10 0	33413 C	'			
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)	-	Volume(m <sup>3</sup>	<u> </u>
Ground floor			73.52	(1a) x		2.4	(2a) =	176.45	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	73.52	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	176.45	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b> + -	0	Ī <b>-</b> [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x '	10 =	0	(7a)
Number of passive vents	3			F	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
· ·				L					`
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+($				0		÷ (5) =	0	(8)
	peen carried out or is intended, proceed	ed to (17),	otherwise (	continue fr	rom (9) to	(16)			
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(Q).	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masoni	v constr	ruction	[(0)	1].0.1 =	0	(11)
if both types of wall are p	resent, use the value corresponding t			•					`
deducting areas of opening	<i>ngs); if equal user 0.35</i> floor, enter 0.2 (unsealed) or 0	1 (cool	od) olco	ontor O					<b>—</b> (40)
If no draught lobby, en	,	. i (Seal	eu), eise	enter o				0	(12)
•	s and doors draught stripped							0	(14)
Window infiltration	3		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7(10)
Shelter factor	<del>c</del> u		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.78	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m <i>÷ 1</i>								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
(-20)	1 0.30	1 0.00	1 3.02	<u> </u>	L	12		J	

Adjusted infiltra	ation rate	e (allowi	ng for st	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effec		_	rate for t	he appli	cable ca	se	•	•	•	•	•		
If mechanica If exhaust air he			andiv N. (S	3h) - (23	a) v Emy (	aguation (I	VE)) otho	nvico (22h	) - (232)			0.5	(23
If balanced with		0 11		, ,	,	. `	,, .	,	) = (23a)			0.5	(23
		-	-	_					Ol- \	00h) [4	(OO = )	79.9	(23
a) If balance	0.25	o.24	0.23	0.23	at recov	0.21	1R) (248 0.21	0.22	2b)m + ( 0.23	23b) × [* 0.23	0.24	÷ 100]	(24
b) If balance					L		<u> </u>	L		L	0.24		(_
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho								<u> </u>					(-
if (22b)m				•	•				.5 × (23k	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v	ـــــــــــــــــــــــــــــــــــــ	on or wh	ole hous	e positi	ve input	ventilatio	on from I	loft	!	!	!		
if (22b)m									0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)					
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(2
3. Heat losses	and he	eat loss r	paramet	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-ł		X k J/K
oors					2.1	x	1.4	=	2.94				(2
Vindows Type	1				3.8	x1	/[1/( 1.4 )+	0.04] =	5.04	=			(2
Vindows Type	2				15.96	3 x1	/[1/( 1.4 )+	0.04] =	21.16	=			(2
loor					73.52	2 X	0.11	i	8.08719	9 [	110	8087	.2 (2
Valls Type1	47.6	64	21.80	6	25.78	3 x	0.15	<b>=</b>	3.87	<b>=</b>	14	360.9	2 (2
Valls Type2	2.4	=	0		2.4	X	0.14	<b>=</b>	0.34	<b>=</b>	14	33.6	=
otal area of el					123.5	_	<u> </u>		0.0 .				\` (3
arty wall		,			37.13	=	0		0	<b>—</b> [	20	742.	`
arty ceiling					73.52	=			<u> </u>		30	2205	=
nternal wall **					110.4	_				L			=
for windows and it					alue calcui		ı formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	9 paragraph	993.	<u>o (</u> (
abric heat los				о ини раг			(26)(30)	) + (32) =				41.43	(3
eat capacity (		•	-,				•		(30) + (3	2) + (32a).	(32e) =	12423.52	(3
hermal mass	,	,	o = Cm -	- TFA) ir	n kJ/m²K				÷ (4) =	, ( - <i>f</i> -	` '	168.98	= (3
or design assessi an be used instea	ments wh	ere the de	tails of the	•			ecisely the	` '		TMP in Ta	able 1f	100.30	
hermal bridge				using Ar	pendix l	K						9.46	(3
details of thermai	l bridging	,		• •	•			(33) +	(36) =			50.89	(3
								\-~/ ·					110
entilation hea	t loss ca	alculated	l monthly	/						(25)m x (5)	) )	00.00	`

(00) = 44.40	1 44 04	T 4444	40.0	40.40	40.00	40.00	T 40.44	40.00	40.40	10.47	1004		(20)
(38)m= 14.48	14.31	14.14	13.3	13.13	12.28	12.28	12.11	12.62	13.13	13.47	13.81		(38)
Heat transfer (39)m= 65.37	65.2	nt, W/K 65.03	64.19	64.02	63.17	63.17	63	(39)m 63.51	64.02	38)m 64.36	64.7		
(39)111=   03.37	03.2	03.03	04.19	04.02	03.17	03.17	03			Sum(39) <sub>1</sub>	<del>                                     </del>	64.15	(39)
Heat loss par	ameter (I	HLP), W	/m²K			_	_		= (39)m ÷		127	00	<b></b> ` ′
(40)m= 0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.88	0.88		_
Number of da	ıvs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.87	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ	unanev	N											(42)
if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.33		(42)
if TFA £ 13 Annual avera	•	atar usar	no in litro	se nar da	v Vd av	orano –	(25 v NI)	<b>+</b> 36		0/	2.5		(42)
Reduce the annu	ial average	hot water	usage by	5% if the a	welling is	designed t			se target o		9.5		(43)
not more that 12:	5 litres per	person pei	r day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	<del>,</del>		ı			1	· <i>'</i>				T 1		
(44)m= 98.45	94.87	91.29	87.71	84.13	80.55	80.55	84.13	87.71	91.29	94.87	98.45	4074.04	7(44)
Energy content of	of hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1074.01	(44)
(45)m= 146	127.69	131.77	114.88	110.23	95.12	88.14	101.14	102.35	119.28	130.2	141.39		
									Γotal = Su	m(45) <sub>112</sub> =	=	1408.2	(45)
If instantaneous	_	ng at point		hot water	storage),	enter 0 in	boxes (46)	) to (61)					
(46)m= 21.9 Water storage	19.15	19.77	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21		(46)
Storage volur		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						` ,
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage		oolorod l	ana fant	ar ia kaa	/Id\A/k	2/dox/\							(40)
<ul><li>a) If manufact</li><li>Temperature</li></ul>				JI 15 KI10	WII (KVVI	i/uay).					0		(48)
Energy lost fr				ar			(48) x (49)	· –			0		(49) (50)
b) If manufac		_	-		or is not		(40) X (40)	_		'	10		(30)
Hot water sto	•			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community Volume factor	_		on 4.3										(50)
Temperature			2b							-	.6		(52) (53)
Energy lost fr				ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				( ) (- )	(- )	,		.03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = (	55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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 Appendix	¢Н	
(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 (annual) fr	om Table 3			(	)	(58)								
Primary circuit loss calculated		$n = (58) \div 365 \times$	(41)m											
(modified by factor from Tal	ole H5 if there is solar	water heating a	nd a cylinder t	hermostat)										
(59)m= 23.26 21.01 23.26	22.51 23.26 22.	51 23.26 23	.26 22.51	23.26 22.51	23.26	(59)								
Combi loss calculated for eac	h month (61)m = (60)	÷ 365 × (41)m												
(61)m= 0 0 0	0 0 0	<del>- i - ` i -</del>	0 0	0 0	0	(61)								
Total heat required for water h	neating calculated for	each month (62)	)m = 0.85 × (45	5)m + (46)m +	 (57)m + (59)m + (61)n	n								
(62)m= 201.28 177.62 187.04	<del></del>		<del>`                                    </del>	174.56 183.7	196.67	(62)								
Solar DHW input calculated using Ap				ontribution to wate	r heating)									
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)         (63)m=       0 </td														
Output from water heater	1 1													
(64)m= 201.28 177.62 187.04	168.37 165.5 148	.61 143.42 156	6.42 155.85 1	174.56 183.7	196.67									
	1 1 1			er heater (annual)		(64)								
Heat gains from water heating	r k\//h/month 0 25 ′ [0	) 85 v (45)m ± (1				<b>_</b> '` ′								
(65)m= 92.77 82.4 88.03	80.99 80.87 74.	1 1	1 1	83.88 86.09	91.23	(65)								
` '	<u> </u>					(55)								
include (57)m in calculation	. ,	ier is in the awe	lling or not wat	er is from comi	munity neating									
5. Internal gains (see Table	, in the second													
Metabolic gains (Table 5), Wa		<del></del>	1.1	_										
Jan Feb Mar	+		lug Sep	Oct Nov	Dec	(2.5)								
(66)m= 116.42 116.42 116.42	116.42   116.42   116	.42 116.42 116	6.42   116.42   1	116.42   116.42	116.42	(66)								
Lighting gains (calculated in A	ppendix L, equation L	.9 or L9a), also												
(67)m= 18.31 16.26 13.22	10.01 7.48 6.3	32 6.83 8.	87 11.91	15.12 17.65	18.82	(67)								
Appliances gains (calculated i	n Appendix L, equation	on L13 or L13a),	also see Table	e 5										
(68)m= 205.37 207.5 202.13	190.7 176.27 162	2.7 153.64 15 <sup>4</sup>	1.51 156.88 1	168.31 182.74	196.31	(68)								
Cooking gains (calculated in A	Appendix L, equation L	_15 or L15a), als	so see Table 5	;										
(69)m= 34.64 34.64 34.64	34.64 34.64 34.	64 34.64 34	.64 34.64	34.64 34.64	34.64	(69)								
Pumps and fans gains (Table	5a)			-										
(70)m= 0 0 0	0 0 0	0	0 0	0 0	0	(70)								
Losses e.g. evaporation (nega	ative values) (Table 5)		•											
(71)m= -93.14 -93.14 -93.14	-93.14 -93.14 -93		3.14 -93.14 -	-93.14 -93.14	-93.14	(71)								
Water heating gains (Table 5)	I I			l										
(72)m= 124.69 122.62 118.33		.36 98.83 104	4.64 106.7 1	112.74 119.57	122.63	(72)								
Total internal gains =	1 1 1 1 1	(66)m + (67)m + (6		!!										
(73)m= 406.29 404.31 391.61	371.13 350.38 330	<del>-   -   -   -   -   -   -   -   -   -  </del>	<del> </del>	354.11 377.89	395.68	(73)								
6. Solar gains:	071.10 000.00 000	.01 017.22 022	2.50 000.42	504.11 077.00	000.00	(1-5)								
Solar gains are calculated using sol	ar flux from Table 6a and a	ssociated equations	to convert to the	applicable orientati	on.									
Orientation: Access Factor	Area	Flux	g_	 FF	Gains									
Table 6d	m <sup>2</sup>	Table 6a	Table 6b	Table 6c	(W)									
North 0.9x 0.77	3.8 ×	10.63 ×	0.48	x 0.7	= 9.41	(74)								
0.77	3.8 X	20.32 X	0.48	x 0.7	= 17.98	(74)								
0.11	3.0 ^ _	20.02	0.40	0.7	17.90									

N I o willo						_	_		1			_	г				<b>-</b>	٦
North	0.9x	0.77		X	3.8	_  '	`	34.53	X		0.48	X	Ļ	0.7		=	30.55	<b>(74)</b>
North	0.9x	0.77		X	3.8		× L	55.46	X		0.48	X	Ļ	0.7		=	49.08	(74)
North	0.9x	0.77		x	3.8	<u> </u>	<u>د</u> لــ	74.72	X		0.48	X	Ļ	0.7		=	66.11	(74)
North	0.9x	0.77		X	3.8	<u> </u>	· L	79.99	X		0.48	X	Ļ	0.7		=	70.77	(74)
North	0.9x	0.77		x	3.8	<u> </u>	×	74.68	X		0.48	X	L	0.7		=	66.08	(74)
North	0.9x	0.77		х	3.8	] ;	x	59.25	X		0.48	X		0.7		=	52.42	(74)
North	0.9x	0.77		x	3.8	] ;	× _	41.52	X		0.48	X		0.7		=	36.73	(74)
North	0.9x	0.77		x	3.8	] ;	x	24.19	X		0.48	X		0.7		=	21.4	(74)
North	0.9x	0.77		x	3.8	] ;	x [	13.12	X		0.48	X		0.7		=	11.61	(74)
North	0.9x	0.77		x	3.8	] ;	x	8.86	X		0.48	X		0.7		=	7.84	(74)
East	0.9x	1		x	15.96	] ;	× [	19.64	X		0.48	X		0.7		=	72.99	(76)
East	0.9x	1		x	15.96	] ;	x [	38.42	X		0.48	X		0.7		=	142.78	(76)
East	0.9x	1		х	15.96	] ;	x 🗌	63.27	x		0.48	X		0.7		=	235.14	(76)
East	0.9x	1		x	15.96	Ī,	× $$	92.28	X		0.48	X	Ī	0.7		=	342.94	(76)
East	0.9x	1		x	15.96	Ī,	× 🗏	113.09	X		0.48	x	Ī	0.7		=	420.28	(76)
East	0.9x	1		х	15.96	Ī,	x 🗏	115.77	x		0.48	X	Ī	0.7		=	430.23	(76)
East	0.9x	1		x	15.96	Ī,	х <u> </u>	110.22	x		0.48	X	Ī	0.7		=	409.6	(76)
East	0.9x	1		x	15.96	Ī,	٠ <u> </u>	94.68	X		0.48	X	Ī	0.7		=	351.84	(76)
East	0.9x	1		x	15.96	<b>j</b> ,	, <u> </u>	73.59	j x		0.48	= x	Ī	0.7		=	273.48	(76)
East	0.9x	1		х	15.96	Ī,	, <u> </u>	45.59	X		0.48	X	Ī	0.7		=	169.42	(76)
East	0.9x	1		х	15.96	Ī,	, <u> </u>	24.49	X		0.48	X	Ī	0.7		=	91.01	(76)
East	0.9x	1		x	15.96	ij,	νĒ	16.15	X		0.48	X	Ť	0.7		=	60.02	<b>–</b> (76)
	L					_	_		_			_	_					_
Solar g	ains in	watts, ca	alculate	ed	for each mo	nth			(83)m	n = Sı	um(74)m .	(82)r	n					
(83)m=	82.4	160.76	265.69	7	392.01 486.	39	501.	01 475.67	404	.26	310.21	190.	82	102.61	67	.87		(83)
Total g	ains – iı	nternal a	nd sol	ar	(84)m = (73)	m +	(83	)m , watts									•	
(84)m=	488.69	565.07	657.3		763.14 836.	77	831.	32 792.9	727	'.21	643.63	544.	93	480.5	463	3.55		(84)
7. Me	an inter	nal temp	eratur	e (I	heating seas	on)												
					eriods in the		g ar	ea from Tal	ble 9	, Th	1 (°C)						21	(85)
Utilisa	tion fac	tor for g	ains fo	r liv	ving area, h1	,m	(see	Table 9a)										_
	Jan	Feb	Mar	$\neg$	Apr Ma	$\overline{}$	Ju		A	ug	Sep	Od	ct	Nov		Эес		
(86)m=	0.99	0.97	0.93	T	0.83 0.6	3	0.4	8 0.35	0.	4	0.64	0.8	9	0.97	0.	99		(86)
Mean	interna	l temner	ature ii	ı Li	ving area T1	(fo	llow	stens 3 to 3	7 in 7	' Γahle	- 9c)			<u>.</u>				
(87)m=	19.88	20.08	20.39	T	20.73 20.9		20.9	i	2		20.95	20.6	57	20.21	19	.84		(87)
		<u> </u>	!		l l		امييا	lina franc Ta										
(88)m=	20.18	20.18	20.18	÷	eriods in rest		20.	<u> </u>	20		20.2	20.1	a	20.19	20	.18	]	(88)
		<u> </u>	ļ			!			<u>!</u>		20.2	20.1	9	20.19		.10		(00)
Ī			ı	rre	est of dwellin	Ť		· 1	T -	. 1			_	1			1	(00)
(89)m=	0.98	0.97	0.92	$\perp$	0.8 0.6	2	0.4	2 0.29	0.3	33	0.58	0.8	7	0.97	0.	99		(89)
Mean		l temper	ature ii	n th	he rest of dw	ellir	ng T	2 (follow ste	eps 3	3 to 7	7 in Tabl	e 9c)		,			1	
(90)m=	18.68	18.97	19.41		19.88 20.1	1	20.1	19 20.2	20	.2	20.16	19.8		19.17		.63		(90)
											f	LA = L	.ivi	ng area ÷ (4	4) =		0.36	(91)

Mean internal temperature (for the whole dwelling) = fLA ×	T1 + (1 – fl	Δ) <b>v</b> T2					
(92)m= 19.11 19.37 19.76 20.19 20.4 20.48 20.4	<del></del>	20.44	20.12	19.54	19.07		(92)
Apply adjustment to the mean internal temperature from Ta	able 4e, whe	re appro	priate				
(93)m= 19.11 19.37 19.76 20.19 20.4 20.48 20.4	49 20.49	20.44	20.12	19.54	19.07		(93)
8. Space heating requirement							
Set Ti to the mean internal temperature obtained at step 11 the utilisation factor for gains using Table 9a	of Table 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan Feb Mar Apr May Jun Ju	ıl Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:	.   /109	ООР		1.01			
(94)m= 0.98 0.96 0.91 0.8 0.63 0.44 0.3	1 0.35	0.6	0.86	0.96	0.98		(94)
Useful gains, hmGm , W = (94)m x (84)m							
(95)m= 477.41 541.42 598.73 609.7 525.19 366.34 244.	.81 256.15	384.15	470.74	460.79	454.76		(95)
Monthly average external temperature from Table 8					1		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.		14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39	<del></del>	<u> </u>			T 1		(07)
(97)m= 968.13 943.27 862.61 724.47 557.25 371.27 245.		402.74	609.34	800.81	961.73		(97)
Space heating requirement for each month, kWh/month = (98)m=   365.09   270.04   196.33   82.63   23.85   0   0	i	0 m – (95	)m] X (4 103.12	1)m 244.82	377.19		
(90)111= 300.09 270.04 190.00 02.00 20.00 0				r) = Sum(9		1663.08	(98)
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Total	i pei yeai	(KVVII/yeai	) = Sum(9	/O)15,912 =		=
Space heating requirement in kWh/m²/year						22.62	(99)
9b. Energy requirements – Community heating scheme							
This part is used for space heating, space cooling or water he Fraction of space heat from secondary/supplementary heating.				unity sch	neme.	0	(301)
Fraction of space heat from community system 1 – (301) =						1	(302)
The community scheme may obtain heat from several sources. The procedure to be a few to be			ıp to four	other heat	sources; ti	he latter	_
includes boilers, heat pumps, geothermal and waste heat from power static Fraction of heat from Community boilers	ons. See Appen	iaix C.				1	(303a)
Fraction of total space heat from Community boilers			(3	02) x (303	a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for con	nmunity hea	ting syst	tem			1	(305)
Distribution loss factor (Table 12c) for community heating sy	rstem					1.05	(306)
Space heating					!	kWh/yea	•
Annual space heating requirement						1663.08	
Space heat from Community boilers		(98) x (30	)4a) x (30	5) x (306)	=	1746.23	(307a)
Efficiency of secondary/supplementary heating system in %	(from Table	4a or A	ppendix	E)		0	(308
Space heating requirement from secondary/supplementary	system	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating Annual water heating requirement					ĺ	2059.04	7
If DHW from community scheme:						2000.04	
Water heat from Community boilers		(64) x (30	)3a) x (30	5) x (306)	=	2161.99	(310a)
Electricity used for heat distribution	0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	39.08	(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 number and fone within dwelling (Table 4f)				
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	from outside		142.61	(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) =	142.61	(331)
Energy for lighting (calculated in Appendix L)			323.34	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission facto kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (not 0 Efficiency of heat source 1 (%)	CHP) IP using two fuels repeat (363) to	(366) for the second for	uel 89.5	(367a)
CO2 associated with heat source 1	307b)+(310b)] x 100 ÷ (367b) x	0.22	943.21	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 20.28	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= 963.5	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or insta	antaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		963.5	(376)
CO2 associated with electricity for pumps and fans within	dwelling (331)) x	0.52	<b>=</b> 74.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 167.81	(379)
Total CO2, kg/year sum of (376)(382) =	=		1205.33	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			16.39	(384)
El rating (section 14)			86.37	(385)

		l Iser I	Details:						
Assessor Name:	Matthew Stainrod	– <u>036</u> FL	Strom					023501	
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.4.16	
Address :	GF-2, Bertram Street, Lond		Address	: 06-18-0	69419 G	iF-2			
1. Overall dwelling dime		OH							
		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	<sup>3</sup> )
Ground floor		9	90.93	(1a) x	2	2.4	(2a) =	218.23	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) = = = = = = = = = = = = = = = = = = =	90.93	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	218.23	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	<u> </u>	0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x .	10 =	0	(7a)
Number of passive vents	3			F	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			_ [	0	X 4	40 =	0	(7c)
_				L					
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+($				0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otherwise (	continue fr	rom (9) to	(16)		0	(9)
Additional infiltration	ne aweiling (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction	,	•	0	(11)
	resent, use the value corresponding t	o the grea	ter wall are	a (after					_
deducting areas of openial lf suspended wooden to	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	.1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(***	/,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
,	q50, expressed in cubic metro	-	•	•	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$ es if a pressurisation test has been do				io boing u	and		0.15	(18)
Number of sides sheltere		ne or a de	gree air pe	ппеаышу	is being u	seu		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(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		
	II		+		-		<u> </u>	ı	

Adjusted infiltrati		<del></del>		1	<del>i i</del>	<del>`                                    </del>	<del>`                                    </del>	1	1	1	1	
	0.16 0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calcul <del>ate effecti</del> If mechanical	_	rate for t	пе аррп	cable ca	13 <b>C</b>						0.5	(2
If exhaust air heat	pump using App	endix N, (2	(23a) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	o) = (23a)			0.5	<b>=</b> (2
If balanced with he	eat recovery: effi	ciency in %	allowing	for in-use f	actor (fror	n Table 4h	) =				79.9	<b>=</b> `(2
a) If balanced	mechanical v	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)		`
· —	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	]	(2
b) If balanced	mechanical v	entilation	without	heat red	covery (	л МV) (24k	m = (2)	2b)m + (	23b)	1	J	
24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(2
c) If whole hou	use extract ver < 0.5 × (23b),		•	•				.5 × (23b	) )	•	ı	
24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural ve	entilation or wh = 1, then (24d							0.5]			1	
24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24
Effective air ch	nange rate - e	nter (24a	) or (24l	o) or (24	c) or (24	ld) in bo	x (25)	•			•	
25)m= 0.26	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(2
3. Heat losses a	and heat loss	paramet	er:									
ELEMENT	Gross area (m²)	Openir m		Net Ar A ,r		U-val W/m2		A X U (W/l	K)	k-value kJ/m²-		X k I/K
Doors				2.1	X	1.4	=	2.94				(2
Vindows Type 1				12.15	5 x1	/[1/( 1.4 )+	0.04] =	16.11				(2
Vindows Type 2				7.63	x1	/[1/( 1.4 )+	0.04] =	10.12				(2
loor				90.93	3 x	0.11	=	10.0023	3	110	10002.	.3 (2
Valls Type1	77.99	21.8	8	56.1	1 x	0.15	=	8.42		14	785.54	4 (2
Valls Type2	3.6	0		3.6	x	0.14	=	0.51		14	50.4	(2
Valls Type3	4.8	0		4.8	x	0.15	=	0.72		14	67.2	(2
otal area of ele	ments, m <sup>2</sup>			177.3	2							 (3
Party wall				22.8	x	0	=	0		20	456	(3
Party ceiling				90.93	3					30	2727.9	9 (3:
nternal wall **				153.6	<u>=</u>					9	1382.4	4 (3
for windows and ro * include the areas					l lated usino	g formula 1	/[(1/U-valu	ue)+0.04] a	as given ir	n paragraph		
abric heat loss,	W/K = S (A x)	( U)				(26)(30	) + (32) =				48.81	(3
leat capacity Cr	$n = S(A \times k)$						((28).	(30) + (32	2) + (32a)	(32e) =	15471.74	(3
hermal mass pa	arameter (TM	P = Cm -	- TFA) iı	n kJ/m²K			= (34)	÷ (4) =			170.15	(3
For design assessme an be used instead	of a detailed cald	culation.				recisely the	e indicative	e values of	TMP in T	able 1f		_
			- ' A -	ايدالم محمد	1						1	(3
hermal bridges	: S (L x Y) ca	liculated	using Ap	ppenaix i	n.						12.2	(5

Γ	i	Feb	alculated Mar	<del> </del>	<del></del>	lun	Jul	۸۰۰۰	Sep	`	25)m x (5) Nov	Dec		
0)	Jan			Apr	May	Jun	1	Aug		Oct		-		(3
8)m=	18.94	18.72	18.49	17.34	17.11	15.96	15.96	15.73	16.42	17.11	17.57	18.03		(3
Г		oefficier		Γ	Γ	I	Ι	ı		= (37) + (3				
9)m=	79.96	79.73	79.5	78.35	78.12	76.97	76.97	76.74	77.43	78.12	78.58	79.04		<b>ا</b> ر
eat lo	ss para	meter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> (4)	12 /12=	78.29	(3
0)m=	0.88	0.88	0.87	0.86	0.86	0.85	0.85	0.84	0.85	0.86	0.86	0.87		
umbe	er of day	rs in mor	nth (Tab	le 1a)				•	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.86	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
				-	-	_	-	-			-			
. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ar:	
ssum	ed occu	pancy, I	N									.64		(4
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	013 x (	ΓFA -13.		.04		(
	A £ 13.9	•						(O.E. N.I)	00					
						ay Vd,av Iwelling is				se target o		5.86		(
		_		• •		not and co	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t wate						ctor from 7								
4)m=	106.54	102.67	98.8	94.92	91.05	87.17	87.17	91.05	94.92	98.8	102.67	106.54		
L								<u> </u>	-	Γotal = Su	<u>l</u> m(44) <sub>112</sub> =	=	1162.3	(
ergy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	158	138.19	142.6	124.32	119.29	102.94	95.39	109.46	110.76	129.09	140.91	153.02		
_										Γotal = Su	m(45) <sub>112</sub> =	=	1523.96	(
nstanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)		•			
6)m=	23.7	20.73	21.39	18.65	17.89	15.44	14.31	16.42	16.61	19.36	21.14	22.95		(
	storage		includin	a any c	olar or M	/WHRS	ctorogo	within co	mo voc	col				,
_		` ,		•		nter 110	•		une ves	3 <b>C</b> I		0		(
	•	•			•	nstantar		` '	ers) ente	er 'O' in <i>(</i>	47)			
	storage			(					,		,			
) If ma	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(
empe	rature fa	actor fro	m Table	2b								0		(
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(
) If ma	anufact	urer's de	eclared o	cylinder l	oss fact	or is not								•
					e 2 (kW	h/litre/da	ıy)				0.	.02		(
	-	eating s from Tal	ee secti	on 4.3										,
			ole 2a m Table	2h								.03		(
•								(47) (51)	(50)	F0)		0.6		(
		m water 54) in (5	storage	, KVVN/ye	ar			(47) x (51)	x (52) X (	o3) =	-	.03		(
. 11 <u>0</u> 1 (	. , .		•	for ooob				((56) <del>~</del> = (	FF) (44).	_	1.	.03		(
otor -														
ater s	32.01	28.92	32.01	30.98	32.01		32.01	32.01	55) × (41)ı 30.98	32.01		32.01		(

,	is dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	пт)] <del>-</del> (э	u), eise (s	<i>i</i> )iii = (30)	m where (	HTT) IS ITC	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	t loss (ar	nual) fro	m Table	 3				•	•		0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	55 × (41)	m				•	
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss 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 heat req	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 213.28	188.12	197.88	177.81	174.57	156.43	150.66	164.73	164.26	184.36	194.4	208.29		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 213.28	188.12	197.88	177.81	174.57	156.43	150.66	164.73	164.26	184.36	194.4	208.29		_
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2174.8	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 96.76	85.89	91.64	84.13	83.89	77.02	75.94	80.62	79.62	87.14	89.65	95.1		(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga	ains (see	e Table 5	and 5a	):									
Metabolic gair	ns (Table	e 5). Wat	ts										
Jan	Feb	Mar											
(00)		Iviai	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 131.91	131.91	131.91	Apr 131.91	May 131.91	Jun 131.91	Jul 131.91	Aug 131.91	Sep 131.91	Oct	Nov 131.91	Dec 131.91		(66)
Lighting gains	l	131.91	131.91	131.91	131.91	131.91	131.91	131.91		-			(66)
` ′	l	131.91	131.91	131.91	131.91	131.91	131.91	131.91		-			(66) (67)
Lighting gains	(calcula	131.91 ted in Ap 15.52	131.91 ppendix 11.75	131.91 _, equati 8.78	131.91 on L9 or 7.41	131.91 r L9a), a 8.01	131.91 Iso see	131.91 Table 5	131.91 17.75	131.91	131.91		` '
Lighting gains (67)m= 21.48	(calcula	131.91 ted in Ap 15.52	131.91 ppendix 11.75	131.91 _, equati 8.78	131.91 on L9 or 7.41	131.91 r L9a), a 8.01	131.91 Iso see	131.91 Table 5	131.91 17.75	131.91	131.91		` '
Lighting gains (67)m= 21.48 Appliances ga	(calcula 19.08 iins (calc	131.91 ted in Ap 15.52 culated in 236.98	131.91 opendix 11.75 Append 223.58	131.91 L, equati 8.78 dix L, equali	131.91 on L9 or 7.41 uation L	131.91 r L9a), a 8.01 13 or L1 180.13	131.91 Iso see 10.41 3a), also	131.91 Table 5 13.98 see Ta	131.91 17.75 ble 5 197.33	20.71	131.91 22.08		(67)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78	(calcula 19.08 iins (calc	131.91 ted in Ap 15.52 culated in 236.98	131.91 opendix 11.75 Append 223.58	131.91 L, equati 8.78 dix L, equali	131.91 on L9 or 7.41 uation L	131.91 r L9a), a 8.01 13 or L1 180.13	131.91 Iso see 10.41 3a), also	131.91 Table 5 13.98 see Ta	131.91 17.75 ble 5 197.33	20.71	131.91 22.08		(67)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains	(calcula 19.08 ins (calcula 243.28 (calcula 36.19	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19	131.91 opendix 11.75 Append 223.58 opendix 36.19	131.91 L, equati 8.78 dix L, equ 206.66 L, equat	131.91 on L9 or 7.41 uation L 190.75 ion L15	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a)	131.91 lso see 10.41 3a), also 177.63	131.91 Table 5 13.98 see Ta 183.93 ee Table	131.91 17.75 ble 5 197.33	20.71 214.25	22.08 230.15		(67) (68)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19	(calcula 19.08 ins (calcula 243.28 (calcula 36.19	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19	131.91 opendix 11.75 Append 223.58 opendix 36.19	131.91 L, equati 8.78 dix L, equ 206.66 L, equat	131.91 on L9 or 7.41 uation L 190.75 ion L15	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a)	131.91 lso see 10.41 3a), also 177.63	131.91 Table 5 13.98 see Ta 183.93 ee Table	131.91 17.75 ble 5 197.33	20.71 214.25	22.08 230.15		(67) (68)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains	131.91 ted in Ap 15.52 ulated in 236.98 ated in Ap 36.19 (Table 5	131.91 ppendix 11.75 Append 223.58 ppendix 36.19 5a)	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negat	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equati 36.19  0  es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19 0 le 5)	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69) (70)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negat	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equati 36.19  0  es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19 0 le 5)	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69) (70)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating	(calcula 19.08 ins (calcula 243.28 36.19 ns gains 0 vaporatio -105.53 gains (T	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negation of the column of t	131.91 ppendix 11.75 Append 223.58 opendix 36.19 5a) 0 ciive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equat 36.19  0 es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19 0 -105.53	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19 0 -105.53	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19 0 -105.53	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53	131.91 20.71 214.25 36.19 0 -105.53	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05	(calcula 19.08 ins (calcula 243.28 36.19 ns gains 0 vaporatio -105.53 gains (T	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negation of the column of t	131.91 ppendix 11.75 Append 223.58 opendix 36.19 5a) 0 ciive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equat 36.19  0 es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19 0 -105.53	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19 0 -105.53	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19 0 -105.53	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53	131.91 20.71 214.25 36.19 0 -105.53	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05  Total internal	(calcula 19.08 ins (calcula 243.28 c (calcula 36.19 ns gains 0 raporatio -105.53 gains (Tar.81 gains = 452.74	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negation of the column of t	131.91 opendix 11.75 Append 223.58 opendix 36.19 5a) 0 tive valu -105.53	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19  0 es) (Tab -105.53	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19  0  -105.53  102.07 m + (67)m	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19 0 -105.53 108.35 1+ (68)m -	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19 0 -105.53 110.59 + (69)m + (	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53  117.13  (70)m + (7	131.91 20.71 214.25 36.19 0 -105.53 124.51 1)m + (72)	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71) (72)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05  Total internal (73)m= 454.88	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 427.81 gains = 452.74 s:	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negate) -105.53 Table 5) 123.17 : 438.24	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 6a) 0 tive valu -105.53 116.85	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19  0 es) (Tab -105.53  112.75	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53  106.97 (66) 367.72	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19  0  -105.53  102.07 m + (67)m 352.78	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19 0 -105.53 108.35 1 + (68)m - 358.97	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19 0 -105.53 110.59 + (69)m + (	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53  117.13  (70)m + (7  394.78	131.91 20.71 214.25 36.19 0 -105.53 124.51 1)m + (72) 422.05	131.91 22.08 230.15 36.19 0 -105.53 127.82		(67) (68) (69) (70) (71) (72)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_									_			_				
Southea	1St 0.9x	0.77		X	7.6	3	X	3	6.79	X	0.44		X	0.7	=	59.92	(77)
Southea	st 0.9x	0.77		X	7.6	3	x	6	2.67	X	0.44		X	0.7		102.07	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	8	5.75	X	0.44		X	0.7	=	139.65	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	10	06.25	X	0.44		x	0.7	=	173.04	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	1	19.01	X	0.44		x	0.7		193.82	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	11	18.15	X	0.44		X	0.7		192.42	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	11	13.91	X	0.44		x	0.7		185.51	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	10	04.39	X	0.44		x	0.7		170.01	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	9	2.85	X	0.44		X	0.7	=	151.22	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	6	9.27	X	0.44		x	0.7	=	112.81	(77)
Southea	st <sub>0.9x</sub>	0.77		x	7.6	3	x	4	4.07	X	0.44		X	0.7	=	71.77	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	3	1.49	X	0.44		X	0.7	=	51.28	(77)
South	0.9x	0.77		x	12.1	15	x	4	6.75	X	0.44		x	0.7	=	121.24	(78)
South	0.9x	0.77		x	12.1	15	x	7	6.57	X	0.44		X	0.7	=	198.57	(78)
South	0.9x	0.77		x	12.1	15	x	9	7.53	X	0.44		x	0.7	=	252.94	(78)
South	0.9x	0.77		x	12.1	15	x	11	10.23	X	0.44		x	0.7	=	285.88	(78)
South	0.9x	0.77		x	12.1	15	x	11	14.87	X	0.44		X	0.7	=	297.9	(78)
South	0.9x	0.77		x	12.1	15	X	11	10.55	X	0.44		X	0.7	=	286.69	(78)
South	0.9x	0.77		x	12.1	15	x	10	08.01	X	0.44		x	0.7		280.11	(78)
South	0.9x	0.77		x	12.1	15	X	10	04.89	X	0.44		x	0.7		272.03	(78)
South	0.9x	0.77		x	12.1	15	X	10	01.89	X	0.44		x	0.7		264.22	(78)
South	0.9x	0.77		x	12.1	15	x	8	2.59	X	0.44		x	0.7		214.17	(78)
South	0.9x	0.77		x	12.1	15	X	5	5.42	X	0.44		x	0.7		143.72	(78)
South	0.9x	0.77		x	12.1	15	X		10.4	X	0.44		X	0.7	=	104.77	(78)
Solar g	ains in	watts, ca	lcula	ted	for each	n mon	:h			(83)m	n = Sum(74	)m(8	82)m			_	
(83)m=	181.17	300.64	392.	59	458.91	491.72	2 4	79.11	465.62	442	.04 415.	44 3	326.98	215.49	156.05	5	(83)
Total ga	ains – i	nternal a	nd so	olar	(84)m =	(73)n	า + (	83)m	, watts								
(84)m=	636.05	753.38	830.	83	873.66	882.48	3 8	46.82	818.4	801	.01 786.	51 7	'21.76	637.53	598.68	3	(84)
7. Mea	an inter	nal temp	eratu	ıre (	heating	seaso	n)										
Tempe	erature	during h	eatin	g pe	eriods in	the li	ving	area f	from Tal	ble 9	, Th1 (°C	)				21	(85)
Utilisa	tion fac	tor for ga	ains f	or li	ving are	a, h1,	m (s	ee Ta	ble 9a)								
ſ	Jan	Feb	Ma	ar	Apr	May	/	Jun	Jul	А	ug Se	эр	Oct	Nov	Dec	:	
(86)m=	0.98	0.96	0.9	3	0.86	0.74		0.56	0.41	0.4	4 0.6	4	0.87	0.96	0.99	7	(86)
Mean	interna	l tempera	ature	in li	ving are	ea T1	follo	w ste	ns 3 to 7	7 in T	able 9c)	•		•		_	
(87)m=	19.95	20.17	20.4	$\overline{}$	20.7	20.88	<del>`</del>	20.98	21	20.	<del></del>	95 2	20.72	20.29	19.91	7	(87)
Temp	oraturo	during h	oatin	a ne	riode in	roct	of du	بماالم	from To	abla (	<b>_</b> 9, Th2 (°(					_	
(88)m=	20.19	20.19	20.1	<del></del>	20.2	20.2	$\neg$	20.21	20.21	20.	<del></del> _		20.2	20.2	20.19	7	(88)
L											1			- :-		_	. ,
Utilisa (89)m=	0.98	tor for ga	0.9	-	0.83	0.69	$\overline{}$	,m (se <sub>0.5</sub>	0.34	9a) 0.3	36 0.5	, T	0.84	0.96	0.98	7	(89)
L											!			0.90	0.96	_	(00)
Mean	interna	I tempera	ature	in th	ne rest (	of dwe	lling	T2 (fo	ollow ste	eps 3	to 7 in T	able	9c)				

(90)m= 18.78 19.1 19.47 19.85 20.08 20.19 20.21	20.21 20.17	19.89	19.28	18.73	l	(90)
(90)m= 18.78 19.1 19.47 19.85 20.08 20.19 20.21		fLA = Living			0.34	(91)
			<b>9</b> (	,	0.34	(01)
Mean internal temperature (for the whole dwelling) = $fLA \times T1$ (92)m= 19.18 19.47 19.8 20.14 20.36 20.46 20.48	$\frac{-(1-fLA) \times 12}{20.48}$	20.18	19.63	19.13		(92)
Apply adjustment to the mean internal temperature from Table			10.00	10.10		(02)
(93)m= 19.18 19.47 19.8 20.14 20.36 20.46 20.48	20.48 20.44	20.18	19.63	19.13		(93)
8. Space heating requirement	,					
Set Ti to the mean internal temperature obtained at step 11 of	Table 9b, so tha	at Ti,m=(7	76)m an	d re-calc	culate	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul	Aug Sep	Oct	Nov	Dec		
Jan   Feb   Mar   Apr   May   Jun   Jul   Utilisation factor for gains, hm:	Aug Sep	OCI	INOV	Dec		
(94)m= 0.97 0.95 0.9 0.83 0.7 0.52 0.36	0.39 0.6	0.84	0.95	0.98		(94)
Useful gains, hmGm , W = (94)m x (84)m	I					
(95)m= 618.76 713.65 751.74 722.16 617.84 440.19 297.12	310.97 469.28	604.82	604.91	585.61		(95)
Monthly average external temperature from Table 8	1				I	4
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6	16.4 14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m $\times (97)$ m = $[1190.1 \ 1161.88 \ 1057.64 \ 880.88 \ 676.51 \ 451.29 \ 298.75 ]$	313.22 490.87	748.08	984.74	1180.29		(97)
Space heating requirement for each month, kWh/month = 0.02				1100.29		(01)
(98)m= 425.07 301.21 227.59 114.28 43.66 0 0	0 0	106.59	273.47	442.44		
	Total per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1934.31	(98)
Space heating requirement in kWh/m²/year					21.27	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heat						
			unity sch	neme.	0	(301)
Fraction of space heat from secondary/supplementary heating (			unity sch	neme.	0	(301)
Fraction of space heat from secondary/supplementary heating (Fraction of space heat from community system $1 - (301) =$	Гable 11) '0' if r	none			1	(301)
Fraction of space heat from secondary/supplementary heating (Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations.	Γable 11) '0' if r	none			1	==
Fraction of space heat from secondary/supplementary heating (  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure of	Γable 11) '0' if r	none			1	==
Fraction of space heat from secondary/supplementary heating (Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations.	Γable 11) '0' if r	none up to four d		sources; t	1 he latter	(302)
Fraction of space heat from secondary/supplementary heating (Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary from Community boilers	Table 11) '0' if r	up to four o	other heat	sources; t	1 he latter	(302)
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary fraction of heat from Community boilers  Fraction of total space heat from Community boilers	Table 11) '0' if π  Illows for CHP and the Appendix C.   Inity heating systems	up to four o	other heat	sources; t	1 he latter 1	(302) (303a) (304a)
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community	Table 11) '0' if π  Illows for CHP and the Appendix C.   Inity heating systems	up to four o	other heat	sources; t	1 he latter  1 1	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating (Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system	Table 11) '0' if π  Illows for CHP and the Appendix C.   Inity heating systems	up to four o	other heat	sources; t	1 he latter  1 1 1 1 1.05	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system Space heating	Table 11) '0' if π  Ilows for CHP and the Appendix C.   Inity heating system	up to four o	other heat 02) x (303	sources; t	1 he latter  1 1 1 1 1.05 kWh/yea	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system.  Space heating  Annual space heating requirement	Table 11) '0' if nallows for CHP and see Appendix C.  Inity heating system (98) x (3)	up to four of (30)	other heat 02) x (303) 5) x (306) =	sources; t	1 he latter  1 1 1 1.05 kWh/yea 1934.31	(302) (303a) (304a) (305) (306)
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Fractor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system.  Space heating  Annual space heating requirement  Space heat from Community boilers	Table 11) '0' if name of the second s	up to four of (30)	5) x (306) = E)	sources; t	1 he latter  1 1 1 1.05 kWh/yea 1934.31 2031.02	(302) (303a) (304a) (305) (306) ar
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary boilers  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system)  Water heating	Table 11) '0' if name of the second s	up to four of (30) (30) (30) (30) (30) (30) (30) (30)	5) x (306) = E)	sources; t	1 he latter  1 1 1 1.05 kWh/yea 1934.31 2031.02 0 0	(302) (303a) (304a) (305) (306) ar (307a) (308
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary boilers  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system)  Water heating  Annual water heating requirement	Table 11) '0' if name of the second s	up to four of (30) (30) (30) (30) (30) (30) (30) (30)	5) x (306) = E)	sources; t	1 he latter  1 1 1 1.05 kWh/yea 1934.31 2031.02 0	(302) (303a) (304a) (305) (306) ar (307a) (308
Fraction of space heat from secondary/supplementary heating ( Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary boilers  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system)  Water heating	Table 11) '0' if nullows for CHP and see Appendix C.  Inity heating system  (98) x (3)  In Table 4a or A	up to four of (30) (30) (30) (30) (30) (30) (30) (30)	5) x (306) = E) - (308) =	sources; t	1 he latter  1 1 1 1.05 kWh/yea 1934.31 2031.02 0 0	(302) (303a) (304a) (305) (306) ar (307a) (308
Fraction of space heat from secondary/supplementary heating (Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure includes boilers, heat pumps, geothermal and waste heat from power stations. Secondary boilers  Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system in the secondary system is secondary system in the secondary system in the secondary system is secondary system.	Table 11) '0' if nullows for CHP and see Appendix C.  Inity heating system  (98) x (3)  In Table 4a or A	(30 (30 (30 (30 (304a) x (305 (305a) x (305	5) x (306) = E) - (308) =	sources; to	1 he latter  1 1 1 1.05 kWh/yea 1934.31 2031.02 0 0 2174.8	(302) (303a) (304a) (305) (306)  ar (307a) (308 (309)

Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwe	• ,					7
mechanical ventilation - balanced, extrac	ct or positive input from	outside		<u> </u>	176.39	(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) =		176.39	(331)
Energy for lighting (calculated in Append	lix L)				379.38	(332)
12b. CO2 Emissions – Community heati	ng scheme					
		Energy	Emission fac			
		kWh/year	kg CO2/kWh	Κį	g CO2/year	
CO2 from other sources of space and water Efficiency of heat source 1 (%)	<b>3</b> \ ,	g two fuels repeat (363) to	(366) for the secon	d fuel	89.5	(367a)
CO2 associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x	0.22	=	1041.28	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	22.39	(372)
Total CO2 associated with community sy	rstems	(363)(366) + (368)(372	)	=	1063.67	(373)
CO2 associated with space heating (sec	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersi	on heater or instantane	eous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =			1063.67	(376)
CO2 associated with electricity for pump	s and fans within dwelli	ng (331)) x	0.52	=	91.54	(378)
CO2 associated with electricity for lighting	g	(332))) x	0.52	=	196.9	(379)
Total CO2, kg/year	sum of (376)(382) =				1352.11	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.87	(384)

El rating (section 14)

(385)

86.67

			User D							
Assessor Name:	Matthew Stain				a Num				023501	
Software Name:	Stroma FSAP	_•			are Ve		4.4		n: 1.0.4.16	
Aulden	Llavias 44 Dark		· ·	Address	s: 06-18-6	69419 Ho	ouse-11			
Address: 1. Overall dwelling dimer	House-11, Bert	ram Street, Lo	ondon							
1. Overall dwelling diffier	1510115.		Δro	a(m²)		Av. Hei	aht(m)		Volume(m³)	
Ground floor				57.15	(1a) x	2		(2a) =	161.16	(3a)
First floor			6	31.15	(1b) x	2.	47	(2b) =	151.04	(3b)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	+(1e)+(1n)	) 1	28.3	(4)			_		_
Dwelling volume					(3a)+(3b	)+(3c)+(3d)	+(3e)+	(3n) =	312.2	(5)
2. Ventilation rate:										
	main heating	secondary heating	/	other		total			m³ per houi	٢
Number of chimneys		+ 0	] + [	0	=	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	+ [	0	=	0	X	20 =	0	(6b)
Number of intermittent far	is					4	X	10 =	40	(7a)
Number of passive vents						0	Х	10 =	0	(7b)
Number of flueless gas fir	es					0	х	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s. flues and fans	= (6a)+(6b)+(7a	a)+(7b)+(	7c) =	Г	40	$\neg$	÷ (5) =	0.13	(8)
If a pressurisation test has be	·				continue fr			. (-)	0.10	
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening			the great	ter wall are	ea (after					
If suspended wooden fl			1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ento	er 0.05, else ente	r O							0	(13)
Percentage of windows	and doors draug	ht stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)
Air permeability value, o	q50, expressed in	cubic metres	s per ho	our per s	square m	etre of e	nvelope	area	3	(17)
If based on air permeabilit	y value, then (18)	$= [(17) \div 20] + (8)$	), otherw	ise (18) =	(16)				0.28	(18)
Air permeability value applies		st has been done	e or a de	gree air pe	ermeability	is being us	ed	ı		_
	J					10)1			1	(19)
Number of sides sheltered	1			(20) 1	[O OZE v /					<b>-</b>
Number of sides sheltered Shelter factor					[0.075 x (1	19)] =			0.92	(20)
Number of sides sheltered Shelter factor Infiltration rate incorporati	ng shelter factor				(0.075 x (1 3) x (20) =	19)] =			0.92	(20)
Number of sides sheltered Shelter factor Infiltration rate incorporati	ng shelter factor			(21) = (18	3) x (20) =	···		1		=
Number of sides sheltered Shelter factor Infiltration rate incorporati	ng shelter factor	peed //ay Jun	Jul			Oct	Nov	Dec		=

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2 (22a)m= 1.27	22a)m = 1.25	(22)m ÷	1.1	1.08	0.95	0.95	0.92	1 1	1.08	1.12	1.18	]
, ,					!	!		<u> </u>	1		1	I
Adjusted infiltra	ation rat	e (allowi	ng for sh 0.28	nelter an	0.24	speed) = 0.24	(21a) x 0.24	(22a)m <sub>0.26</sub>	0.28	0.29	0.3	1
Calculate effec							0.24	0.20	0.20	0.29	0.5	J
If mechanica												0 (23a)
If exhaust air he									o) = (23a)			0 (23b)
If balanced with		-	•	_					<b>0</b> 1.) (		4 (00.)	0 (23c)
a) If balance	d mech	anical ve	ntilation 0	with he	at recove	ery (MVI	HR) (24a 	$\frac{a)m = (2)}{0}$	2b)m + (   0	23b) × [	1 – (23c)   0	) ÷ 100] ]
b) If balance									ļ			(244)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole h												· ''
,		(23b), t		•	•				.5 × (23b	)		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24c)
d) If natural				•	•					-		
		en (24d)	<u> </u>		· `	<del></del>	<del>- `</del>	<del></del>	<del></del>	0.54	1 0.55	] (244)
(24d)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(24d)
Effective air (25)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(25)
` /					0.55	0.55	0.55	0.00	0.54	0.54	0.55	] (23)
2 2 2 2 2 2 2 2	مطالم مرمم											
3. Heat losse		•			NI a t A a		11 -1		A V 11		1 -1	- A X/I
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²-	
	Gros	SS	Openin	gs								
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I			K kJ/K
<b>ELEMENT</b> Doors	Gros area	SS	Openin	gs	A ,r	m² x x1	W/m2	eK =     0.04] =	(W/l			K kJ/K (26)
ELEMENT  Doors  Windows Type	Gros area a 1	SS	Openin	gs	A ,r 2.1 2.88	m <sup>2</sup> x x <sup>1</sup> 1 x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+	eK =   0.04] =   0.04] =	2.94 3.82			K kJ/K (26) (27)
ELEMENT  Doors  Windows Type  Windows Type	Gros area a 1 a 2 e 1	SS	Openin	gs	A ,r 2.1 2.88 11.61	m <sup>2</sup> x x1 1 x1 x1	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	2.94 3.82 15.39			K kJ/K (26) (27) (27)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ	Gros area a 1 a 2 e 1	SS	Openin	gs	A ,r 2.1 2.88 11.61 4.05	m <sup>2</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) +	0.04] = 0.04] = 0.04] =	(W/l 2.94 3.82 15.39 5.67	K)		K kJ/K (26) (27) (27) (27b)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ	Gros area a 1 a 2 e 1	ss (m²)	Openin	gs <sub>2</sub>	A ,r 2.1 2.88 11.61 4.05 5.4	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 2.94 3.82 15.39 5.67 7.56	K)	kJ/m²-	K kJ/K (26) (27) (27) (27b) (27b)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor	Gros area a 1 a 2 e 1 e 2	ss (m²)	Openin m	gs <sub>2</sub>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	2.94 3.82 15.39 5.67 7.56 8.7295	K)	kJ/m²-	K kJ/K (26) (27) (27) (27b) (27b) (27b) (28)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls	Gros area 2 1 2 2 e 1 e 2	64 31	Openin m	gs <sup>2</sup>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15	0.04] = 0.04]	2.94 3.82 15.39 5.67 7.56 8.7295	K)	110 150	K kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (28) (13207.5 (29)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls  Roof Type1	Gros area 1 2 2 e 1 e 2 104. 40.3 30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15	0.04] = 0.04]	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43	K)	110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (30)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2	Gros area 1 2 2 e 1 e 2 104. 40.3 30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15	0.04] = 0.04]	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43	K)	110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (30) (30)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls  Roof Type1  Roof Type2  Total area of e	Gros area  1 1 2 2 e 1 e 2 104.  40.3  30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15 88.05 40.31 21.54	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall	Gros area  1 1 2 2 e 1 e 2 104.  40.3  30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (29) (362.79 (30) (31) (31) (2768.5 (32)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling	Gros area  1 2 1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1	64 B1 D9 S, m <sup>2</sup>	16.55 0 9.45	gs <sub>1</sub> 2	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4) + /[1/(1.4) +  0.13  0.15  0.11  0	EK	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27b) (320) (31) (31) (32c) (32d) (550.35 (32e)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and	Gros area  1 1 2 2 e 1 e 2  104. 40.3 30.9	64 31 99 s, m <sup>2</sup>	Openin m  16.59  0  9.45	gs P	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4) + /[1/(1.4) +  0.13  0.15  0.11  0	EK	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27b) (320) (31) (31) (32c) (32d) (550.35 (32e)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling	Gros area  1 1 2 2 e 1 e 2 104.  40.3  30.5  Ilements	64 B1 B9 G, m <sup>2</sup> ows, use e	16.50  9.45	gs P	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4) + /[1/(1.4) +  0.13  0.15  0.11  0	2K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (27c) (30c) (31) (31c) (31c) (31c) (32c) (32c) (32c) (32c) (33c) (32c) (33c) (32c) (33c) (33
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area	Gros area  1 1 2 2 2 e 1 40.3 30.9 30.9 30.9 30.9 30.9 30.9 30.9	64 31 39 39 30, m <sup>2</sup> 30, m <sup>2</sup> 30, m <sup>2</sup> 30, m <sup>2</sup>	16.50  9.45	gs P	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11  0.11	2K =   0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =   =   =   =   =   =	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18 9	K kJ/K (26) (27) (27) (27b) (320) (31) (31) (32c) (32d) (550.35 (32e)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area Fabric heat los	Gros area  1 1 2 2 e 1 e 2 1 104.  40.3 30.9 Ilements  1 roof winders on both iss, W/K:  Cm = S(	64 31 39 3, m <sup>2</sup> 3, m <sup>2</sup> 3, m <sup>2</sup>	16.50 9.45	gs p g g g g g g g g g g	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  61.15  alue calcultitions	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11  0.11	K	(W// 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (27c) (30) (31) (31) (31) (32c) (32c) (32c) (33.2)

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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 instea	ad of a do	tailad calc	ulation										
Thermal bridge				usina An	nendix I	K						19.78	(36)
if details of therma	,	•			•	•						19.70	(00)
Total fabric hea	0 0		( )	,	,			(33) +	(36) =			83.19	(37)
Ventilation hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)			_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 57.06	56.84	56.63	55.64	55.45	54.59	54.59	54.43	54.92	55.45	55.83	56.22		(38)
Heat transfer of	oefficier	nt, W/K					•	(39)m	= (37) + (	38)m		•	
(39)m= 140.25	140.03	139.82	138.83	138.65	137.78	137.78	137.62	138.12	138.65	139.02	139.41		
Heat loss para	meter (H	HLP), W/	m²K			-	-		Average = = (39)m ÷		12 /12=	138.83	(39)
(40)m= 1.09	1.09	1.09	1.08	1.08	1.07	1.07	1.07	1.08	1.08	1.08	1.09		
Number of day	s in moi	oth (Tah	le 1a)			•	•		Average =	Sum(40) <sub>1</sub>	12 /12=	1.08	(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)
L!					<u> </u>	!	!		!	!	ļ		
4. Water heat	ing ener	av requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13	.9)	89		(42)
Annual averag	•	ater usag	ae in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		10:	2.85		(43)
Reduce the annua	_				_	_	to achieve	a water us	se target o	f			
not more that 125						•					_	I	
Jan Hot water usage ir	Feb	Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	-						· ·	400.70	1,04,04	1,00,00	140.40	Ī	
(44)m= 113.13	109.02	104.91	100.79	96.68	92.56	92.56	96.68	100.79	104.91	109.02	113.13	4004.40	7(44)
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	m x nm x E	OTm / 3600		Total = Su oth (see Ta	( /		1234.18	(44)
(45)m= 167.77	146.74	151.42	132.01	126.67	109.3	101.29	116.23	117.61	137.07	149.62	162.48		
						!	!		Total = Su	m(45) <sub>112</sub> =	=	1618.2	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)				•	
(46)m= 25.17 Water storage	22.01	22.71	19.8	19	16.4	15.19	17.43	17.64	20.56	22.44	24.37		(46)
Storage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` ,		•			_							, ,
Otherwise if no	_			_			. ,	ers) ente	er '0' in (	47)			
Water storage												•	
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee sectio		-								1	
Volume factor			Oh.								0		(52)
Temperature fa	actor iro	штаріе	ZU								0		(53)

Energy lost fro		•	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or	. , ,	,									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n			•	
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	/)m = (56)	m where (	H11) is fro	m Append	IX H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Primary circuit				•	•	` '	` '						
(modified by						i	<del></del>	<del></del>		<del></del>	i	1	,,
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m					_	
(61)m= 50.96	46.03	50.96	49.32	49.27	45.65	47.17	49.27	49.32	50.96	49.32	50.96		(61)
Total heat req	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= 218.73	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	contribut	ion to wate	er heating)	•	
(add additiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 218.73	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2207.36	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n1 + 0 8 x	[(46)m	+ (57)m	+ (59)m	1	
							. (0.)	.,	( 0 ) 1 1 1	· (01)	1 (00)111	J	
(65)m= 68.52	60.3	63.09	56.22	54.43	47.76	45.47	50.96	51.44	58.32	62.08	66.76	, 	(65)
(65)m= 68.52 include (57)				54.43	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57)	m in calc	culation o	of (65)m	54.43 only if c	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57) 5. Internal ga	m in cald ains (see	culation of Table 5	of (65)m and 5a	54.43 only if c	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57)	m in cald ains (see	culation of Table 5	of (65)m and 5a	54.43 only if c	47.76	45.47	50.96 dwelling	51.44	58.32	62.08	66.76		(65)
include (57)  5. Internal game	m in calc ains (see as (Table	culation of Table 5	of (65)m and 5a	54.43 only if c	47.76 ylinder i	45.47	50.96	51.44 or hot w	58.32 ater is fr	62.08 om com	66.76 munity h		(65)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52	m in cald ains (see as (Table Feb	e Table 5 e 5), Wat Mar	of (65)m and 5a ts Apr 144.52	54.43 only if c : May 144.52	47.76 ylinder is Jun 144.52	45.47 s in the o	50.96 dwelling Aug 144.52	51.44 or hot w Sep	58.32 ater is fr	62.08 om com	66.76 munity h		
include (57)  5. Internal games  Metabolic gain  Jan	m in cald ains (see as (Table Feb	e Table 5 e 5), Wat Mar	of (65)m and 5a ts Apr 144.52	54.43 only if c : May 144.52	47.76 ylinder is Jun 144.52	45.47 s in the o	50.96 dwelling Aug 144.52	51.44 or hot w Sep	58.32 ater is fr	62.08 om com	66.76 munity h		
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52	m in calconnum in	ETable 5 E Table 5 E 5), Wate Mar 144.52 ted in Ap	of (65)m and 5a ts Apr 144.52 ppendix 14.5	54.43 only if c : May 144.52 L, equati	47.76  ylinder is  Jun  144.52 ion L9 of  9.15	45.47 s in the o  Jul 144.52 r L9a), a 9.89	Aug 144.52 Iso see 12.86	51.44 or hot w Sep 144.52 Table 5	58.32 ater is fr Oct 144.52 21.91	62.08 om com Nov 144.52	66.76 munity h		(66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games	m in calc	Evaluation of Table 5  Evaluation of Table 5  Evaluation of Table 5  Mar  144.52  Ited in Ap  19.16  ulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5	54.43 only if colors May 144.52 L, equati 10.84 dix L, eq	Jun 144.52 ion L9 of 9.15 uation L	45.47 s in the o  Jul 144.52 r L9a), a 9.89 13 or L1	50.96  dwelling  Aug 144.52 lso see 12.86 3a), also	51.44 or hot w Sep 144.52 Table 5 17.25 o see Tal	58.32 ater is fr Oct 144.52 21.91	62.08 om com Nov 144.52	Dec 144.52		(66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc	Evaluation of Table 5 E 5), Wate Mar 144.52 Ited in Ap 19.16 Evaluated in 291	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54	54.43 only if c :  May 144.52 L, equati 10.84 dix L, eq 253.76	Jun 144.52 ion L9 of 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12	51.44 or hot w Sep 144.52 Table 5 17.25 o see Tal 225.85	58.32  ater is fr  Oct 144.52  21.91  ole 5 242.31	62.08 om com Nov 144.52	66.76 munity h		(66) (67)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains	m in calc ains (see as (Table Feb 144.52 (calcula: 23.56 ins (calcula: 298.73 (calcula:	Table 5 5), Wate Mar 144.52 ted in Ap 19.16 ulated in Ap 291	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Append 274.54 ppendix	54.43 only if c :  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat	Jun 144.52 ion L9 o 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a)	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se	Sep 144.52 Table 5 17.25 See Table 225.85	58.32  ater is fr  Oct  144.52  21.91  ole 5  242.31  5	62.08 om com Nov 144.52 25.57	Dec 144.52 27.26 282.61		(66) (67) (68)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45	Table 5 2 5), Wate Mar 144.52 ted in Ap 19.16 ulated in 291 ated in Ap 37.45	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45	54.43 only if c :  May 144.52 L, equati 10.84 dix L, eq 253.76	Jun 144.52 ion L9 of 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12	51.44 or hot w Sep 144.52 Table 5 17.25 o see Tal 225.85	58.32  ater is fr  Oct 144.52  21.91  ole 5 242.31	62.08 om com Nov 144.52	Dec 144.52		(66) (67)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fain	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains	ted in Apulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45	54.43 only if c  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32  ater is fr  Oct 144.52  21.91  ble 5 242.31  5 37.45	62.08 om com Nov 144.52 25.57 263.09	Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3	ted in Aputed in	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Append 274.54 ppendix 37.45 5a) 3	54.43 only if co  May 144.52 L, equati 10.84 dix L, equati 253.76 L, equati 37.45	Jun 144.52 ion L9 o 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a)	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se	Sep 144.52 Table 5 17.25 See Table 225.85	58.32  ater is fr  Oct  144.52  21.91  ole 5  242.31  5	62.08 om com Nov 144.52 25.57	Dec 144.52 27.26 282.61		(66) (67) (68)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even	m in calc ains (see s (Table Feb 144.52 (calcular 23.56 ins (calcular 37.45 ns gains 3	ted in Apulated in	of (65)m ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 a) 3 tive valu	54.43 only if c  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat 37.45	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5)	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45	62.08  om com  Nov  144.52  25.57  263.09  37.45	66.76 munity h  Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calcula 37.45 as gains 3 raporatio -115.62	ted in Ap 19.16 ulated in 291 ted in Ap 37.45 (Table 5	of (65)m ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 a) 3 tive valu	54.43 only if co  May 144.52 L, equati 10.84 dix L, equati 253.76 L, equati 37.45	Jun 144.52 ion L9 o 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32  ater is fr  Oct 144.52  21.91  ble 5 242.31  5 37.45	62.08 om com Nov 144.52 25.57 263.09	66.76 munity h  Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 as gains 3 raporatio -115.62 gains (T	ted in Apulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 5a) 3 tive valu -115.62	54.43 only if co  May 144.52 L, equati 10.84 dix L, equ 253.76 L, equat 37.45  3 es) (Tab	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Table 225.85 ee Table 37.45  3	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45	62.08 om com Nov 144.52 25.57 263.09 37.45	Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1	m in calce is (Table Feb 144.52) (calcular 23.56) ins (calcular 37.45) ins gains 3 (caporatio -115.62) gains (Table 89.73)	ted in Ap 19.16 ulated in Ap 37.45 (Table 5 3 on (negat -115.62 Table 5) 84.79	of (65)m ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 a) 3 tive valu	54.43 only if c  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat 37.45	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45  3  -115.62	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45  3  -115.62	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45 3 -115.62	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1  Total internal	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3 vaporatio -115.62 gains (T 89.73 gains =	ted in Ap 19.16 ulated in 291 ated in Ap 37.45 (Table 5 3 on (negate -115.62) able 5) 84.79	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 a) 3 tive valu -115.62	54.43 only if co :  May 144.52 L, equati 10.84 dix L, eqi 253.76 L, equati 37.45  3 es) (Tab -115.62	Jun 144.52 fon L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45 3 -115.62 m + (67)m	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45  -115.62  68.5 1+ (68)m -	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tall 225.85 ee Table 37.45  3  -115.62  71.44 + (69)m + (	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45  3  -115.62  78.38 70)m + (7	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62  86.22  1)m + (72)	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62 89.74		(66) (67) (68) (69) (70) (71)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calcula 37.45 as gains 3 raporatio -115.62 gains (T 89.73 gains =	ted in Ap 19.16 ulated in Ap 37.45 (Table 5 3 on (negat -115.62 Table 5) 84.79	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 5a) 3 tive valu -115.62	54.43 only if co  May 144.52 L, equati 10.84 dix L, equ 253.76 L, equat 37.45  3 es) (Tab	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45  3  -115.62	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45  3  -115.62	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45 3 -115.62	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62		(66) (67) (68) (69) (70)

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

Orientation: Access Fac Table 6d	tor Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East 0.9x 1	x 2.88	x	19.64	x	0.76	x	0.7	=	20.85	(76)
East 0.9x 1	x 2.88	X	38.42	x	0.76	х	0.7	=	40.79	(76)
East 0.9x 1	x 2.88	X	63.27	х	0.76	х	0.7	<b>=</b>	67.18	(76)
East 0.9x 1	x 2.88	X	92.28	x	0.76	x	0.7	] =	97.98	(76)
East 0.9x 1	x 2.88	X	113.09	х	0.76	х	0.7	=	120.08	(76)
East 0.9x 1	x 2.88	X	115.77	x	0.76	х	0.7	=	122.92	(76)
East 0.9x 1	x 2.88	X	110.22	x	0.76	х	0.7	=	117.03	(76)
East 0.9x 1	x 2.88	X	94.68	x	0.76	x	0.7	=	100.53	(76)
East 0.9x 1	x 2.88	X	73.59	x	0.76	х	0.7	=	78.14	(76)
East 0.9x 1	x 2.88	X	45.59	x	0.76	x	0.7	=	48.41	(76)
East 0.9x 1	x 2.88	X	24.49	x	0.76	x	0.7	=	26	(76)
East 0.9x 1	x 2.88	X	16.15	x	0.76	x	0.7	=	17.15	(76)
West 0.9x 0.77	x 11.61	X	19.64	x	0.76	x	0.7	=	84.07	(80)
West 0.9x 0.77	x 11.61	X	38.42	x	0.76	x	0.7	=	164.45	(80)
West 0.9x 0.77	x 11.61	X	63.27	x	0.76	x	0.7	=	270.83	(80)
West 0.9x 0.77	x 11.61	X	92.28	x	0.76	x	0.7	=	394.99	(80)
West 0.9x 0.77	x 11.61	X	113.09	x	0.76	x	0.7	=	484.07	(80)
West 0.9x 0.77	x 11.61	X	115.77	x	0.76	x	0.7	=	495.54	(80)
West 0.9x 0.77	x 11.61	X	110.22	x	0.76	x	0.7	=	471.77	(80)
West 0.9x 0.77	× 11.61	X	94.68	x	0.76	х	0.7	=	405.24	(80)
West 0.9x 0.77	x 11.61	X	73.59	x	0.76	х	0.7	=	314.99	(80)
West 0.9x 0.77	x 11.61	X	45.59	x	0.76	x	0.7	=	195.14	(80)
West 0.9x 0.77	X 11.61	X	24.49	x	0.76	x	0.7	=	104.82	(80)
West 0.9x 0.77	x 11.61	X	16.15	x	0.76	x	0.7	=	69.13	(80)
Rooflights 0.9x 1	× 4.05	X	26.61	X	0.76	X	0.7	=	51.6	(82)
Rooflights 0.9x 1	× 5.4	X	26.61	X	0.76	X	0.7	=	68.79	(82)
Rooflights <sub>0.9x</sub> 1	x 4.05	X	53.79	x	0.76	x	0.7	=	104.31	(82)
Rooflights 0.9x 1	× 5.4	X	53.79	X	0.76	X	0.7	=	139.08	(82)
Rooflights 0.9x 1	× 4.05	X	92.95	X	0.76	X	0.7	=	180.24	(82)
Rooflights 0.9x 1	× 5.4	X	92.95	X	0.76	X	0.7	=	240.31	(82)
Rooflights 0.9x 1	× 4.05	X	142.44	X	0.76	X	0.7	=	276.21	(82)
Rooflights 0.9x 1	× 5.4	X	142.44	X	0.76	X	0.7	=	368.28	(82)
Rooflights 0.9x 1	x 4.05	X	180.71	x	0.76	x	0.7	=	350.43	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	180.71	x	0.76	x	0.7	=	467.24	(82)
Rooflights <sub>0.9x</sub> 1	x 4.05	X	187.72	x	0.76	х	0.7	=	364.02	(82)
Rooflights 0.9x 1	x 5.4	X	187.72	x	0.76	х	0.7	=	485.36	(82)
Rooflights 0.9x 1	x 4.05	X	177.6	x	0.76	х	0.7	] =	344.39	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	177.6	x	0.76	x	0.7	=	459.18	(82)
Rooflights 0.9x 1	x 4.05	x	148.43	x	0.76	x	0.7	=	287.83	(82)

Rooflights 0	).9x 1	X	5.	4	x	14	8.43	X		0.76	x	0.7	=	383.77	(82)
Rooflights 0	).9x 1	х	4.0	)5	x [	11	0.34	x		0.76	x [	0.7	=	213.96	(82)
Rooflights 0	).9x 1	x	5.	4	x	11	0.34	X		0.76	x	0.7	=	285.28	(82)
Rooflights 0	).9x 1	x	4.0	)5	x	64	1.97	x		0.76	x	0.7	=	125.99	(82)
Rooflights 0	).9x 1	х	5.	4	x	64	1.97	x		0.76	x [	0.7	=	167.99	(82)
Rooflights 0	).9x	x	4.0	)5	x	33	3.49	x		0.76	x	0.7	=	64.94	(82)
Rooflights 0	).9x	x	5.	4	x	33	3.49	x		0.76	x	0.7	=	86.58	(82)
Rooflights 0	).9x 1	x	4.0	)5	x $\lceil$	21	1.68	х		0.76	x	0.7		42.04	(82)
Rooflights 0	).9x	x	5.	4	x	21	1.68	x		0.76	x	0.7		56.06	(82)
		<del></del>			_										
Solar gain	s in watts, c	alculated	I for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 225	5.31 448.64	758.56	1137.47	1421.82	146	7.84	1392.37	1177	7.37	892.36	537.52	282.35	184.38		(83)
Total gains	s – internal a	and solar	(84)m =	= (73)m -	+ (83	3)m ,	watts		•			•	•	•	
(84)m= 708	3.95 930	1222.87	1573.95	1828.94	184	6.91	1753.92	154	6.2	1276.26	949.48	726.58	653.35		(84)
7. Mean i	nternal tem	perature	(heating	season	)										
	ture during l		, ,		<i>'</i>	rea fi	rom Tab	ole 9.	. Th′	1 (°C)				21	(85)
•	n factor for g	٠.			•			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	. ( •)					(、。,
	an Feb	Mar	Apr	May	Ė.	un	Jul	A	ug	Sep	Oct	Nov	Dec	1	
<u> </u>	1 0.99	0.96	0.85	0.66	┢	47	0.34	0.4	<del>-  </del>	0.69	0.95	0.99	1		(86)
	arnal tampa	roturo in	livina or	00 T1 /fc	المال	, eter	o 2 to 7	l 7 in T	l	. 00)		1		1	
	ernal tempe .64 19.89	20.29	20.71	20.93	_	.99	21	2		20.94	20.55	19.99	19.59	1	(87)
. ,					<u> </u>	L					20.00	10.00	10.00		(0.)
· -	ture during l	<del></del>		i		<del>-</del>			$\overline{}$	<u> </u>		1	·	1	(55)
(88)m= 20	.01 20.01	20.01	20.02	20.02	20	.02	20.02	20.	02	20.02	20.02	20.01	20.01		(88)
Utilisation	n factor for g	gains for	rest of d	welling,	h2,n	n (se	e Table	9a)						_	
(89)m=	1 0.99	0.95	0.82	0.6	0.	.4	0.27	0.3	32	0.61	0.93	0.99	1		(89)
Mean inte	ernal tempe	rature in	the rest	of dwelli	na T	Γ2 (fo	llow ste	eps 3	to 7	' in Tabl	e 9c)				
	.76 19.01	19.4	19.8	19.97	<u> </u>	.02	20.02	20.	$\overline{}$	19.99	19.66	19.12	18.71	]	(90)
					!					f	LA = Livi	ng area ÷ (4	4) =	0.26	(91)
Moon into	arnal tampa	ratura (fa	r tha wh	olo duro	llina	\ _ fl	Λ Τ1	. /1	fl	۸) T2					
	ernal tempe .98 19.23	19.63	20.03	20.22		.26	20.27	20.		20.23	19.89	19.34	18.94	1	(92)
` ′	ustment to											10.04	10.04		(/
· · · · · · · · · · · · · · ·	.83 19.08	19.48	19.88	20.07	_	.11	20.12	20.		20.08	19.74	19.19	18.79	1	(93)
	heating req	uirement													
•	the mean in			re obtain	ed a	at ste	p 11 of	Tabl	le 9b	o, so tha	t Ti.m=	(76)m an	d re-cal	culate	
	tion factor f		•							,	,	( )		_	
J	an Feb	Mar	Apr	May	J	un	Jul	Αı	ug	Sep	Oct	Nov	Dec		
Utilisation	n factor for g	gains, hm	:											-	
(94)m=	1 0.98	0.94	0.81	0.6	0.	41	0.28	0.3	33	0.61	0.92	0.99	1		(94)
	ins, hmGm	<del>- `</del>	<u> </u>	<del></del>										•	
(95)m= 705	5.47 915.15	1151.36	1275.34	1105.37	752	2.93	484.3	510	.14	784.54	872.75	718.26	651.1		(95)
	average exte	1	i –	i						-			1	1	
` '	.3 4.9	6.5	8.9	11.7	<u> </u>	4.6	16.6	16.		14.1	10.6	7.1	4.2	]	(96)
	rate for me	1	<u>.</u>	r			- ,	_ <u>-`</u>	<del>-</del> -	<u> </u>		1		1	/a=:
(97)m= 203	8.12 1986.09	1814.52	1524.66	1159.98	759	9.87	485.14	512	.04	825.88	1266.75	1680.54	2033.72	J	(97)

98)m= 991.49 719	_	493.39	179.51	40.63	0	0	24 x [(97)	0	293.14	692.84	1028.67		
L							Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	4439.33	(98)
Space heating re	quirε	ement in	kWh/m²	/year							Ī	34.6	(99)
a. Energy require	mer	ıts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heating:	boo	t from o		/aunnla	mantan	ovetom							(201
Fraction of space Fraction of space			-		пепату	-	(202) = 1 -	- (201) =			F	1	(202
Fraction of total h			•	. ,			(204) = (204)		(203)] =			1	(204
Efficiency of main		•	•				( - / (	- , [	( / ]			90.3	(206
Efficiency of seco					g system	າ, %						0	(208
	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒' ear
Space heating re			•				_ 3					- 7	
991.49 719	.67	493.39	179.51	40.63	0	0	0	0	293.14	692.84	1028.67		
211)m = {[(98)m x	(20	4)] } x 1	00 ÷ (20	6)						T			(211
1098 796	.98	546.39	198.79	44.99	0	0	0	0	324.62	767.27	1139.17		¬,,,
	. ,		\ 1.14 <i>0</i> .7				TUIA	i (KVVII/yea	ii) =Suiii(2	211) <sub>15,1012</sub>	<i>-</i>	4916.2	(21
Space heating fue {[(98)m x (201)]]	•			month									
		00 + (20	0	0	0	0	0	0	0	0	0		
, <u> </u>							Tota	l (kWh/yea	ar) =Sum(2	L 215) <sub>15,1012</sub>	<u> </u>	0	(215
Vater heating													
Output from water	hea	ter (calc	ulated al	oove)									
218.73 192		202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		<b>–</b>
fficiency of water			05.07	00.0	04	04	04	0.4	00.40	00.04	00.55	81	(21)
217)m= 88.46 88		87.38	85.37	82.6	81	81	81	81	86.42	88.04	88.55		(21
uel for water hear 219)m = (64)m x													
219)m= 247.25 218		231.6	212.39	213	191.3	183.28	204.31	206.09	217.57	225.95	241.03		
							Tota	I = Sum(2	19a) <sub>112</sub> =			2592.41	(219
nnual totals				4					k\	Wh/year		kWh/yea	<u>r</u>
pace heating fuel		•	system	1							L	4916.2	_
later heating fuel	use	d										2592.41	
lectricity for pump	s, fa	ans and	electric	keep-ho	t								
central heating pu	ımp:										30		(23
otal electricity for	the	above, k	Wh/yea	r			sum	of (230a).	(230g) =		$\overline{\Gamma}$	30	(23
											=		_
lectricity for lighting	ng											468.38	(23

Energy

kWh/year

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**Emissions** 

kg CO2/year

**Emission factor** 

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	1061.9	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	559.96	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1621.86	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	243.09	(268)
Total CO2, kg/year	sum	of (265)(271) =		1880.52	(272)
Dwelling CO2 Emission Rate	(272)	) ÷ (4) =		14.66	(273)
El rating (section 14)				85	(274)



# APPENDIX B2 SAP OUTPUTS FOR SAMPLE UNITS "CLEAN"

			lloor D	) otoilo:						
Assessor Name: Software Name:	Matthew Stainrod Stroma FSAP 201	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
Address	1F-3, Bertram Stree			Address	06-18-6	59419 1	F-3			
Address: 1. Overall dwelling dim	*	et, Londo	)I I							
1. Overall dwelling diff	C11310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.4	(2a) =	169.8	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n) 7	70.75	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	169.8	(5)
2. Ventilation rate:										
		econdar neating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	<b>+</b> [	0	= [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = Ē	0	x	20 =	0	(6b)
Number of intermittent f	ans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive vent	S				F	0	x	10 =	0	(7b)
Number of flueless gas						0	x	40 =	0	(7c)
realiser of haciess gas	11100					0			0	(70)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	Sa)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	ed, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 (	<b>(</b>	0.05.6				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
	nings); if equal user 0.35	sportaining to	rino groui	or wan are	a (anor					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
ŭ	vs and doors draught s	tripped		0.05 (0.0	(4.4)	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	, q50, expressed in cub	nia matra	o por bo	. , , ,	, , ,	, , ,	, ,	oroo	0	(16)
If based on air permeab	• •		•	•	•	elle oi e	rivelope	alea	0.15	(17)
•	ies if a pressurisation test ha					is being u	sed		0.15	(10)
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind speed	d							1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (2	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	]	
· LL		1				L	1		1	

Adjusted infiltr	ration rat	e (allowi	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		•	rate for t	he appli	cable ca	se	•	•	•	•	•		(22a)
If exhaust air h			endix N (2	23h) <i>- (23</i> ;	a) × Fmv (4	equation (I	NS)) othe	rwise (23h	) = (23a)			0.5	(23a)
If balanced wit									) = (20u)			0.5	(23b) (23c)
a) If balance		-	•	_					2h)m + (	23h) 🗴 [¹	1 <i>– (2</i> 3c)	79.9 ÷ 1001	(230)
(24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	л ЛV) (24t	p)m = (22)	2b)m + (2	23b)		I	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	nouse ex	tract ver	ntilation o	or positiv	e input	ventilatio	n from o	outside	!				
if (22b)r	m < 0.5 >	< (23b), t	then (24	c) = (23k	o); other	wise (24	c) = (22h	b) 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 $m = 1$ , th								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-l		X k J/K
Doors		,			2.1	x	1.4	=	2.94	$\stackrel{\prime}{\Box}$			(26)
Windows Type	e 1				3.8	x1	/[1/( 1.4 )+	0.04] =	5.04	一			(27)
Windows Type	e 2				15.96	3 x1	/[1/( 1.4 )+	0.04] =	21.16				(27)
Walls Type1	47.6	64	21.8	6	25.78	3 X	0.15	= i	3.87		14	360.9	(29)
Walls Type2	8.0	2	0		8.02	X	0.14	<del>-</del>	1.13	T i	14	112.2	28 (29)
Total area of	elements	s, m²	<u></u>		55.66	3							(31)
Party wall					31.5	1 x	0	=	0		20	630.	2 (32)
Party floor					70.75	5					40	2830	(32a)
Party ceiling					70.75	5				Ī	30	2122	.5 (32b)
Internal wall **	*				105.6	3				Ī	9	950.	4 (32c)
* for windows and ** include the are						lated using	formula 1	1/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)	) + (32) =				34.13	(33)
Heat capacity	Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	7006.3	(34)
Thermal mass	s parame	eter (TMF	⊃ = Cm -	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			99.03	(35)
For design asses can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		_
Thermal bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	K						5.36	(36)
if details of therm		are not kr	nown (36) :	= 0.15 x (3	31)			, .	,,				 
Total fabric he								. ,	(36) =	·> :		39.5	(37)
Ventilation he	1		<u> </u>	<u> </u>	1	11	<b>1</b>	<del>- `                                   </del>	= 0.33 × (		_	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(2.2)	l					·				l			(00)
(38)m= 14.74	14.56	14.38	13.49	13.31	12.42	12.42	12.24	12.78	13.31	13.67	14.03		(38)
Heat transfer of			50.00	50.04	54.00			· · · ·	= (37) + (37)	<del></del>			
(39)m= 54.24	54.06	53.88	52.99	52.81	51.92	51.92	51.74	52.27	52.81	53.17	53.52	52.94	(39)
Heat loss para	meter (l	HLP), W	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 / 12=	52.94	(39)
(40)m= 0.77	0.76	0.76	0.75	0.75	0.73	0.73	0.73	0.74	0.75	0.75	0.76		<b>_</b>
Number of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.75	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
							•			!			
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed see	in an air	N I											(40)
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.26		(42)
Annual averag	•	ater usaç	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		87	<b>.</b> .97		(43)
Reduce the annua							to achieve	a water us	se target o	f			, ,
not more that 125						<u> </u>		_		·			
Jan Hot water usage ii	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	,		86.22			1	· <i>′</i>	86.22	90.72	93.25	96.77		
(44)m= 96.77	93.25	89.73	86.22	82.7	79.18	79.18	82.7	l	89.73	93.∠5 m(44) <sub>112</sub> =	<u> </u>	1055.7	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L	1000.7	(\/
(45)m= 143.51	125.51	129.52	112.92	108.35	93.5	86.64	99.42	100.61	117.25	127.98	138.98		
									Total = Su	m(45) <sub>112</sub> =	= [	1384.18	(45)
If instantaneous w	/ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	) to (61)					
(46)m= 21.53 Water storage	18.83	19.43	16.94	16.25	14.02	13	14.91	15.09	17.59	19.2	20.85		(46)
Storage volum		) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '					•							, ,
Otherwise if no	_			-			. ,	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):					0		(48)
Temperature f							(40)				0		(49)
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)	) =		1	10		(50)
Hot water stora			-							0.	.02		(51)
If community h	_		on 4.3										
Volume factor										1.	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
Enter (50) or (	. , .	•	or ooob	manth			//EC\m /	EE) (44).	_	1.	.03		(55)
Water storage							((56)m = (						(50)
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01	30.98	32.01	30.98 x [(50) = (	32.01 H11)1 ÷ (5	32.01 0) else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01	x H	(56)
		r		1		1					<del>- 1</del>	S.I.I.	/F=\
(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 (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder th	nermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51 2	23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0	0 0 0 (61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)	0)m + (46)m + (57)m + (59)m + (61)m
	72.52 181.48 194.26 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar co	ontribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	g/
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
	72.52 181.48 194.26
	heater (annual) <sub>112</sub> 2035.02 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(4)	` ,
	33.21 85.35 90.43 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot wate	er is from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
	Oct Nov Dec
(66)m= 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21	13.21 113.21 113.21 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 17.74 15.76 12.82 9.7 7.25 6.12 6.62 8.6 11.54 1	4.66 17.11 18.24 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table	5
(68)m= 199.04 201.11 195.9 184.82 170.83 157.69 148.91 146.84 152.05 16	63.13 177.11 190.26 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32	34.32 34.32 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57	90.57 -90.57 -90.57 (71)
Water heating gains (Table 5)	
	11.84 118.54 121.55 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m$	
J	46.58 369.73 387.01 (73)
6. Solar gains:	, ,
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the ap	pplicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m² Table 6a Table 6b	Table 6c (W)
North 0.9x 0.77 x 3.8 x 10.63 x 0.558	x 0.7 = 10.94 (74)
North 0.9x 0.77 x 3.8 x 20.32 x 0.558	x 0.7 = 20.9 (74)
0.000	20.0

	_								_						_		_
North	0.9x	0.77	x	:;	3.8	X	3	34.53	X		0.558	X	0.7	=	• <u>L</u>	35.52	(74)
North	0.9x	0.77	Х	; ;	3.8	X	5	55.46	X		0.558	X	0.7	-		57.05	(74)
North	0.9x	0.77	X	; ;	3.8	X	7	4.72	X		0.558	X	0.7	-		76.85	(74)
North	0.9x	0.77	Х	;	3.8	X	7	79.99	X		0.558	X	0.7	=		82.27	(74)
North	0.9x	0.77	х	;	3.8	x	7	4.68	X		0.558	X	0.7			76.81	(74)
North	0.9x	0.77	X	: ;	3.8	x	5	9.25	X		0.558	X	0.7			60.94	(74)
North	0.9x	0.77	х	: ;	3.8	x	4	1.52	X		0.558	X	0.7	=		42.7	(74)
North	0.9x	0.77	X	; ;	3.8	x	2	24.19	x		0.558	X	0.7	=		24.88	(74)
North	0.9x	0.77	х	; ;	3.8	x	1	3.12	x		0.558	x	0.7	-		13.49	(74)
North	0.9x	0.77	х	; ;	3.8	x		8.86	x		0.558	х	0.7	-		9.12	(74)
West	0.9x	0.77	х	1:	5.96	x	1	9.64	X		0.56	X	0.7			84.85	(80)
West	0.9x	0.77	х	1:	5.96	x	3	88.42	X		0.56	X	0.7		Ē	165.98	(80)
West	0.9x	0.77	×	1:	5.96	x	6	3.27	x		0.56	x	0.7		• [	273.35	(80)
West	0.9x	0.77	×	1:	5.96	x	9	2.28	x		0.56	x	0.7	╗ -	· ┌	398.66	(80)
West	0.9x	0.77	×	1:	5.96	x	1	13.09	x		0.56	x	0.7	╡ =	- ┌	488.58	(80)
West	0.9x	0.77	×	1:	5.96	×	1	15.77	x		0.56	x	0.7	╡ =	•	500.15	(80)
West	0.9x	0.77	×	1:	5.96	x	1	10.22	х		0.56	x	0.7		Ē	476.16	(80)
West	0.9x	0.77	×	1:	5.96	x	9	94.68	x		0.56	x	0.7		Ē	409.01	(80)
West	0.9x	0.77	×	1:	5.96	x	7	73.59	x		0.56	x	0.7		▗▕▔	317.92	(80)
West	0.9x	0.77	×	1:	5.96	x	4	l5.59	x		0.56	x	0.7		┇	196.95	(80)
West	0.9x	0.77	×	1:	5.96	×	2	24.49	x		0.56	x	0.7	╡ -	· F	105.8	(80)
West	0.9x	0.77	×	1:	5.96	×	1	6.15	x		0.56	x	0.7	╡ =	┇	69.78	(80)
	L					•											
Solar g	ains in	watts, ca	lculate	d for ea	ch mon	th			(83)m	n = Su	m(74)m .	(82)m					
(83)m=	95.79	186.88	308.87	455.71	565.43	3 5	82.42	552.97	469	.95	360.62	221.83	3 119.29	78.89			(83)
Total g	ains – i	nternal a	nd sola	r (84)m	= (73)n	n + (	83)m	, watts									
(84)m=	493.11	582.26	691.87	818.79	908.3	4 9	05.81	863.61	786	5.23	687.07	568.42	489.01	465.9			(84)
7. Mea	an inter	nal temp	erature	(heatir	g seaso	on)											
		during h					area	from Tal	ole 9	, Th1	(°C)				Г	21	(85)
Utilisa	tion fac	ctor for ga	ains for	living a	rea, h1,	m (s	ee Ta	ıble 9a)							_		_
	Jan	Feb	Mar	Apr	Ma	y T	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	;		
(86)m=	0.94	0.9	0.82	0.67	0.51		0.36	0.26	0.	3	0.5	0.76	0.9	0.95			(86)
Mean	interna	l tempera	ature in	living a	rea T1	(follo	ow ste	ps 3 to 7	7 in T	able	9c)		-				
(87)m=	19.7	19.98	20.37	20.73	20.91	<del>`</del>	20.98	21	20.		20.94	20.66	20.12	19.65			(87)
Temp	oraturo	during h	eating	nerinde	in rest (	of dv	uelling	from Ta	hla (	a Th	2 (°C)			!	_		
(88)m=	20.28	20.28	20.29	20.3	20.3	$\neg$	20.31	20.31	20.		20.31	20.3	20.3	20.29	П		(88)
L								<u> </u>	<u> </u>				1		_		
(89)m=	0.93	tor for ga	0.8	0.65	0.48		,m (se 0.32	0.22	9a) 0.2	26 T	0.45	0.73	0.89	0.94	$\neg$		(89)
L		<u> </u>			<u> </u>			<u> </u>			!		0.09	1 0.94			(55)
T T		l tempera		1		-	•	i	·		- 1		1 40 45	40.47	$\neg$		(00)
(90)m=	18.53	18.93	19.47	19.97	20.21		20.29	20.31	20.	31	20.25	19.89	19.15 ring area ÷ (4	18.47	+	0.05	(90)
											"	LA - LI\	ing area + (	<del>-,,                                   </del>	L	0.35	(91)

Mean i	internal ter	nperatu	ure (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=			19.79	20.24	20.46	20.54	20.55	20.55	20.5	20.16	19.49	18.89		(92)
Apply	adjustmen	to the	mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.94 19	9.3 1	19.79	20.24	20.46	20.54	20.55	20.55	20.5	20.16	19.49	18.89		(93)
8. Spa	ce heating	require	ement											
	to the mea			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	lisation fac		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisat	tion factor				iviay	Odii	- Oui	7109	ОСР	001	1101	_ <u>_</u>		
(94)m=		<del></del>	0.79	0.64	0.48	0.34	0.24	0.27	0.47	0.73	0.87	0.92		(94)
Useful	gains, hm	Gm , W	V = (94	l)m x (8	4)m						<u> </u>			
(95)m=	450.78 50	6.49 5	43.95	527.39	439.31	303.51	204.1	213.06	319.76	413.59	427.41	430.77		(95)
Month	ly average	externa	al tem	perature	from Ta	able 8					•			
(96)m=			6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Г	oss rate for													(07)
` ′			15.99	601.05	462.46	308.22	205.12	214.71	334.31	504.86	658.81	786.02		(97)
· -	heating re 255.57   183		128	r eacn n 53.03	17.22	/vn/mon	$\ln = 0.02$	24 X [(97)	)m – (95 0	)MJ X (4 <sup>7</sup> 67.91	1)m 166.61	264.3		
(90)111=	233.37	2.04	120	33.03	17.22	0	U	l	l per year		<u> </u>		1135.49	(98)
Space	heating re	auirem	ent in	kWh/m²	²/vear					(	,(-	[	16.05	(99)
•	ergy require	•				scheme						L	10.00	
	rt is used f			· ·	Ĭ			ina prov	rided by	a comm	unity scł	neme.		
	of space										army cor		0	(301)
Fraction	of space	heat fro	om cor	mmunity	system	1 – (30	1) =						1	(302)
	munity schem	-								up to four o	other heat	sources; th	ne latter	_
	boilers, heat p				aste heat f	rom powe	r stations.	See Appei	ndix C.			ſ		7(2025)
	of heat fro			•	0							<u>[</u>	0.6	(303a)
	n of commu	•										. [	0.4	(303b)
	n of total sp				•						02) x (303	l l	0.6	(304a)
Fraction	n of total sp	ace he	eat fror	m comm	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.4	(304b)
Factor f	or control a	and cha	arging	method	(Table	4c(3)) fo	r commu	unity hea	ting sys	tem			1	(305)
Distribu	tion loss fa	ctor (T	able 1	2c) for o	commun	ity heatii	ng syste	m					1.05	(306)
Space I	heating												kWh/yeaı	—
Annual	space hea	ting red	quirem	ent									1135.49	
Space h	neat from C	Commu	ınity C	HP					(98) x (30	04a) x (305	5) x (306)	= [	715.36	(307a)
Space h	neat from h	eat sou	urce 2						(98) x (30	04b) x (305	5) x (306)	= [	476.91	(307b)
Efficien	cy of secor	ndary/s	uppler	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space h	neating req	uireme	ent fror	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 ÷	÷ (308) =		0	(309)
Water h	neating											_		_
Annual	water heat	ing req	uireme	ent									2035.02	
	from comr neat from C								(64) v (3(	03a) x (305	5) x (306) :	_ [	1282.06	(310a)
vvalerii	ioat IIOIII C	Jiiiiiul	inty Of	11					(U+) X (3(	Juay x (300	) x (300)	- [	1202.00	(STUA)

Water heat from heat source 2		(64) x (303b) x	(305) v (306) –	854.71	(310b)
Electricity used for heat distribution					╡`
•	u:_	0.01 x [(307a)(307	e) + (310a)(310e)] =	33.29	(313)
Cooling System Energy Efficiency Rat		(407) - (044)		0	(314)
Space cooling (if there is a fixed coolir		$=(107) \div (314)$	=	0	(315)
Electricity for pumps and fans within d mechanical ventilation - balanced, extra	· ,	n outside		137.24	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330b	o) + (330g) =	137.24	(331)
Energy for lighting (calculated in Appe	endix L)			313.38	(332)
12b. CO2 Emissions – Community hea	ating scheme				
Electrical efficiency of CHP unit				29.73	(361)
Heat efficiency of CHP unit				45.95	(362)
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) (3)	07a) × 100 ÷ (362) =	1556.82 ×	0.22	336.27	(363)
less credit emissions for electricity -(	(307a) × (361) ÷ (362) =	462.84 ×	0.52	-240.22	(364)
Water heated by CHP (3	10a) × 100 ÷ (362) =	2790.13 ×	0.22	602.67	」 (365)
less credit emissions for electricity —	(310a) × (361) ÷ (362) =	829.51 X	0.52	-430.51	(366)
Efficiency of heat source 2 (%)	If there is CHP usi	ng two fuels repeat (363) to	(366) for the second fu	el 91	(367b)
CO2 associated with heat source 2	[(307b)	)+(310b)] x 100 ÷ (367b) x	0.22	= 316.08	(368)
Electrical energy for heat distribution		[(313) x	0.52	= 17.28	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(372	2)	= 601.57	(373)
CO2 associated with space heating (s	secondary)	(309) x	0	= 0	(374)
CO2 associated with water from imme	ersion heater or instantar	neous heater (312) x	0.22	= 0	
Total CO2 associated with space and	water heating	(373) + (374) + (375) =		601.57	
CO2 associated with electricity for pun	mps and fans within dwe	lling (331)) x	0.52	= 71.23	(378)
CO2 associated with electricity for ligh		(332))) x		= 162.64	」、
Total CO2, kg/year	sum of (376)(382) =			835.44	」、 (383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.81	(384)
El rating (section 14)				90.33	(385)
J (					

			User_[	Details:						
Assessor Name: Software Name:	Matthew Stainro Stroma FSAP 20			Strom Softwa					0023501 on: 1.0.4.16	
			i i	Address	06-18-6	59419 1	F-4			
Address :	1F-4, Bertram Stre	eet, Londo	n							
1. Overall dwelling dime	ensions:		Λ	a/m²\		Av. Ha	! or lo 4 / roo \		Val	`
Ground floor				<b>a(m²)</b> 58.06	(1a) x		2.4	(2a) =	<b>Volume(m³</b> 139.34	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	1e)+(1r	n) :	58.06	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	139.34	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	′y □ +	other 0	7 = [	total 0	x	40 =	m³ per hou	r
Number of open flues			<b>Ⅎ</b> ͺͰ		]		x	20 =		=
·	U	0		0	J Ū	0			0	(6b)
Number of intermittent fa					Ĺ	0		10 =	0	(7a)
Number of passive vents	S				L	0	X '	10 =	0	(7b)
Number of flueless gas t	fires					0	X ·	40 =	0	(7c)
								Air cl	nanges per ho	our
Infiltration due to chimne	evs. flues and fans =	(6a)+(6b)+(7	<sup>7</sup> a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has					ontinue fr	_		. (0) –		
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	present, use the value corr				•	ruction			0	(11)
deducting areas of open If suspended wooden	• / /	aled) or 0	1 (spal	معام (امد	antar N					(12)
If no draught lobby, er	•	,	. i (Scai	eu), eise	enter o				0	(12)
Percentage of window									0	(14)
Window infiltration	g			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 co	ubic metre	s per h	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeab	ility value, then (18) = [	(17) ÷ 20]+(	8), otherw	vise (18) = (	16)				0.15	(18)
Air permeability value appli		as been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelter Shelter factor	ed			(20) = 1 -	in n75 v (1	Q)1 <b>–</b>			3	(19)
Infiltration rate incorpora	ting shelter factor			(20) = 1 (21) = (18)	`	0/] =			0.78	(20)
Infiltration rate modified	-	ad		(21) - (10	/ X (20) =				0.12	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s		<u>, 1 </u>	1	1		1 - 50.	1		1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
	LL		I	1		l		1	1	
Wind Factor $(22a)m = (2a)m =$	<del>'</del>	1		1			T	<u> </u>	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	]	

Adjusted infiltra	ation rate (allo	wing for sl	helter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.15	0.15 0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effect	•	e rate for i	the appli	cable ca	ise	•	•	•	•	•	<i>-</i>	
If mechanica	i ventilation: at pump using Ap	onendiy N. (3	23h) - (23:	a) v Emy (4	aguation (	N5N othe	rwise (23h	n) – (23a)			0.5	(23a
	heat recovery: ef							) = (20a)			0.5	(23b
	-	-	_					2h\m . (	22h) v [	1 (226)	79.9	(230
(24a)m= 0.25	d mechanical 0.25 0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24	) <del>-</del> 100] ]	(24a
` '	d mechanical		ļ	ļ		<u> </u>	<u> </u>	<u> </u>		0.24	]	(
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	1	(24b
` '	ouse extract v										_	
	$0.5 \times (23b)$							.5 × (23b	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(240
d) If natural v	/entilation or v	vhole hous	se positi	ve input	ventilati	on from	loft	ļ	<u>!</u>	<u> </u>	1	
,	1 = 1, then (24							0.5]			_	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(240
Effective air	change rate -	enter (24a	a) or (24l	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m= 0.25	0.25 0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25)
3. Heat losses	s and heat los	s paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value		X k J/K
Doors	aroa (m.)			2.1	 x	1.4		2.94		110/111		(26)
Windows Type	1			15.96	= ,	/[1/( 1.4 )+		21.16	=			(27)
Windows Type				2.4	_	/[1/( 1.4 )+		3.18	=			(27)
Floor	_				= "		=			75	4354	``
Walls Type1	20.04	00.4		58.06	=	0.2	_	11.612		75	= =	=
Walls Type2	30.84	20.4	0	10.38	=	0.15	=	1.56		14	145.3	=
	24.12	0	_	24.12	<u> </u>	0.14	=	3.4	_	14	= =	(29)
Walls Type3	9.6	0		9.6	X	0.15	=	1.44		14	134.	``
Total area of el	ements, m <sup>2</sup>			122.6	2							(31)
Party wall				16.32	2 X	0	=	0		20	326.	4 (32)
Party ceiling				58.06	5				إ	30	1741	.8 (32b
Internal wall **				81.6						9	734.	4 (320
* for windows and ** include the area					lated using	g formula 1	1/[(1/U-valı	ue)+0.04] á	as given in	n paragrapi	h 3.2	
Fabric heat los	s, $W/K = S (A)$	x U)				(26)(30	) + (32) =				45.29	(33)
Heat capacity (	$Cm = S(A \times k)$	)					((28).	(30) + (32	2) + (32a)	(32e) =	7774.5	(34)
Thermal mass	parameter (TN	MP = Cm -	÷ TFA) ir	n kJ/m²K			= (34)	) ÷ (4) =			133.9	(35)
- , .	ments where the	details of the	e construct	tion are no	t known p	recisely the	e indicative	e values of	TMP in T	able 1f		
For design assess can be used instead												
-	nd of a detailed ca	alculation.			K						13.72	(36)
can be used instea	nd of a detailed ca es:S (L x Y) c I bridging are not	alculation. alculated	using Ap	pendix l	K						13.72	(36)

Ventilation	heat	loss ca	alculated	l monthly	<u>/</u>				(38)m	= 0.33 × (	25)m x (5)			
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 11	1.44	11.3	11.17	10.5	10.37	9.7	9.7	9.57	9.97	10.37	10.64	10.9		(38)
Heat trans	sfer co	efficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 70	).45	70.31	70.18	69.51	69.38	68.71	68.71	68.58	68.98	69.38	69.64	69.91		
Heat loss	param	neter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	69.48	(39)
(40)m= 1.	.21	1.21	1.21	1.2	1.19	1.18	1.18	1.18	1.19	1.19	1.2	1.2		
Number o	f days	in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.2	(40)
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water	heatir	ng ener	gy requi	irement:								kWh/ye	ear:	
Assumed	occun	ancy N	N								1	93		(42
	· 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		93		(42
Annual av	erage	hot wa										.95		(43
Reduce the a						_	_	to achieve	a water us	se target o	f			
			•			i .	·	Ι.			l			
J Hot water us	an	Feb litres per	Mar day for ea	Apr	May Vd m = fa	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	<del>-</del>		81.55			1	1	· <i>'</i>	70.05	81.55	04.75	07.04		
(44)m= 87	7.94	84.75	61.55	78.35	75.15	71.95	71.95	75.15	78.35		84.75 m(44) <sub>112</sub> =	87.94	959.39	(44
Energy conte	ent of h	ot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600					939.39	(
(45)m= 13	0.42	114.07	117.7	102.62	98.46	84.97	78.73	90.35	91.43	106.55	116.31	126.3		
lf instantane	ous wat	ter heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1257.91	(45
	- 1	17.11	17.66	15.39	14.77	12.75	11.81	13.55	13.71	15.98	17.45	18.95		(46
Water stor	•					/\/\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		201.2		1				
Storage vo		,		•			_		ame ves	sel		0		(47
lf commur Otherwise Water stoi	if no	stored			_			. ,	ers) ente	er '0' in (	47)			
a) If manu	•		eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(48
Temperati	ure fac	ctor fro	m Table	2b								0		(49
Energy los	st from	n water	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50
b) If manu				-										
Hot water					e 2 (kW	h/litre/da	ıy)				0.	02		(51
f commur Volume fa	-	-		on 4.3								00		(50
rolullie la Temperati				2b								.6		(52 (53
Energy los					ear			(47) x (51)	x (52) x (	53) =		03		(54
Enter (50)			_	,y(				( · · ) // ( <b>o</b> · )	, ( <del>==</del> )	/		03		(55
Water stoi	, ,	, ,	•	for each	month			((56)m = (	55) × (41)	m	<u>'</u>	-		, -
		28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56
		_0.0_	52.51	L 55.55	52.01	1 30.00	1 52.51	1 32.31	1 20.00	l	1 20.00	1 02.01		,,

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (5	<del>57</del> )
Primary circuit loss (annual) from Table 3 0 (5	8)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (5	9)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m =	51)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 185.7 163.99 172.98 156.11 153.74 138.46 134.01 145.63 144.92 161.83 169.8 181.58 (6	2)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (6	3)
Output from water heater	
(64)m= 185.7 163.99 172.98 156.11 153.74 138.46 134.01 145.63 144.92 161.83 169.8 181.58	
Output from water heater (annual) <sub>112</sub> 1908.75 (6	4)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 87.59 77.87 83.36 76.92 76.96 71.05 70.4 74.26 73.19 79.65 81.47 86.22 (6	55)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
	i7)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	,
(68)m=   168.03   169.77   165.38   156.02   144.22   133.12   125.71   123.96   128.36   137.71   149.52   160.62   (68)m=   168.03   169.77   165.38   156.02   160.62   (68)m=   168.03   169.77   165.38   169.77   169	(8)
	Ο,
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	.0/
	9)
Pumps and fans gains (Table 5a) (70)m=	<b>'</b> (0)
Losses e.g. evaporation (negative values) (Table 5)	٠,
(71)m= -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05	'1)
Water heating gains (Table 5)	,
	<b>'</b> 2)
Total internal gains = $ (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m $	,
(73)m= 352.63 350.85 340.13 322.94 305.68 288.86 277.81 282.93 291.66 309.03 329 343.79 (7	<b>'3</b> )
6. Solar gains:	-,
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_			ii.						-			_					_
North	0.9x	0.77		X	2.4	1	X	1	0.63	X	(	0.558	X	0.7		=	6.91	(74)
North	0.9x	0.77		X	2.4	1	X	2	0.32	X	(	0.558	X	0.7		=	13.2	(74)
North	0.9x	0.77		X	2.4	1	X	3	4.53	X	(	0.558	X	0.7		=	22.43	(74)
North	0.9x	0.77		x	2.4	1	X	5	5.46	X	(	0.558	X	0.7		=	36.03	(74)
North	0.9x	0.77		x	2.4	1	x	7	4.72	X	(	0.558	X	0.7		=	48.54	(74)
North	0.9x	0.77		x	2.4	1	x	7	9.99	X	(	0.558	X	0.7		=	51.96	(74)
North	0.9x	0.77		x	2.4	1	х	7	4.68	X	(	0.558	X	0.7		=	48.51	(74)
North	0.9x	0.77		x	2.4	1	х	5	9.25	X	(	0.558	X	0.7		=	38.49	(74)
North	0.9x	0.77		x	2.4	1	х	4	1.52	X	(	0.558	X	0.7		=	26.97	(74)
North	0.9x	0.77		x	2.4	1	х	2	4.19	X	(	0.558	X	0.7		=	15.71	(74)
North	0.9x	0.77		x	2.4	1	x	1	3.12	X	(	0.558	x	0.7		=	8.52	(74)
North	0.9x	0.77		x	2.4	1	х	8	3.86	X	(	0.558	X	0.7		=	5.76	(74)
East	0.9x	1		x	15.9	96	x	1	9.64	X	(	0.56	X	0.7		=	84.85	(76)
East	0.9x	1		x	15.9	96	x	3	8.42	X	(	0.56	x	0.7		=	165.98	(76)
East	0.9x	1		x	15.9	96	x	6	3.27	X	(	0.56	X	0.7		=	273.35	(76)
East	0.9x	1		x	15.9	96	x	9	2.28	X	(	0.56	x	0.7		=	398.66	(76)
East	0.9x	1		x	15.9	96	x	1	13.09	X	(	0.56	x	0.7		=	488.58	(76)
East	0.9x	1		x	15.9	96	x	1	15.77	X	(	0.56	X	0.7		=	500.15	(76)
East	0.9x	1		x	15.9	96	x	1	10.22	X	(	0.56	×	0.7		=	476.16	(76)
East	0.9x	1		x	15.9	96	x	9	4.68	X	(	0.56	x	0.7		=	409.01	(76)
East	0.9x	1		x	15.9	96	x	7	3.59	X	(	0.56	×	0.7		=	317.92	(76)
East	0.9x	1		x	15.9	96	x	4	5.59	X	(	0.56	×	0.7		=	196.95	(76)
East	0.9x	1		x	15.9	96	x	2	4.49	X	(	0.56	×	0.7		=	105.8	(76)
East	0.9x	1		x	15.9	96	x	1	6.15	X	(	0.56	X	0.7		=	69.78	(76)
							•			_						•		
		watts, ca								_		n(74)m						
(83)m=	91.76	179.18	295.	.78	434.7	537.12	2 5	52.11	524.67	447	7.5	344.89	212.6	7 114.32	75.5	3		(83)
Total g	ains – i	nternal a	nd s	olar	(84)m =	: (73)n	า + (	83)m	, watts									
(84)m=	444.38	530.03	635.	.92	757.63	842.79	8	40.97	802.48	730	.43	636.54	521.7	443.32	419.	32		(84)
7. Me	an inter	nal temp	erati	ure (	heating	seaso	n)											
Temp	erature	during h	eatir	ng pe	eriods in	the li	ving	area f	from Tal	ble 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for g	ains	for li	ving are	a, h1,	m (s	ee Ta	ble 9a)							'		
	Jan	Feb	M	ar	Apr	Ma	/	Jun	Jul	Α	ug	Sep	Oct	Nov	De	ЭС		
(86)m=	0.97	0.94	0.9	9	0.79	0.65		0.49	0.37	0.4	11	0.64	0.86	0.95	0.9	7		(86)
Mean	interna	l temper	ature	in li	ving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able	9c)			-			
(87)m=	19.13	19.41	19.8	$\overline{}$	20.39	20.75	<del>`</del>	20.92	20.98	20.		20.82	20.31	19.62	19.0	)7		(87)
Temn	erature	during h	eatir	na ne	eriode in	rest	of du	elling	from Ta	ahla (	a Tha	2 (°C)		<del> </del>			l	
(88)m=	19.91	19.91	19.9	<del></del>	19.92	19.92	_	9.93	19.93	19.	$\overline{}$	19.93	19.92	19.92	19.9	2		(88)
																		•
(89)m=	0.96	tor for g	0.8	-	0.76	velling 0.59	$\overline{}$	,m (se <sub>0.42</sub>	e Table 0.28	9a) 0.3	32 T	0.57	0.83	0.94	0.9	7		(89)
														0.94	L 0.9	'		(00)
Mean	interna	I temper	ature	in t	he rest	of dwe	lling	T2 (fo	ollow ste	eps 3	to 7 i	in Table	e 9c)					

(90)m=	17.44	17.85	18.5	19.22	19.67	19.87	19.92	19.92	19.77	19.13	18.16	17.36		(90)
(50)111=	17.77	17.00	10.0	10.22	10.07	10.07	10.02	10.02	<u> </u>		g area ÷ (4		0.49	(91)
						\					<b>J</b> (	' L	0.40	(01)
(92)m=	18.26	18.61	ature (fo 19.17	r the wh	20.19	20.39	LA × 11	+ (1 – fL 20.43	20.29	19.71	18.87	18.2		(92)
			ne mean								10.07	10.2		(02)
(93)m=	18.26	18.61	19.17	19.79	20.19	20.39	20.44	20.43	20.29	19.71	18.87	18.2		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(	76)m and	d re-calcı	ulate	
the ut			or gains u			1	11	Λ	Con	0-4	Nev	Daa		
Utilis	Jan ation fac	Feb tor for a	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.95	0.92	0.86	0.75	0.61	0.45	0.32	0.37	0.59	0.82	0.92	0.96		(94)
Usefu	⊔⊔⊔ ul gains,	hmGm ,	W = (94)	1)m x (8	4)m	<u>I</u>	<u>I</u>	<u>I</u>	Į	<u> </u>				
(95)m=	421.77	487.76	548.26	571.29	512.42	375.91	257.88	267.63	375.83	428.59	409.68	400.79		(95)
Montl	hly 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)
		964.32	an intern 889.21	al tempe 756.99	589.29	·	=[(39)m : 263.58	x [(93)m <sub>276.22</sub>	- (96)m 426.63	-	040.00	978.45		(97)
(97)m=	983.55		ement fo		l	397.53	l	l		631.9	819.89	976.45		(97)
(98)m=	417.96	320.25	253.67	133.7	57.19	0	0.02	0	0	151.26	295.35	429.78		
` '								Tota	l per year	l (kWh/year	) = Sum(98	8) <sub>15,912</sub> =	2059.16	(98)
Spac	e heatin	a reauire	ement in	kWh/m²	2/vear								35.47	(99)
•		• •	nts – Con			scheme								
			ace hea		The state of the s			tina prov	rided by	a comm	unitv sch	neme.		
			from sec								, ,		0	(301)
Fractio	on of spa	ce heat	from cor	mmunity	system	1 – (30	1) =					Ī	1	(302)
The con	nmunity sc	heme may	/ obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and t	up to four o	other heat	sources; th	e latter	_
			s, geothern		aste heat f	rom powe	r stations.	See Appe	ndix C.			Г	0.0	(2020)
			Communi	-	_							Ĺ	0.6	(303a)
Fractio	on of con	nmunity	heat fror	m heat s	source 2							Ĺ	0.4	(303b)
Fraction	on of tota	al space	heat fror	m Comn	nunity C	HP				(3	02) x (303a	a) =	0.6	(304a)
Fractio	on of tota	al space	heat fror	m comm	nunity he	at sourc	e 2			(3	02) x (303l	b) =	0.4	(304b)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem		Ī	1	(305)
Distrib	ution los	s factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m				Ī	1.05	(306)
	heating			,		•						L	kWh/yea	 r
-	_	-	requirem	ent									2059.16	<u></u>
Space	heat fro	m Comr	nunity C	HP					(98) x (30	04a) x (305	5) x (306) =	<u> </u>	1297.27	(307a)
			-								5) x (306) =	L	864.85	(307b)
Space		iii iioat t	50 ai 00 Z						(00) // (01	)	)	L	004.00	(00.0)
Space		condor	//eunnlar	mantari	heating	evetom	in % /fra	m Table	12 or 1	nnendiv	E)	Γ	^	(300
Efficie	ncy of se	•	//suppler	•	_	•	,				,	[	0	(308
Efficie	ncy of se	•	//suppler	•	_	•	,			ppendix 01) x 100 -	,	]	0	(308
Efficier Space Water	ncy of se heating	requirer	ment fror	n secon	_	•	,				,	[ ] -		=  `
Efficier Space Water Annua	ncy of se heating heating l water h	requirer  I neating r		m secon	_	•	,				,	] ] ]		=  `

			_
Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1202.51	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	801.68	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	41.66	(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	om outside	112.62	(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) =	112.62	(331)
Energy for lighting (calculated in Appendix L)		264.55	(332)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2823.22 X 0.22	609.82	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	839.34 × 0.52	-435.62	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2617.01 X 0.22	565.27	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	778.04 × 0.52	-403.8	(366)
Efficiency of heat source 2 (%)	sing two fuels repeat (363) to (366) for the second fue	91	(367b)
CO2 associated with heat source 2 [(307	(b)+(310b)] x 100 ÷ (367b) x 0.22 =	395.57	(368)
Electrical energy for heat distribution	[(313) x 0.52 =	21.62	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	752.86	(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) =	752.86	(376)
CO2 associated with electricity for pumps and fans within dw	relling (331)) x 0.52 =	58.45	(378)
CO2 associated with electricity for lighting	(332))) x 0.52 =	137.3	(379)
Total CO2, kg/year sum of (376)(382) =	<del></del>	948.62	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		16.34	(384)
El rating (section 14)		87.67	(385)

			lloor F	) otoilo:						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
Address	2F-5, Bertram Stre		· ·	Address	06-18-6	59419 2	F-5			
Address: 1. Overall dwelling dim	•	et, Londo	)I I							
1. Overall awelling aim	C11310113.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				<u> </u>	(1a) x		2.4	(2a) =	121.08	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) <u> </u>	50.45	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	121.08	(5)
2. Ventilation rate:										
Number of chimneys	heating	secondar heating	'y □ + □	other	7 <sub>=</sub> [	total		40 =	m³ per hou	_
Number of chimneys		0	╛╘	0	╛╘	0			0	(6a)
Number of open flues	0 +	0	_	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vent	s					0	X	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	x	40 =	0	(7c)
					_					
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =		0		÷ (5) =	0	(8)
	been carried out or is intend	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			_
Number of storeys in Additional infiltration	the dwelling (ns)						[(0)	410.4	0	(9)
	0.25 for steel or timber	frame or	. 0 35 fo	r masoni	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
	present, use the value corre				•	dollon			0	(11)
deducting areas of open	• / .									_
·	floor, enter 0.2 (unsea	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
• •	nter 0.05, else enter 0	اد د دانده							0	(13)
Window infiltration	vs and doors draught s	strippea		0.25 - [0.2	x (14) ± 1	001 -			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
	, q50, expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	3	(17)
If based on air permeab			•	•	•				0.15	(18)
Air permeability value appli	ies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	red								3	(19)
Shelter factor				(20) = 1 -		[9)] =			0.78	(20)
Infiltration rate incorpora	-			(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified	<del></del>	1	<del></del>	Ι.			1	<del></del>	1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	·	1		T			T	<u>-</u>	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	J	
Wind Factor (22a)m = (2	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	]	
									-	

djusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effecture of the control o		•	rate for t	he appli	cable ca	se						0.5	(23
If exhaust air h			endix N. (2	3b) = (23a	a) x Fmv (e	eguation (I	N5)) . othe	rwise (23b	) = (23a)			0.5	(23
If balanced with									, (200)			0.5	(23
a) If balance		-	•	_					2h)m + (	23h) 🗴 ['	 1 <i>– (2</i> 3c)	79.9 ÷ 1001	(2\
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24	+ 100j	(24
b) If balance	<u> </u>	L anical ve	<u> </u>		heat red	covery (N	ļ	$\lim_{n \to \infty} \frac{1}{(2n)^n} = \frac{(2n)^n}{(2n)^n}$	2b)m + (:	L 23h)	ļ	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					.5 × (23b	))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation ventilation			•					0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)	•		•		
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losse	s and he	at loss i	naramet	≏r·									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-ł		
Ooors					2.1	x	1.4		2.94				(20
Vindows Type	e 1				12.17	7 x1	/[1/( 1.4 )+	0.04] =	16.13	=			(27
Vindows Type	2				1.68	x1	/[1/( 1.4 )+	0.04] =	2.23				(2
Valls Type1	30.2	27	15.9	5	14.32	2 X	0.15	i	2.15		14	200.48	(2
Valls Type2	34.0	)6	0		34.06	3 x	0.14	<b>=</b>	4.8	<b>=</b>	14	476.84	(2
otal area of e	elements	 , m²	L		64.33	=							` (3
arty wall					10.8	=	0		0		20	216	) (3
arty floor					50.45	=					40	2018	(3
arty ceiling					50.45	=					30	1513.5	=
nternal wall **					76.8	=				_ Г	9	691.2	(3
for windows and include the area	roof wind				alue calcui		g formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in			(°
abric heat los							(26)(30)	) + (32) =				28.25	(3
leat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =	5116.02	
hermal mass		,	c = Cm ÷	- TFA) ir	n kJ/m²K	,		= (34)	÷ (4) =			101.41	) (3
or design assess an be used inste	sments wh	ere the de	tails of the	•			ecisely the	e indicative	e values of	TMP in Ta	able 1f		`
hermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	K						5.65	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)								_
otal fabric he									(36) =			33.9	(3
entilation hea	at loss ca	alculated	d monthly	<b>/</b>					= 0.33 × (	25)m x (5)	) 	I	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

			1		1			ı			i			4
(38)m=	9.94	9.82	9.71	9.13	9.01	8.43	8.43	8.31	8.66	9.01	9.24	9.47		(38)
		coefficier							· · · ·	= (37) + (	<del>_</del>	T 1		
(39)m=	43.84	43.72	43.61	43.03	42.91	42.33	42.33	42.22	42.56	42.91	43.14	43.38	40	(39)
Heat Id	ss para	meter (F	HLP), W	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	43	(39)
(40)m=	0.87	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		_
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.85	(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. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Δeeum	ed occu	ipancy, I	NI									<del>-</del> 1		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.7		(42)
		,	ater usag	ge in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		74	1.65		(43)
					5% if the d ater use, h	-	-	to achieve	a water us	se target o	f			
not more			<i>'</i>			_		ı .			·			
Hot wate	Jan er usage in	Feb	Mar day for ea	Apr	May Vd,m = fa	Jun	Jul	Aug (43)	Sep	Oct	Nov	Dec		
								. /	72.16	76.15	70.12	02.12		
(44)m=	82.12	79.13	76.15	73.16	70.18	67.19	67.19	70.18	73.16	76.15	79.13 m(44) <sub>112</sub> =	82.12	895.86	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /		093.00	(++)
(45)m=	121.78	106.51	109.91	95.82	91.94	79.34	73.52	84.37	85.37	99.49	108.61	117.94		
15.						, ,				Γotal = Su	m(45) <sub>112</sub> =	=	1174.61	(45)
It instant				of use (no	not water	storage),	enter 0 ın	boxes (46,	) to (61)					
(46)m= Water	18.27 storage	15.98	16.49	14.37	13.79	11.9	11.03	12.65	12.81	14.92	16.29	17.69		(46)
	_		includin	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Ū		` ,		•	elling, e		Ū							( )
	•	_			-			mbi boil	ers) ente	er '0' in (	47)			
	storage													
•					or is kno	wn (kWh	n/day):					0		(48)
•			m Table									0		(49)
			storage	-	ear loss fact	or ic not		(48) x (49)	) =		1	10		(50)
,				•	e 2 (kWl						0	.02		(51)
		_	ee secti		`		,							` '
Volum	e factor	from Tal	ble 2a								1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
• • • • • • • • • • • • • • • • • • • •			storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(54)
	. ,	(54) in (5	•								1.	.03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n				
(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)
It cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	u), else (5	/)m = (56)	m where (	H11) is fro	m Append	хН	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div (59)$ m = $(58)$	365 × (41)m
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	3     23.26     22.51     23.26     22.51     23.26     (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	
(61)m= 0 0 0 0 0 0 0	0 0 0 0 0 (61)
Total heat required for water heating calculated for each month	th $(62)$ m = $0.85 \times (45)$ m + $(46)$ m + $(57)$ m + $(59)$ m + $(61)$ m
(62)m= 177.06 156.44 165.19 149.32 147.22 132.83 128.8	
Solar DHW input calculated using Appendix G or Appendix H (negative quan	
(add additional lines if FGHRS and/or WWHRS applies, see A	
(63)m= 0 0 0 0 0 0 0	0 0 0 0 0 (63)
Output from water heater	
(64)m= 177.06 156.44 165.19 149.32 147.22 132.83 128.8	3 139.64 138.87 154.77 162.1 173.22
(**************************************	Output from water heater (annual) <sub>112</sub> 1825.45 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	` '
(65)m= 84.71 75.36 80.77 74.66 74.79 69.18 68.67	
include (57)m in calculation of (65)m only if cylinder is in the	a dwelling or not water is from community neating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec
(66)m= 85.17 85.17 85.17 85.17 85.17 85.17 85.17	85.17 85.17 85.17 85.17 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5
(67)m= 13.23 11.75 9.56 7.23 5.41 4.57 4.93	6.41 8.61 10.93 12.76 13.6 (67)
Appliances gains (calculated in Appendix L, equation L13 or L	-13a), also see Table 5
(68)m= 148.4 149.94 146.06 137.8 127.37 117.57 111.03	2 109.48 113.36 121.62 132.05 141.85 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15	ia), also see Table 5
(69)m= 31.52 31.52 31.52 31.52 31.52 31.52 31.52	2 31.52 31.52 31.52 31.52 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0	0 0 0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -68.13 -68.13 -68.13 -68.13 -68.13 -68.13 -68.13	3 -68.13 -68.13 -68.13 -68.13 (71)
Water heating gains (Table 5)	
(72)m= 113.86 112.14 108.56 103.69 100.53 96.08 92.29	97.14 98.86 103.9 109.59 112.15 (72)
	')m + (68)m + (69)m + (70)m + (71)m + (72)m
(73)m= 324.05 322.38 312.73 297.27 281.86 266.76 256.8	
6. Solar gains:	10.100   100.100   100.100   0.10.10
Solar gains are calculated using solar flux from Table 6a and associated eq	uations to convert to the applicable orientation.
Orientation: Access Factor Area Flux	g_ FF Gains
Table 6d m² Table 6a	Table 6b Table 6c (W)
North 0.9x 0.77 x 1.68 x 10.63	x 0.558 x 0.7 = 4.84 (74)
North 0.9x 0.77 x 1.68 x 20.32	x 0.558 x 0.7 = 9.24 (74)
20.02	

	_											_					_
North	0.9x	0.77	X	1.6	88	X	3	34.53	X		0.558	X	0.7		=	15.7	(74)
North	0.9x	0.77	X	1.6	68	X	5	55.46	X		0.558	X	0.7		=	25.22	(74)
North	0.9x	0.77	Х	1.6	88	X	7	4.72	X		0.558	X	0.7		=	33.98	(74)
North	0.9x	0.77	Х	1.6	88	X	7	79.99	X		0.558	X	0.7		=	36.37	(74)
North	0.9x	0.77	X	1.6	88	X	7	4.68	X		0.558	x	0.7		=	33.96	(74)
North	0.9x	0.77	Х	1.6	68	X	5	9.25	X		0.558	X	0.7		=	26.94	(74)
North	0.9x	0.77	X	1.6	68	X	4	1.52	x		0.558	X	0.7		=	18.88	(74)
North	0.9x	0.77	X	1.6	88	X	2	24.19	X		0.558	x	0.7		=	11	(74)
North	0.9x	0.77	Х	1.6	68	X	1	3.12	x		0.558	x	0.7		=	5.97	(74)
North	0.9x	0.77	х	1.6	68	X		8.86	x		0.558	x	0.7		=	4.03	(74)
East	0.9x	1	X	12.	17	X	1	9.64	x		0.56	x	0.7		=	64.7	(76)
East	0.9x	1	X	12.	17	X	3	88.42	x		0.56	x	0.7		=	126.57	(76)
East	0.9x	1	X	12.	17	X	6	3.27	x		0.56	×	0.7		=	208.44	(76)
East	0.9x	1	X	12.	17	X	9	2.28	x		0.56	×	0.7		=	303.99	(76)
East	0.9x	1	X	12.	17	X	1	13.09	x		0.56	×	0.7		=	372.56	(76)
East	0.9x	1	X	12.	17	X	1	15.77	x		0.56	×	0.7		=	381.38	(76)
East	0.9x	1	X	12.	17	X	1	10.22	x		0.56	x	0.7		=	363.09	(76)
East	0.9x	1	Х	12.	17	X	9	94.68	x		0.56	x	0.7		=	311.89	(76)
East	0.9x	1	X	12.	17	X	7	73.59	x		0.56	×	0.7		=	242.42	(76)
East	0.9x	1	X	12.	17	X	4	l5.59	x		0.56	x	0.7		=	150.18	(76)
East	0.9x	1	X	12.	17	X	2	24.49	x		0.56	x	0.7	一	=	80.67	(76)
East	0.9x	1	X	12.	17	X	1	6.15	x		0.56	×	0.7		=	53.21	(76)
	_						-		-								
Solar g	ains in	watts, ca	alculate	d for eac	h montl	า			(83)m	n = Su	m(74)m .	(82)m					
(83)m=	69.54	135.81	224.14	329.22	406.53		17.75	397.05	338	.83	261.3	161.1	86.64	57.	24		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (	83)m	, watts									
(84)m=	393.58	458.19	536.87	626.49	688.39	6	84.51	653.85	600	.42	530.69	446.1	389.59	373	.39		(84)
7. Mea	an inter	nal temp	erature	(heating	seaso	n)											
Temp	erature	during h	eating p	periods i	n the liv	ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	D	ес		
(86)m=	0.93	0.89	0.82	0.69	0.53		0.38	0.28	0.3	32	0.51	0.76	0.89	0.9	94		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	follo	w ste	ps 3 to 7	in T	able	9c)			-			
(87)m=	19.58	19.85	20.25	20.65	20.87	_	20.97	20.99	20.		20.92	20.58	20.02	19.	52		(87)
Temp	erature	during h	eating r	periods in	n rest o	f dw	elling	from Ta	hle (	 9 Th	2 (°C)		<b>!</b>	•		l	
(88)m=	20.19	20.2	20.2	20.21	20.21		20.22	20.22	20.		20.22	20.21	20.21	20	.2		(88)
			<u> </u>					<u> </u>			!						
(89)m=	0.92	0.88	0.8	rest of d	weiling, 0.5		,m (se 0.34	0.23	9a) 0.2	<sub>27</sub> T	0.46	0.73	0.88	0.9	33		(89)
								<u> </u>					1 0.00	1 0.8			(55)
Г		· ·		the rest	i — —	Ť		i	·		1		40.00	1 45	00	1	(00)
(90)m=	18.29	18.68	19.24	19.78	20.07	2	20.19	20.21	20.	21	20.14	19.72		18.	22	0.50	(90)
											I	∟∧ = LI\	ving area ÷ (	<b>→</b> ) =		0.53	(91)

Mean	internal	tamnar	ature (fo	r the wh	ole dwe	lling) – fl	ΙΔ <b>ν</b> Τ1	⊥ (1 _ fl	Δ) ~ T2					
(92)m=	18.97	19.3	19.77	20.24	20.49	20.6	20.62	20.62	20.55	20.17	19.5	18.91		(92)
	adjustm						m Table	4e. whe						, ,
(93)m=	18.97	19.3	19.77	20.24	20.49	20.6	20.62	20.62	20.55	20.17	19.5	18.91		(93)
8. Spa	ace heati	ng requ	uirement							L	L			
	i to the m			•		ed at ste	ep 11 of	Table 9	b, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation factor			•	,				'	<u> </u>				
(94)m=	0.91	0.86	0.79	0.66	0.51	0.36	0.26	0.29	0.49	0.73	0.87	0.92		(94)
Usefu	ıl gains, h	nmGm ,	W = (94	1)m x (8	4)m									
(95)m=	356.41	396.05	423.06	413.33	350.38	247.38	168.63	175.66	257.54	325.69	337.39	341.9		(95)
Month	nly avera	ge 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)
	loss rate			<u>.</u>			<del>-`                                    </del>	<del>-``</del>	<del>` ´ ´ </del>	<del></del>	<del></del>			
(97)m=		629.51	578.65	487.85	377.3	253.92	170.25	178.1	274.35	410.78	535.12	637.89		(97)
-	e heating								<u> </u>	<del></del>	r			
(98)m=	213.21	156.89	115.76	53.65	20.03	0	0	0	0	63.31	142.37	220.21	005.44	7(00)
_								1018	ıl per year	(kwn/year	r) = Sum(9	8)15,912 =	985.44	(98)
·	e heating	•										L	19.53	(99)
	ergy requ				Ĭ									
	art is use on of spac										unity sch	neme.	0	(301)
Fractio	n of spac	ce heat	from co	mmunity	system	1 – (30	1) =					Ī	1	(302)
	nmunity sch									up to four	other heat	sources; th	ne latter	
	on of heat		-		aste neat n	ioni powei	stations.	осс Арреі	nuix O.			[	0.6	(303a)
Fractio	n of com	munity	heat fro	m heat s	source 2							[	0.4	(303b)
Fractio	n of total	space	heat fro	m Comn	nunity C	HP				(3	02) x (303	a) =	0.6	(304a)
Fractio	n of total	space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.4	(304b)
Factor	for contro	ol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution loss	factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating											_	kWh/yea	<u>r_</u>
Annua	l space h	eating	requirem	nent									985.44	
Space	heat from	n Comr	nunity C	HP					(98) x (30	04a) x (30	5) x (306)	= [	620.82	(307a)
Space	heat fron	n heat s	source 2						(98) x (30	04b) x (30	5) x (306)	= [	413.88	(307b)
Efficier	ncy of sec	condary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating r	equirer	ment fro	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
	heating	ootina =	oguiror:	ont								Г	1005.15	$\neg$
	I water he	•	•									Ĺ	1825.45	
	/ from co heat from								(64) x (30	03a) x (30	5) x (306)	= [	1150.03	(310a)

Cooling System Energy Efficiency Ratio   System Energy Energian   System   System Energian   System Energian   System Energian   System   System Energian   System Energian   System Energian   System   System Energian   System Energian   System Energian   System Energian   System Energian   System Energian   System   Syste	Water heat from heat source 2	(64) x (303b) x (305) x (306) =	766.69	(310b)
Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) =				╡`
Space cooling (if there is a fixed cooling system, if not enter 0)	·	0.01 x [(307a)(307e) + (310a)(310e)] =		
Electricity for pumps and fans within dwelling (Table 4f):   mechanical ventilation - balanced, extract or positive input from outside		(407) (404)		╣```
Mary mair heating system fans   3389   warm air heating system fans   3389   3389   warm air heating system   3389   warm air heating system   3389   warm air heating warm air fans within dwelling warm air fans wi		) = (107) ÷ (314) =	0	(315)
Description   Color	· · · · · · · · · · · · · · · · · · ·	m outside	97.86	(330a)
Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = (330a) + (330g) = (330a) + (330g) = (330a) + (330g) = (331a) + (332g) = (331a) + (332g) = (331a) + (332g) = (331a) + (332g) = (332	warm air heating system fans		0	(330b)
Column   C	pump for solar water heating		0	(330g)
Electrical efficiency of CHP unit   29.73   (361)	Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	97.86	(331)
Electrical efficiency of CHP unit   29.73   (361)	Energy for lighting (calculated in Appendix L)		233.65	(332)
Energy kWh/year   Emission factor kWh/year   Emission factor kWh/year kg CO2/kWh kg CO2/kg C	12b. CO2 Emissions – Community heating scheme			
Energy kWh/year kg CO2/kWh kg CO2/kg kg CO2/kwh kg CO2/kg CO2/kwh kg CO2/kwh kg CO2/kwh kg CO2/kwh kg CO2/kwh kg CO2/kwh	Electrical efficiency of CHP unit		29.73	(361)
Name	Heat efficiency of CHP unit		45.95	(362)
less credit emissions for electricity -(307a) × (361) ÷ (362) = 401.68 × 0.52				
Water heated by CHP $(310a) \times 100 \div (362) =$ $2502.79 \times 0.22$ $540.6 (365)$ less credit emissions for electricity $-(310a) \times (361) \div (362) =$ $744.08 \times 0.52$ $-386.18 (366)$ Efficiency of heat source 2 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel $91 \times (367b) \times (367$	Space heating from CHP) $(307a) \times 100 \div (362) =$	1351.09 × 0.22	291.84	(363)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$ Tefficiency of heat source 2 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  CO2 associated with heat source 2  [(307b)+(310b)] $\times$ 100 $\div$ (367b) $\times$ Discrete (367b) $\times$ Electrical energy for heat distribution  [(313) $\times$ Discrete (363) $\times$ CO2 associated with community systems  (363)(366) $\times$ (368)(372)  Total CO2 associated with space heating (secondary)  (309) $\times$ CO2 associated with water from immersion heater or instantaneous heater  (312) $\times$ Discrete (312) $\times$ CO2 associated with electricity for pumps and fans within dwelling  (373) $\times$ (373)  CO2 associated with electricity for pumps and fans within dwelling  (373) $\times$ (374) $\times$ CO2 associated with electricity for lighting  (373) $\times$ (374) $\times$ CO2 associated with electricity for lighting  (375) $\times$ Total CO2, kg/year  sum of (376)(382) =  Dwelling CO2 Emission Rate  (383) $\times$ (4) =  13.98  (384)	less credit emissions for electricity $-(307a) \times (361) \div (362) =$	401.68 × 0.52	-208.47	(364)
Efficiency of heat source 2 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 91 (367b) CO2 associated with heat source 2 $[(307b)+(310b)] \times 100 \div (367b) \times 0.22 = 280.22$ (368) Electrical energy for heat distribution $[(313) \times 0.52] = 15.32$ (372) Total CO2 associated with community systems $(363)(366) + (368)(372) = 533.33$ (373) CO2 associated with space heating (secondary) $(309) \times 0 = 0$ (374) CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.22 = 0$ (375) Total CO2 associated with space and water heating $(373) + (374) + (375) = 533.33$ (376) CO2 associated with electricity for pumps and fans within dwelling $(331)) \times 0.52 = 50.79$ (378) CO2 associated with electricity for lighting $(332)) \times 0.52 = 121.26$ (379) Total CO2, kg/year sum of $(376)(382) = 705.39$ (383) Total CO2 Emission Rate $(383) \div (4) = 13.98$ (384)	Water heated by CHP $(310a) \times 100 \div (362) =$	2502.79 × 0.22	540.6	(365)
CO2 associated with heat source 2 $ [(307b)+(310b)] \times 100 \div (367b) \times 0.22 $ = $280.22$ (368) $ [(313) \times 0.52] $ = $15.32$ (372) $ [(313) \times 0.52] $ = $15.32$ (373) $ [(313) \times 0.52] $ = $15.32$ (374) $ [(313) \times 0.52] $ = $15.32$ (374) $ [(313) \times 0.52] $ = $15.32$ (375) $ [(313) \times 0.52] $ = $15.32$ (374) $ [(313) \times 0.52] $ = $15.32$ (375) $ [(313) \times 0.52] $ = $15.32$ (376) $ [(313) \times 0.52] $ = $15.32$ (376) $ [(313) \times 0.52] $ = $15.32$ (377) $ [(313) \times 0.52] $ = $15.32$ (378) $ [(313) \times 0.52] $ = $15.32$ (378) $ [(313) \times 0.52] $ = $15.32$ (379) $ [(313) \times 0.52] $ = $15.32$	less credit emissions for electricity -(310a) × (361) ÷ (362) =	744.08 × 0.52	-386.18	(366)
Electrical energy for heat distribution $ [(313) \times 0.52] = 15.32 (372) $ Total CO2 associated with community systems $ (363)(366) + (368)(372) $ $ = 533.33 (373) $ CO2 associated with space heating (secondary) $ (309) \times 0 = 0 (374) $ CO2 associated with water from immersion heater or instantaneous heater $ (312) \times 0.22 = 0 (375) $ Total CO2 associated with space and water heating $ (373) + (374) + (375) = 533.33 (376) $ CO2 associated with electricity for pumps and fans within dwelling $ (331) \times 0.52 = 50.79 (378) $ CO2 associated with electricity for lighting $ (332)) \times 0.52 = 121.26 (379) $ Total CO2, kg/year $ sum \text{ of } (376)(382) = 705.39 (383) $ Dwelling CO2 Emission Rate $ (383) \div (4) = 13.98 (384) $	Efficiency of heat source 2 (%)	ing two fuels repeat (363) to (366) for the second fue	91	(367b)
Total CO2 associated with community systems $(363)(366) + (368)(372)$ = $533.33$ (373) CO2 associated with space heating (secondary) $(309) \times 0$ = $0$ (374) CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.22$ = $0$ (375) Total CO2 associated with space and water heating $(373) + (374) + (375) =$ $533.33$ (376) CO2 associated with electricity for pumps and fans within dwelling $(331)) \times 0.52$ = $50.79$ (378) CO2 associated with electricity for lighting $(332)) \times 0.52$ = $121.26$ (379) Total CO2, kg/year sum of $(376)(382) =$ $705.39$ (383) Dwelling CO2 Emission Rate $(383) \div (4) =$ $13.98$ (384)	CO2 associated with heat source 2 [(307b)	)+(310b)] x 100 ÷ (367b) x 0.22	280.22	(368)
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) = $533.33$ (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x $0.52 = 50.79$ (378) CO2 associated with electricity for lighting (332))) x $0.52 = 121.26$ (379) Total CO2, kg/year sum of (376)(382) = $705.39$ (383) Dwelling CO2 Emission Rate (383) ÷ (4) =	Electrical energy for heat distribution	[(313) x 0.52	15.32	(372)
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) = 533.33 (376)  CO2 associated with electricity for pumps and fans within dwelling (331)) x $0.52$ = $50.79$ (378)  CO2 associated with electricity for lighting (332))) x $0.52$ = $121.26$ (379)  Total CO2, kg/year sum of (376)(382) = $705.39$ (383)  Dwelling CO2 Emission Rate (383) ÷ (4) = $13.98$ (384)	Total CO2 associated with community systems	(363)(366) + (368)(372)	533.33	(373)
Total CO2 associated with space and water heating $(373) + (374) + (375) =$ CO2 associated with electricity for pumps and fans within dwelling $(331)$ ) x  CO2 associated with electricity for lighting $(332)$ ) x $(376)$ CO2 associated with electricity for lighting $(332)$ ) x $(376)$ $(378)$ $(378)$ $(379)$ Total CO2, kg/year sum of $(376)$ $(382)$ = $(383) \div (4) =$	CO2 associated with space heating (secondary)	(309) x 0	= 0	(374)
CO2 associated with electricity for pumps and fans within dwelling $(331)$ ) x $0.52$ = $50.79$ $(378)$ CO2 associated with electricity for lighting $(332)$ )) x $0.52$ = $121.26$ $(379)$ Total CO2, kg/year sum of $(376)$ $(382)$ = $705.39$ $(383)$ Dwelling CO2 Emission Rate $(383) \div (4)$ = $13.98$ $(384)$	CO2 associated with water from immersion heater or instantar	neous heater (312) x 0.22	= 0	(375)
CO2 associated with electricity for lighting (332))) x 0.52 = 121.26 (379)  Total CO2, kg/year sum of (376)(382) = 705.39 (383)  Dwelling CO2 Emission Rate (383) ÷ (4) = 13.98 (384)	Total CO2 associated with space and water heating	(373) + (374) + (375) =	533.33	(376)
Total CO2, kg/year sum of (376)(382) = 705.39 (383)  Dwelling CO2 Emission Rate (383) ÷ (4) = 13.98 (384)	CO2 associated with electricity for pumps and fans within dwe	elling (331)) x 0.52	50.79	
Total CO2, kg/year sum of (376)(382) = 705.39 (383)  Dwelling CO2 Emission Rate (383) ÷ (4) = 13.98 (384)	CO2 associated with electricity for lighting	(332))) x 0.52	= 121.26	_
<b>Dwelling CO2 Emission Rate</b> (383) ÷ (4) = 13.98 (384)				<b>-</b>   -
<u> </u>	, 0,			╡`
			90.1	(385)

			User D	etails:						
Assessor Name: Software Name:	Matthew Stain Stroma FSAP			Stroma Softwa					023501 n: 1.0.4.16	
		Р	roperty .	Address	06-18-6	69419 21	F-6			
Address :	2F-6, Bertram S	Street, Londo	n							
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	3)
Ground floor			7	3.35	(1a) x	2	2.4	(2a) =	176.04	(38
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	1) 7	3.35	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	176.04	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys		+ 0	<b>]</b> + [	0	] = [	0	X	40 =	0	(6a
Number of open flues	0	+ 0	╡ᆠ┝	0	] <sub>=</sub> [	0	X	20 =	0	(6b
Number of intermittent fa					J			10 =	<u> </u>	╡`
					Ļ	0			0	(7a
Number of passive vents	5					0	X	10 =	0	(7t
Number of flueless gas f	ires					0	X	40 =	0	(70
								A ir ah	angaa nar ha	
		(O-) - (Ob.) - (7	z - \ . ( <del>   </del>   \ . (	<b>7</b> -\	_				anges per ho	_
nfiltration due to chimne	•				ontinus fr	0		÷ (5) =	0	(8)
If a pressurisation test has leading to the Number of storeys in t		iteriaea, procee	a to (17), (	otnerwise (	ontinue ir	om (9) to (	(16)		0	(9)
Additional infiltration	ric awciirig (ris)						[(9)	-1]x0.1 =	0	-(1)
Structural infiltration: 0	.25 for steel or tim	ber frame or	0.35 for	r masonr	v constr	uction	[(0)	. j	0	=\(\)
if both types of wall are p					•				<u> </u>	`
deducting areas of openi	= :									_
If suspended wooden	•	,	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en									0	(13
Percentage of window Window infiltration	s and doors draug	int stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14
Infiltration rate				(8) + (10)	. ,	_	± (15) =		0	= (15
Air permeability value,	aEO expressed in	oubic motro	s par ha					oroo	0	(16
f based on air permeabi			•	•	•	elle ol e	invelope	alea	3	= (17
Air permeability value applie	-					is beina u	sed		0.15	(18
Number of sides shelter				, poi	wanty				3	(19
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.78	(20
nfiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.12	(21
nfiltration rate modified	for monthly wind s	peed								
Jan Feb	Mar Apr N	/lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								•	
(22)m= 5.1 5		.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
						•	•	•	1	
Wind Factor (22a)m = (2	2)m ÷ 4									

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ition rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calcul <del>ate effec</del> If mechanica		•	rate for t	пе арріі	саріе са	ise						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	very: effici	iency in %	allowing f	or in-use f	actor (fror	n Table 4h	) =				79.9	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recov	ery (MV	HR) (24a	a)m = (2)	2b)m + (2	23b) × [	1 – (23c)	÷ 100]	<b>-</b>
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	covery (I	MV) (24b	o)m = (22	2b)m + (2	23b)	-	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v									0.5]			'	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change i	rate - en	iter (24a	) or (24k	o) or (24	c) or (24	ld) in bo	x (25)				-	
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losses	and he	at loss p	paramete	er:									
LEMENT	Gros area	_	Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-l		X k /K
Doors					2.1	x	1.4	=	2.94				(2
Vindows					15.96	<sub>5</sub> x1	/[1/( 1.4 )+	0.04] =	21.16				(2
Valls Type1	33.84	4	18.00	6	15.78	3 X	0.15	=	2.37		14	220.92	2 (2
Valls Type2	13.5	1	0		13.5′	1 x	0.14	=	1.9		14	189.14	4 (2
Valls Type3	13.82	2	0		13.82	<u>x</u>	0.15	=	2.07		14	193.48	8 (2
otal area of el	ements,	, m²			61.17	7							(3
arty wall					21.19	) x	0	=	0		20	423.8	(3
arty floor					73.35	5					40	2934	(3
Party ceiling					73.35	5				Ī	30	2200.5	5 (3
nternal wall **					105.6	3				Ī	9	950.4	(3
for windows and a						lated using	g formula 1	/[(1/U-valu	ıе)+0.04] а	s given in	paragraph	1 3.2	_
abric heat los	s, W/K =	= S (A x	U)				(26)(30	) + (32) =				30.44	(3
leat capacity (	2m = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	7112.24	(3
hermal mass	paramet	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			96.96	(3
or design assessi an be used instea				construct	ion are no	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	•	,		• .	•	K						6.02	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)			(22) -	(26)		ĺ		<b></b> ,_
otal fabric hea	ม เบรร							(33) +	(36) =			36.46	(3
entilation hea	t loop on	ا معامده	manthi	,				(20)	= 0.33 × (	25)m + (F)	`		

(00)		T											(00)
(38)m= 14.45	14.28	14.11	13.27	13.1	12.25	12.25	12.09	12.59	13.1	13.44	13.77		(38)
Heat transfer of			10.70	10.50	10.70	10.70	10.55	· · ·	= (37) + (	<del></del>			
(39)m= 50.91	50.74	50.57	49.73	49.56	48.72	48.72	48.55	49.05	49.56	49.9	50.23	49.69	(39)
Heat loss para	meter (I	HLP), W	/m²K	•	i	•			= (39)m ÷	Sum(39)₁ · (4)	12 / 1 Z=	49.69	(39)
(40)m= 0.69	0.69	0.69	0.68	0.68	0.66	0.66	0.66	0.67	0.68	0.68	0.68		<b>–</b> 1
Number of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.68	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requ	irement:								kWh/ye	ar:	
Assumed occu	ıpancv.	N								2	.32		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.02		(12)
Annual averag	je hot wa										).41		(43)
Reduce the annua							to achieve	a water us	se target o	f			
						<u> </u>	l Aug	Con	Oct	Nov	Doo		
Jan Hot water usage i	Feb n litres pe	Mar r day for ea	Apr ach month	May $Vd, m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 98.35	94.77	91.2	87.62	84.05	80.47	80.47	84.05	87.62	91.2	94.77	98.35		
(11)=	0 7	01.2	07.02	01.00	00.11	00.11	0 1.00	l		m(44) <sub>112</sub> =		1072.92	(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)		<b>_</b>
(45)m= 145.85	127.56	131.63	114.76	110.12	95.02	88.05	101.04	102.25	119.16	130.07	141.25		
If instantaneous w	vater heati	na at noint	of use (no	n hot water	r storaga)	enter () in	hoves (16		Γotal = Su	m(45) <sub>112</sub> =	=	1406.77	(45)
	ı		,	ı		ı		` '	47.07	10.54			(46)
(46)m= 21.88 Water storage	19.13 loss:	19.75	17.21	16.52	14.25	13.21	15.16	15.34	17.87	19.51	21.19		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufact		aclarad l	nee fact	nr ie kna	wn (k\//k	J(day).					_		(48)
Temperature f				JI 13 KI10	WII (ICVVI	ı, day).					0		(49)
Energy lost fro				ear			(48) x (49)	) =			10		(50)
b) If manufact		_	-		or is not		(10)11(10)				10		(00)
Hot water stor	•			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	•		on 4.3										(50)
Temperature f			2b							-	.6		(52) (53)
Energy lost fro				≏ar			(47) x (51)	) x (52) x (	53) =		==		(54)
Enter (50) or (		_	, 12 VII/ y C	Jui			( 11 ) X (O1)	, A ( <del>52)</del> A (			.03		(54) (55)
Water storage	` , , ,	•	for each	month			((56)m = (	55) × (41)ı	m				, ,
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												¢Η	
(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)
L	•	•	•	•		•	•			•			

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	<u> </u>
(61)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 201.13 177.49 186.91 168.25 165.39 148.52 143.33 156.32 155.74 174.44	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	dion to water neating)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 201.13 177.49 186.91 168.25 165.39 148.52 143.33 156.32 155.74 174.44	183.57 196.53
Output from water heat	<del></del>
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>
(65)m= 92.72 82.36 87.99 80.95 80.84 74.39 73.5 77.82 76.79 83.84	86.04 91.19 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23	116.23 116.23 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 18.29 16.24 13.21 10 7.48 6.31 6.82 8.86 11.9 15.11	17.63 18.8 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 204.99 207.11 201.75 190.34 175.94 162.4 153.35 151.23 156.59 168	182.4 195.94 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<u> </u>
(69)m= 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62	34.62 34.62 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99	-92.99 -92.99 (71)
Water heating gains (Table 5)	
(72)m= 124.62 122.55 118.27 112.43 108.65 103.32 98.79 104.59 106.66 112.69	119.51 122.56 (72)
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
	· · · · · · · · · · · · · · · · · · ·
	377.41 395.17 (73)
<ol><li>Solar gains:</li><li>Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the application.</li></ol>	able orientation
	FF Gains
<u>0</u>	Table 6c (W)
w	
3.50 G.77 A 13.50 A 13.54 A 0.50 A	0.7 = 84.85 (80)
West 0.9x 0.77 × 15.96 × 38.42 × 0.56 ×	0.7 = 165.98 (80)

	_									_									_
West	0.9x	0.77		X	15.9	96	X	6	3.27	X		0.56	)		0.7		=	273.35	(80)
West	0.9x	0.77		X	15.9	96	X	9	2.28	X		0.56	)	· [	0.7		=	398.66	(80)
West	0.9x	0.77		X	15.9	96	X	1	13.09	X		0.56	)	· [	0.7		=	488.58	(80)
West	0.9x	0.77		x	15.9	96	X	1	15.77	x		0.56	)	· [	0.7		=	500.15	(80)
West	0.9x	0.77		x	15.9	96	X	1	10.22	x		0.56	)		0.7		=	476.16	(80)
West	0.9x	0.77		x	15.9	96	X	9	4.68	X		0.56	)		0.7		=	409.01	(80)
West	0.9x	0.77		x	15.9	96	X	7	3.59	x		0.56	)		0.7		=	317.92	(80)
West	0.9x	0.77		X	15.9	96	X	4	5.59	x		0.56	)		0.7		=	196.95	(80)
West	0.9x	0.77		X	15.9	96	X	2	4.49	x		0.56	)		0.7		=	105.8	(80)
West	0.9x	0.77		X	15.9	96	X	1	6.15	x		0.56	<u> </u>	· [	0.7		=	69.78	(80)
	_													_					_
Solar g	ains in	watts, ca	alculate	ed	for each	n montl	า			(83)m	n = Si	um(74)m .	(82)	m					
(83)m=	84.85	165.98	273.35	5	398.66	488.58	5	00.15	476.16	409	.01	317.92	196	.95	105.8	69.7	78		(83)
Total g	ains – i	nternal a	nd sol	ar	(84)m =	(73)m	+ (	83)m	, watts				•		•			-	
(84)m=	490.61	569.76	664.45	<u> </u>	769.31	838.51	8	30.04	792.99	731	.57	650.93	550	.62	483.21	464.	.95		(84)
7 Me	an inter	nal temp	eratur	e (	heating	seaso	n)												
		during h						area f	from Tal	ole 9	Th	1 (°C)						21	(85)
•		tor for g	•	•			-			010 0	,	. ( 0)						21	
	Jan	Feb	Mar	$\neg$	Apr	May	Ť	Jun	Jul	Α	ug	Sep		ct	Nov	D	ec	]	
(86)m=	0.94	0.9	0.82	+	0.68	0.52	+	0.37	0.27	0.3	Ť	0.5	0.7		0.9	0.9			(86)
` ′ [		<u> </u>			!				<u> </u>										, ,
ī		l temper	1	$\overline{}$					i e	T T				74	T 00 00	1 40		1	(07)
(87)m=	19.84	20.1	20.44		20.77	20.93		20.98	21	20.	99	20.95	20.	/1	20.23	19.	8		(87)
r		during h	r	$\overline{}$	eriods in	rest o	f dw	elling	from Ta	able 9	9, Tł	n2 (°C)			1			Ī	
(88)m=	20.35	20.35	20.35	$\perp$	20.36	20.36	2	20.37	20.37	20.	37	20.37	20.	36	20.36	20.3	35		(88)
Utilisa	ation fac	tor for g	ains fo	r re	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.93	0.89	0.8		0.66	0.49		0.33	0.23	0.2	26	0.46	0.7	73	0.89	0.9	4		(89)
Mean	interna	l temper	ature i	n tl	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c	)		-			
(90)m=	18.78	19.14	19.63	_	20.07	20.28	Ť	20.36	20.37	20.		20.32	20.		19.35	18.7	72		(90)
L			ļ		!				<u>I</u>			f	LA =	Livir	ig area ÷ (4	4) =		0.39	(91)
N4				c	حاد د محالا د		. 11!	\ £1	. A <b>T</b> 4	. /4	£I	۸) <b>T</b> O							_
Г		l temper 19.52	19.95	$\overline{}$	20.35	20.53	_	g) = 11 20.6	20.62	<u>`</u>			20	20	10.60	10.	1.5	1	(92)
(92)m=	19.2		<u> </u>						!	20.		20.57	20.		19.69	19.	15		(32)
(93)m=	19.2	nent to tl	19.95	_	20.35	20.53	_	20.6	20.62	20.		20.57	20.		19.69	19.	1.5	1	(93)
				_	20.33	20.55	<u> </u>	20.6	20.02	20.	02	20.57	20.	20	19.69	19.	15		(33)
		ting requ			norotur	o obtoi	<b>500</b>	l ot ot	on 11 of	Tobl	ام ۸	o oo tho	4 T: .	~ <i>(</i>	76)m on	d ro	مماد	vuloto	
		mean int factor fo					nea	al Sie	<del>з</del> р п ог	rabi	ie st	o, so ma	ll 11,1	11=(	76)III an	a re-	Calc	culate	
	Jan	Feb	Mar	$\neg$	Apr	May	T	Jun	Jul	Α	ug	Sep	Го	ct	Nov	D	ec		
ı Utilisa		tor for g	l	_											1			l	
(94)m=	0.91	0.87	0.79	Т	0.65	0.5	1	0.35	0.25	0.2	28	0.47	0.7	73	0.87	0.9	2		(94)
ւ Usefu	ıl gains,	hmGm .	. W = (	94	 )m x (84	4)m	-		<u> </u>				!		!			l	
(95)m=	448.62	496.91	526.11	_	503.74	417.4	2	88.49	194.83	203	.36	305.48	401	.09	422.3	429.	.92		(95)
	nly aver	age exte	rnal te	mr	erature	from 7	abl	e 8	<u> </u>									ı	
(96)m=	4.3	4.9	6.5	Ť	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10	.6	7.1	4.2	2		(96)
L	I					I			1									1	

Heat loss rate for mean internal temperature, Lm , $W = [(39)m \times (93)m - (39)m]$	(96)m 1					
		479.97	628.4	750.83		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)n	n – (95)	m] x (41	1)m			
(98)m= 230.59 164.49 114.52 47.13 15.19 0 0 0	0	58.69	148.39	238.76		_
	per year (l	kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1017.76	(98)
Space heating requirement in kWh/m²/year				Į	13.88	(99)
9b. Energy requirements – Community heating scheme			., ,			
This part is used for space heating, space cooling or water heating provide Fraction of space heat from secondary/supplementary heating (Table 11)	•		unity scr	neme.	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 Control includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix		p to four o	other heat	sources; th	ne latter	_
Fraction of heat from Community CHP				Ĺ	0.6	(303a)
Fraction of community heat from heat source 2					0.4	(303b)
Fraction of total space heat from Community CHP		(30	02) x (303	a) =	0.6	(304a)
Fraction of total space heat from community heat source 2		(30	02) x (303	b) =	0.4	(304b)
Factor for control and charging method (Table 4c(3)) for community heati	ing syste	em		[	1	(305)
Distribution loss factor (Table 12c) for community heating system				[	1.05	(306)
Space heating				Г	kWh/year	¬
Annual space heating requirement	(00) (00)	4-) (205	T) (200)	Ĺ	1017.76	](207-)
	(98) x (304	, ,		Ļ	641.19	(307a)
	(98) x (304	, ,		= _ _	427.46	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4	·	•	,	Į	0	(308
Space heating requirement from secondary/supplementary system (	(98) x (30°	1) x 100 ÷	- (308) =	L	0	(309)
Water heating Annual water heating requirement				[	2057.61	
If DHW from community scheme: Water heat from Community CHP	(64) x (303	3a) x (305	5) x (306) :	<b>-</b> [	1296.29	(310a)
Water heat from heat source 2	(64) x (303	3b) x (305	5) x (306) :	= [	864.2	(310b)
Electricity used for heat distribution 0.01 x	k [(307a)	.(307e) +	(310a)(	310e)] =	32.29	(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				[	142.28	(330a)
warm air heating system fans				Ī	0	(330b)
pump for solar water heating				Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) +	(330b) +	(330g) =	Ī	142.28	(331)
Energy for lighting (calculated in Appendix L)				Ī	322.98	(332)

12b. CO2 Emissions – Community h	neating scheme				
Electrical efficiency of CHP unit				29.73	(361)
Heat efficiency of CHP unit				45.95	(362)
		Energy kWh/year	Emission factoring Kg CO2/kWh	r Emissions kg CO2/year	
Space heating from CHP)	(307a) × 100 ÷ (362) =	1395.41 ×	0.22	301.41	(363)
less credit emissions for electricity	$-(307a) \times (361) \div (362) =$	414.85 ×	0.52	-215.31	(364)
Water heated by CHP	(310a) × 100 ÷ (362) =	2821.09 ×	0.22	609.36	(365)
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$	838.71 ×	0.52	-435.29	(366)
Efficiency of heat source 2 (%)	If there is CHP us	sing two fuels repeat (363) to	(366) for the second fu	uel 91	(367b)
CO2 associated with heat source 2	[(307b	b)+(310b)] x 100 ÷ (367b) x	0.22	= 306.59	(368)
Electrical energy for heat distribution	1	[(313) x	0.52	= 16.76	(372)
Total CO2 associated with communi	ity systems	(363)(366) + (368)(372	2)	= 583.51	(373)
CO2 associated with space heating	(secondary)	(309) x	0	= 0	(374)
CO2 associated with water from imn	nersion heater or instanta	neous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space an	d water heating	(373) + (374) + (375) =		583.51	(376)
CO2 associated with electricity for p	umps and fans within dwe	elling (331)) x	0.52	73.85	(378)
CO2 associated with electricity for lig	ghting	(332))) x	0.52	= 167.63	(379)
Total CO2, kg/year	sum of (376)(382) =			824.98	(383)
Dwelling CO2 Emission Rate	$(383) \div (4) =$			11.25	(384)
El rating (section 14)				90.66	(385)

		User	Details:						
Assessor Name:	Matthew Stainrod		Strom	a Num	ber		STRO	023501	
Software Name:	Stroma FSAP 2012	2	Softwa					n: 1.0.4.16	
		Propert	y Address:	06-18-6	69419 31	F-7			
Address :	3F-7, Bertram Street	, London							
1. Overall dwelling dime	nsions:	Δr	ea(m²)		Av Ha	ight(m)		Volume(m³	١
Ground floor				(1a) x		2.4	(2a) =	130.75	) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	54.48	(4)			_		
Dwelling volume		. ,			)+(3c)+(3c	d)+(3e)+	.(3n) =	130.75	(5)
2. Ventilation rate:									
		condary eating	other		total			m³ per hou	r
Number of chimneys	0 +	0 +	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	Ī = [	0	x	20 =	0	(6b)
Number of intermittent fa	ns				0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				_				_	_
				_			Air ch	anges per ho	our —
Infiltration due to chimney  If a pressurisation test has be	, -			continuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		a, proceed to (17)	, ouriel wise t	orianae m	om (9) to (	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.				•	uction			0	(11)
if both types of wall are prideducting areas of opening	resent, use the value corresp ngs); if equal user 0.35	onding to the gre	ater wall are	a (atter					
If suspended wooden f		ed) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	aco avaraged in sub-		(8) + (10)				0.00	0	(16)
Air permeability value,  If based on air permeabili	•	•	•	•	etre or e	rivelope	area	3	(17)
Air permeability value applie	•				is being u	sed		0.15	(10)
Number of sides sheltere	d							3	(19)
Shelter factor			(20) = 1 -	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified for	<del></del>				·			1	
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp					1		<u> </u>	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate	e (allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m				_	
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effect If mechanica		•	rate for t	ne appıı	cable ca	ise						0.5	(23
If exhaust air he			endix N, (2	(23a) = (23a	a) × Fmv (	equation (	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23
If balanced with	heat reco	very: effic	eiency in %	allowing t	for in-use f	actor (fro	n Table 4h	ı) =				79.9	(23
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2:	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24
b) If balance	d mecha	anical ve	entilation	without	heat red	covery (	MV) (24k	m = (22)	2b)m + (2	23b)	-	•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n									0.5]			'	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	ld) in bo	x (25)				_	
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losse	s and he	at loss p	paramet	er:									
LEMENT	Gros area	S	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		X k /K
Ooors					2.1	X	1.4	=	2.94				(2
Vindows					12.15	5 x1	/[1/( 1.4 )+	0.04] =	16.11				(2
Valls Type1	31.3	2	14.2	5	17.07	7 X	0.15	=	2.56		14	238.98	3 (2
Valls Type2	25.0	8	0		25.08	3 x	0.14	=	3.53		14	351.12	2 (2
Valls Type3	12.6	6	0		12.6	X	0.13	=	1.67		14	176.4	. (2
otal area of e	lements	, m²			69								(3
arty wall					10.78	3 x	0	=	0		20	215.6	(3
arty floor					54.48	3					40	2179.2	2 (3
Party ceiling					54.48	3				[	30	1634.4	4 (3
nternal wall **					57.6					Ī	9	518.4	. (3
for windows and * include the area						lated usin	g formula 1	l/[(1/U-valu	ue)+0.04] a	as given in	paragraph	1 3.2	_
abric heat los	s, W/K =	= S (A x	U)				(26)(30	) + (32) =				26.81	(3
leat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5314.1	(3
hermal mass	parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			= (34)	) ÷ (4) =			97.54	(3
or design assess an be used inste	ad of a det	tailed calc	ulation.			·	recisely the	e indicative	e values of	TMP in Ta	able 1f		_
hermal bridge	,	•			•	K						5.74	(3
details of thermatorial fabric he		are not kn	own (36) =	= 0.15 x (3	31)			(33) ±	- (36) =			20.54	
entilation hea		alculated	nonthly	./					n = 0.33 × (	25)m v (5)	)	32.54	(3
	11 1000 60	มเบนเสเซเ	a 1110111111	y				(JOJIII	. – v.uu x (	LUMII A (O.	,		

(00)	1 40 04	10.40	0.05	0.70	0.4		0.00	0.05	0.70		40.00		(20)
(38)m= 10.73	10.61	10.48	9.85	9.73	9.1	9.1	8.98	9.35	9.73	9.98	10.23		(38)
Heat transfer (39)m= 43.27	43.15	nt, W/K 43.02	42.4	42.27	41.64	41.64	41.52	(39)m 41.9	42.27	38)m 42.52	42.77		
(39)111= 43.27	45.15	43.02	42.4	42.21	41.04	41.04	41.32			Sum(39) <sub>1</sub>	<u> </u>	42.37	(39)
Heat loss para	ameter (l	HLP), W/	m²K			_	_		= (39)m ÷			.2.0.	` ′
(40)m= 0.79	0.79	0.79	0.78	0.78	0.76	0.76	0.76	0.77	0.78	0.78	0.79		_
Number of da	vs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	0.78	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
											<u>.                                    </u>		
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occ	inancy	NI											(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		82		(42)
if TFA £ 13.	•	otor ucoc	ao io litro	o por da	w Vd ov	orogo –	(25 v NI)	. 26					(40)
Annual average Reduce the annu									se target o		7.48		(43)
not more that 125	litres per	person per	day (all w	ater use, h	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	· ·					1	. /			ī			
(44)m= 85.22	82.12	79.02	75.93	72.83	69.73	69.73	72.83	75.93	79.02	82.12	85.22	000.7	7(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	<u> </u>	929.7	(44)
(45)m= 126.38	110.54	114.06	99.44	95.42	82.34	76.3	87.55	88.6	103.25	112.71	122.39		
									Γotal = Su	m(45) <sub>112</sub> =	=	1218.98	(45)
If instantaneous v			,			1							()
(46)m= 18.96 Water storage	16.58 loss:	17.11	14.92	14.31	12.35	11.44	13.13	13.29	15.49	16.91	18.36		(46)
Storage volum		) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufac		eclared l	oss facto	or is kno	wn (kWh	n/day).					0		(48)
Temperature f				J. 10 11.10	(	"uay).					0		(49)
Energy lost from				ear			(48) x (49)	=			10		(50)
b) If manufac			-										
Hot water stor If community I	•			e 2 (kWl	n/litre/da	ıy)				0.	.02		(51)
Volume factor	•		JII 4.5							1.	03		(52)
Temperature t	factor fro	m Table	2b							<b>—</b>	.6		(53)
Energy lost fro	om watei	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated f	or each	month		_	((56)m = (	55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendix	¢Н	
(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 (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	nostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m	
(62)m= 181.66 160.46 169.34 152.94 150.69 135.83 131.57 142.83 142.09 158.53	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contrib	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	dion to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 181.66 160.46 169.34 152.94 150.69 135.83 131.57 142.83 142.09 158.53	3 166.2 177.67
Output from water hea	<del></del>
Heat gains from water heating, kWh/month 0.25 $^{\circ}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)r (65)m= $\frac{86.24}{76.69}$   $\frac{76.69}{82.15}$   $\frac{75.86}{75.95}$   $\frac{75.95}{70.17}$   $\frac{70.17}{69.59}$   $\frac{73.33}{73.33}$   $\frac{72.25}{78.55}$	<del></del>
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11	91.11 91.11 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 14.16 12.58 10.23 7.74 5.79 4.89 5.28 6.86 9.21 11.7	13.65 14.55 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 158.84 160.49 156.34 147.5 136.33 125.84 118.83 117.19 121.34 130.18	3 141.34 151.84 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11	32.11 32.11 (69)
Pumps and fans gains (Table 5a)	<del></del>
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -72.88 -7	3 -72.88 -72.88 (71)
Water heating gains (Table 5)	
(72)m= 115.92 114.13 110.41 105.36 102.08 97.46 93.54 98.57 100.35 105.58	3 111.49 114.14 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m +$	, ,
(73)m= 339.26 337.53 327.31 310.93 294.53 278.52 267.98 272.95 281.24 297.79	· · · · · · · · · · · · · · · · · · ·
6. Solar gains:	310.02 330.00
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applic	able orientation
	FF Gains
<del>-</del>	Table 6c (W)
West 0.9x 0.77 x 12.15 x 19.64 x 0.56 x	
0.00 A 10.04 A 0.00 A	
West 0.9x 0.77	0.7 = 126.36 (80)

	_									_									_
West	0.9x	0.77		X	12.	15	X	6	3.27	X		0.56	X		0.7		=	208.09	(80)
West	0.9x	0.77		X	12.	15	X	9	2.28	X		0.56	X		0.7		=	303.49	(80)
West	0.9x	0.77		X	12.	15	X	1	13.09	X		0.56	X		0.7		=	371.94	(80)
West	0.9x	0.77		X	12.	15	X	11	15.77	x		0.56	X		0.7		=	380.75	(80)
West	0.9x	0.77		X	12.	15	X	1	10.22	x		0.56	X		0.7		=	362.49	(80)
West	0.9x	0.77		x	12.	15	X	9	4.68	X		0.56	X		0.7		=	311.37	(80)
West	0.9x	0.77		x	12.	15	X	7	3.59	x		0.56	X		0.7		=	242.02	(80)
West	0.9x	0.77		x	12.	15	X	4	5.59	x		0.56	X		0.7		=	149.94	(80)
West	0.9x	0.77		x	12.	15	X	2	4.49	x		0.56	X		0.7		=	80.54	(80)
West	0.9x	0.77		x	12.	15	X	1	6.15	х		0.56	X		0.7		=	53.12	(80)
																			_
Solar g	ains in	watts, ca	alculat	ed	for eacl	n month	1			(83)m	ı = Sı	um(74)m .	(82)ı	n					
(83)m=	64.59	126.36	208.0	9	303.49	371.94	3	80.75	362.49	311	.37	242.02	149.	94	80.54	53.	12		(83)
Total g	ains – i	nternal a	nd so	ar	(84)m =	(73)m	+ (	83)m	, watts						•			•	
(84)m=	403.85	463.89	535.4	1	614.43	666.48	6	59.27	630.47	584	.32	523.26	447.	73	397.36	383	.98		(84)
7 Me	an inter	nal temp	peratur	e (	heating	seasor	n)												
		during h						area f	from Tal	ole 9	Th	1 (°C)						21	(85)
•		tor for g	_	•			_			010 0	,	. ( 0)						21	
	Jan	Feb	Ma	$\neg$	Apr	May	Ť	Jun	Jul	Α	ug	Sep	0	nt .	Nov	D	ec		
(86)m=	0.93	0.89	0.82	$\dashv$	0.7	0.54	+	0.39	0.29	0.3	<del>-  </del>	0.52	0.7		0.89	0.9			(86)
` ′ [		ļ	<u> </u>								!								. ,
ī		l temper	1	n II			_			T T			-00.4			I 40.		1	(07)
(87)m=	19.68	19.93	20.3		20.67	20.88		20.97	20.99	20.	99	20.93	20.6	)2	20.1	19.0	53		(87)
r	erature	during h	r	$\overline{}$	eriods ir	rest of	fdw	elling	from Ta	able 9	9, Tł	n2 (°C)				,		•	
(88)m=	20.26	20.26	20.26	5	20.27	20.27	2	20.28	20.28	20.	29	20.28	20.2	27	20.27	20.2	27		(88)
Utilisa	ation fac	tor for g	ains fo	r re	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.92	0.88	0.8		0.67	0.51		0.35	0.24	0.2	27	0.47	0.7	3	0.88	0.9	3		(89)
Mean	interna	l temper	ature i	n t	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)		-			•	
(90)m=	18.48	18.84	19.36	$\overline{}$	19.87	20.14	┰	20.26	20.28	20.		20.21	19.8		19.09	18.4	42		(90)
` ′ [		l	<u> </u>									f	LA = I	ivin	g area ÷ (4	4) =		0.45	(91)
																		0.10	┛`′
Г		l temper		Ì			_	<del></del>		<del>r`</del>					10.54	1 40.		1	(02)
(92)m=	19.02	19.34	19.78	L	20.23	20.48		20.58	20.6	20	!	20.53	20.		19.54	18.9	97		(92)
		nent to t	i	_			_		1	1			i –		10.54	100		1	(02)
(93)m=	19.02	19.34	19.78		20.23	20.48	2	20.58	20.6	20	.6	20.53	20.1	8	19.54	18.9	97		(93)
		ting requ							44 . 6	T	- 01			. (	70)			Lata	
		mean int factor fo			•		ned	at ste	ep 11 of	rabi	e 9t	o, so tha	t II,n	า=(	76)m an	d re-	calc	culate	
	Jan	Feb	Ma	$\neg$	Apr	May	T	Jun	Jul	Α	ug	Sep	0	nt .	Nov	D	ec		
l Utilisa		tor for g	l	_		iviay		oun	Oui		ug j	ОСР			1101			l	
(94)m=	0.9	0.86	0.79	T	0.67	0.52	Т	0.37	0.26	0.2	29	0.49	0.7	3	0.86	0.9	1		(94)
		hmGm	<u> </u>	<u> </u>									• • • •					l	, ,
(95)m=	365.09	401.07	423.5	<del>`                                    </del>	409.75	345.57	2	43.05	165.22	172	.25	254.47	326.	43	343.37	350	.97		(95)
		age exte		_										_	L			1	. ,
(96)m=	4.3	4.9	6.5	T	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10.	6	7.1	4.2	2		(96)
` ′ [		I			-			•							I			I	. ,

Heat loss rate for mean internal temperature. Lm. W =[/20\m v [/03	2)m (06)m	1				
Heat loss rate for mean internal temperature, Lm, $W = [(39)m \times [(93)m \times (97)m]] = [637.07] 622.86   571.52   480.47   370.99   249   166.62   174.$		405.09	529.18	631.6		(97)
Space heating requirement for each month, kWh/month = 0.024 x [i	(97)m – (95	)m] x (4	l)m			
(98)m= 202.35 149.05 110.07 50.92 18.91 0 0 0	0	58.52	133.78	208.79		_
-	Total per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	932.39	(98)
Space heating requirement in kWh/m²/year					17.11	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table	•		unity sch	neme.	0	(301)
Fraction of space heat from community system $1 - (301) =$				Ī	1	(302)
The community scheme may obtain heat from several sources. The procedure allows includes boilers, heat pumps, geothermal and waste heat from power stations. See A		up to four (	other heat	sources; th	he latter	_
Fraction of heat from Community CHP					0.6	(303a)
Fraction of community heat from heat source 2					0.4	(303b)
Fraction of total space heat from Community CHP	0.6	(304a)				
Fraction of total space heat from community heat source 2	0.4	(304b)				
Factor for control and charging method (Table 4c(3)) for community	heating sys	tem			1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating				,	kWh/year	
Annual space heating requirement					932.39	╛
Space heat from Community CHP	(98) x (30	04a) x (305	5) x (306) =	-	587.41	(307a)
Space heat from heat source 2	(98) x (30	04b) x (305	5) x (306) =	= [	391.6	(307b)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or A	ppendix	E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (30	01) x 100 ÷	- (308) =	[	0	(309)
Water heating Annual water heating requirement				[	1869.82	7
If DHW from community scheme: Water heat from Community CHP	(64) x (30	03a) x (305	5) x (306) =	= [	1177.99	(310a)
Water heat from heat source 2	(64) x (30	03b) x (305	5) x (306) =	<u> </u>	785.33	(310b)
Electricity used for heat distribution	0.01 × [(307a).	(307e) +	(310a)(	310e)] =	29.42	(313)
Cooling System Energy Efficiency Ratio				ĺ	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 outsi	ide			[	105.68	(330a)
warm air heating system fans				ĺ	0	(330b)
pump for solar water heating				ĺ	0	(330g)
Total electricity for the above, kWh/year	=(330a) ·	+ (330b) +	(330g) =	ļ	105.68	(331)
Energy for lighting (calculated in Appendix L)				ĺ	250.09	(332)
				L		_

12b. CO2 Emissions – Community he	eating scheme				
Electrical efficiency of CHP unit				29.73	(361)
Heat efficiency of CHP unit				45.95	(362)
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP)	807a) × 100 ÷ (362) =	1278.36 X	0.22	276.13	(363)
less credit emissions for electricity	(307a) × (361) ÷ (362) =	380.06 ×	0.52	-197.25	(364)
Water heated by CHP	310a) × 100 ÷ (362) =	2563.63 ×	0.22	553.74	(365)
less credit emissions for electricity	(310a) × (361) ÷ (362) =	762.17 ×	0.52	-395.57	(366)
Efficiency of heat source 2 (%)	If there is CHP us	ing two fuels repeat (363) to	(366) for the second fue	el 91	(367b)
CO2 associated with heat source 2	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.22	= 279.36	(368)
Electrical energy for heat distribution		[(313) x	0.52	15.27	(372)
Total CO2 associated with community	y systems	(363)(366) + (368)(372	2)	531.69	(373)
CO2 associated with space heating (s	secondary)	(309) x	0	= 0	(374)
CO2 associated with water from imme	ersion heater or instanta	neous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =		531.69	(376)
CO2 associated with electricity for pur	mps and fans within dwe	elling (331)) x	0.52	54.85	(378)
CO2 associated with electricity for light	hting	(332))) x	0.52	129.8	(379)
Total CO2, kg/year	sum of (376)(382) =			716.33	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =			13.15	(384)
El rating (section 14)				90.35	(385)

			llser I	Details:						
Accessor Names	Matthew St	toinrad	—— <del>0361</del> L		o Nives	hor.		CTD (	023501	
Assessor Name:	Stroma FS				a Num are Ve				on: 1.0.4.16	
Software Name:	Stioma ro	AP 2012	Duonout				F 0	versic	)II. 1.0. <del>4</del> .16	
A daluga e .	2E 9 Portro	m Stroot Lo	Property	Address	: 06-18-0	09419 3	F-8			
Address: 1. Overall dwelling dime	•	m Street, Loi	Idon							
1. Overall dwelling diffic	ensions.		Aro	a(m²)		۸۷ ۵۰	iaht/m\		Volume(m <sup>3</sup>	RN.
Ground floor				66.7	(1a) x		eight(m) 2.4	(2a) =	160.08	(3a)
	-) . (45) . (4 -) . (	'A -1\ . /A -\ .			<u> </u>		<u> </u>	(2a) -	160.06	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1a)+(1e)+	.(1h)	66.7	(4)					_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	160.08	(5)
2. Ventilation rate:										
	main heating	secon heatir		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	<u> </u>	0	= [	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					0	x	10 =	0	(7a)
Number of passive vents	3					0	x	10 =	0	(7b)
•					L		$\dashv$ ,	40 =		Ⅎ .
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	we fluce and fa	anc – (6a)+(6h	)+(7a)+(7h)+	(7c) =	Г					_
If a pressurisation test has	•				continue fr	0 rom (9) to	(16)	÷ (5) =	0	(8)
Number of storeys in t			,,			0 (0) 10	(10)		0	(9)
Additional infiltration	3 (	,					[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0	).25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p			ng to the grea	ter wall are	a (after					
deducting areas of open If suspended wooden	• / .		r 0 1 (spal	ad) alsa	antar ()					7(12)
If no draught lobby, er		,	i U. i (Seai	eu), eise	CITICI U				0	(12)
Percentage of window	•		d						0	(14)
Window infiltration	3 and doors an	augiii sirippo	ď	0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(15)
Infiltration rate				_	+ (11) + (	_	+ (15) =		0	(16)
Air permeability value,	a50. expresse	d in cubic me	etres per h					e area	3	(17)
If based on air permeabi			•	•	•				0.15	(18)
Air permeability value appli	es if a pressurisatio	on test has been	done or a de	gree air pe	rmeability	is being u	sed			` ′
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified	for monthly win	d speed							1	
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 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 (00.)										
Wind Factor $(22a)m = (2a)m =$	:∠)m ÷ 4	1.00	F 0.05	T 0.00		T		_	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effect		-	rate for t	he appli	cable ca	se	•	•	•	•	•		
If mechanica			endix N (2	(23a) = (23a	a) × Fmv (e	equation (	N5)) othe	rwise (23h	n) = (23a)			0.5	(23a
If balanced with									) = (20u)			0.5	(23b
		-	-	_					2h\m + /:	22h) v [-	1 (22a)	79.9	(230
a) If balance (24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	<del>-</del> 100]	(24a
b) If balance				<u> </u>			<u> </u>	<u> </u>	l	l	0.20		(=
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h													`
	า < 0.5 ×								.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural	ventilatio	n or wh	ole hous	e positiv	ve input	ventilati	on from	loft					
if (22b)m	n = 1, the	n (24d)	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]	•			
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change r	ate - er	iter (24a	) or (24b	o) or (24	c) or (24	ld) in bo	x (25)		•	•		
(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losses	s and hea	at loss p	paramet	er:									
ELEMENT	Gross area (	3	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-ł		X k J/K
Doors					2.1	x	1.4	=	2.94	,			(26)
Windows Type	· 1				3.82	x1	/[1/( 1.4 )+	0.04] =	5.06				(27)
Windows Type	2				8.35	x1	/[1/( 1.4 )+	0.04] =	11.07				(27)
Windows Type	3				7.63	x1	/[1/( 1.4 )+	0.04] =	10.12	=			(27)
Walls Type1	52.8		21.9		30.9	x	0.15		4.64	<b>=</b>	14	432.6	6 (29)
Walls Type2	10.39		0		10.39	_	0.14	=	1.46	륵 ;	14	┥	6 (29)
Total area of e					63.19	=	<u> </u>						(31)
Party wall	,				20.53	_	0		0	<b>—</b> [	20	410.6	<b></b> ` ′
Party floor					66.7	=					40	2668	=
Party ceiling					66.7	=					30	2001	=
Internal wall **					96	=				L T	9	╡	= .
* for windows and	roof windo	WS. USA A	effective wi	ndow H-v		l lated using	g formula 1	1/[(1/U-valı	ıe)+0 041 a	L ns given in		864	(320
							, .c.maia i	.,, ., o vait		9 011 111	,sa. agraph	<u>-</u>	
** include the area							(26)(30	) + (32) =				35.29	(33)
	s, W/K =	S (A x	U)										
** include the area		•	U)					((28).	(30) + (32	2) + (32a).	(32e) =	6521.66	(34)
** include the area Fabric heat los	Cm = S(A	Axk)	ŕ	- TFA) ir	n kJ/m²K				(30) + (32 ) ÷ (4) =	2) + (32a).	(32e) =	6521.66 97.78	= '
** include the area Fabric heat los Heat capacity (	Cm = S(A paramete ments whe	Axk) er (TMF re the de	P = Cm -tails of the	,			recisely the	= (34)	÷ (4) =				(34)
** include the area Fabric heat los Heat capacity ( Thermal mass For design assess	Cm = S(A paramete ments whe ad of a deta	A x k ) er (TMF re the de	P = Cm - tails of the	construct	ion are no	t known pi	recisely the	= (34)	÷ (4) =				=
** include the area Fabric heat los Heat capacity ( Thermal mass For design assess can be used instead	Cm = S(A paramete ments whe ad of a deta es : S (L >	Axk) er (TMF re the de niled calcu xY) cal	P = Cm - tails of the ulation.	construct	ion are no pendix l	t known pi	recisely the	= (34)	÷ (4) =			97.78	(35)

Ventila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	13.9	13.73	13.56	12.72	12.55	11.71	11.71	11.54	12.04	12.55	12.89	13.22		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m=	55.06	54.89	54.73	53.88	53.71	52.87	52.87	52.7	53.21	53.71	54.05	54.39		
Heat lo	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	53.84	(39)
(40)m=	0.83	0.82	0.82	0.81	0.81	0.79	0.79	0.79	0.8	0.81	0.81	0.82		
Numbe	er of day	s in moi	nth (Tab	le 1a)			•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.81	(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	ter heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		16		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by	5% if the $a$	lwelling is	designed			se target o		.58		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	_		_	_		
(44)m=	94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14		
Energy c	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1026.98	(44)
(45)m=	139.61	122.1	126	109.85	105.4	90.95	84.28	96.71	97.87	114.06	124.5	135.2		
If instant	aneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1346.53	(45)
(46)m=	20.94	18.32	18.9	16.48	15.81	13.64	12.64	14.51	14.68	17.11	18.68	20.28		(46)
	storage		منالم مال مالات		-1 \	/\// IDC	_1	isladada a		1			` I	\
If comn	nunity h	eating a	includin and no ta hot wate	nk in dw	velling, e	nter 110	litres in	(47)				0		(47)
•			eclared l		or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage eclared o	-		or is not		(48) x (49)	) =		1	10		(50)
		_	factor free section		e 2 (kW	h/litre/da	ay)				0.	02		(51)
		from Ta									1.	03		(52)
•			m Table								0	.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
	` ' '	(54) in (5 loss cal	ວວ <i>ງ</i> culated f	or each	month			((56)m = (	55) × (41)	m	1.	03		(55)
(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)
,,	01		1 -2.01	1	I	1 -0.00	I	I'	1 -0.00	1 -2.01	L -0.00	1 -2.0		(-3)

If cylinder cont	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) - (	H11)] ÷ (5	u), eise (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.0	)1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	cuit loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circ	,	,			59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)	_		
(59)m= 23.2	26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss	calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water he	eating ca	alculated	I for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.	88 172.03	181.27	163.34	160.68	144.45	139.56	151.99	151.36	169.33	178	190.48		(62)
Solar DHW inp	out calculated	using App	endix G oı	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 194.	88 172.03	181.27	163.34	160.68	144.45	139.56	151.99	151.36	169.33	178	190.48		
							Outp	out from wa	ater heate	r (annual)₁	12	1997.37	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	]	
(65)m= 90.6	80.54	86.12	79.32	79.27	73.04	72.24	76.38	75.34	82.15	84.19	89.18		(65)
include (5	57)m in cal	culation (	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Interna	I gains (see	e Table 5	and 5a	):									
Metabolic g	ains (Table	e 5). Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 108.	17 108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 16.8	39 15	12.2	9.24	6.9	5.83	6.3	8.19	10.99	13.95	16.29	17.36		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		•	•	
(68)m= 189.	48 191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.6	181.12		(68)
Cooking ga	ins (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also se	ee Table	5	•	•	•	
(69)m= 33.8	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82		(69)
Pumps and	fans gains	(Table 5	īa)		•							•	
-	_		-ω,										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
(70)m= 0 Losses e.g.		0	0	<u> </u>		0	0	0	0	0	0		(70)
	evaporation	0	0	<u> </u>		-86.54	-86.54	-86.54	-86.54	0 -86.54	-86.54	 	(70) (71)
Losses e.g.	evaporation 54 -86.54	0 on (nega	0 tive valu	es) (Tab	le 5)					<u> </u>	<u> </u>		
Losses e.g. (71)m= -86.	evaporation 54 -86.54 ng gains (7	0 on (nega	0 tive valu	es) (Tab	le 5)					<u> </u>	<u> </u>		
Losses e.g. (71)m= -86 Water heati (72)m= 121	evaporation 54 -86.54 ng gains (7 83 119.85	0 on (negar -86.54 Table 5)	0 tive valu -86.54	es) (Tab -86.54	-86.54 101.44	-86.54 97.1	-86.54 102.66	-86.54	-86.54 110.41	-86.54 116.93	-86.54 119.86		(71)
Losses e.g. (71)m= -86. Water heati	evaporation 54 -86.54 ng gains (7 83 119.85 nal gains =	0 on (negar -86.54 Table 5)	0 tive valu -86.54	es) (Tab -86.54	-86.54 101.44	-86.54 97.1	-86.54 102.66	-86.54 104.63	-86.54 110.41	-86.54 116.93	-86.54 119.86		(71)
Losses e.g. (71)m= -86. Water heati (72)m= 121. Total interi	evaporation 54 -86.54  ng gains (7 83 119.85  nal gains = 65 381.75	0 on (nega: -86.54 Table 5) 115.75	0 tive valu -86.54	es) (Tab -86.54	le 5) -86.54 101.44 (66)	-86.54 97.1 m + (67)m	-86.54 102.66 1 + (68)m +	-86.54 104.63 + (69)m + (	-86.54 110.41 (70)m + (7	-86.54 116.93 1)m + (72)	-86.54		(71) (72)
Losses e.g. (71)m= -86.3  Water heati (72)m= 121.  Total interi (73)m= 383.  6. Solar ga	evaporation 54 -86.54  ng gains (7 83 119.85  nal gains = 65 381.75	0 n (nega) -86.54 [able 5] 115.75 369.89	0 tive valu -86.54 110.17	es) (Tab -86.54 106.54	-86.54 101.44 (66) 312.83	-86.54 97.1 m + (67)m 300.6	-86.54 102.66 1 + (68)m + 306.08	-86.54 104.63 + (69)m + (	-86.54 110.41 (70)m + (7 335.1	-86.54 116.93 1)m + (72) 357.27	-86.54 119.86 m 373.79		(71) (72)
Losses e.g. (71)m= -86.3  Water heati (72)m= 121.  Total interi (73)m= 383.  6. Solar ga	evaporation 54 -86.54  ng gains (7) 83 119.85  nal gains = 65 381.75  ains:  are calculated	0 on (negar -86.54 Fable 5) 115.75 369.89 using sola	0 tive valu -86.54 110.17	es) (Tab -86.54 106.54 331.52	101.44 (66) 312.83	-86.54  97.1 m + (67)m  300.6	-86.54 102.66 1 + (68)m + 306.08	-86.54 104.63 + (69)m + (	-86.54 110.41 (70)m + (7 335.1	-86.54 116.93 1)m + (72) 357.27	-86.54 119.86 m 373.79	Gains (W)	(71) (72)

Southeast 0.9x	0.77	X	7.63	x	36.79	X	0.56	x [	0.7	=	75.99	(77)
Southeast 0.9x	0.77	X	7.63	x	62.67	x	0.56	x [	0.7	=	129.44	(77)
Southeast 0.9x	0.77	X	7.63	x	85.75	X	0.56	x [	0.7	=	177.11	(77)
Southeast 0.9x	0.77	x	7.63	x	106.25	x	0.56	x [	0.7	=	219.44	(77)
Southeast 0.9x	0.77	X	7.63	x	119.01	X	0.56	x	0.7	=	245.8	(77)
Southeast 0.9x	0.77	x	7.63	x	118.15	X	0.56	x [	0.7	=	244.02	(77)
Southeast 0.9x	0.77	X	7.63	x	113.91	X	0.56	x [	0.7	=	235.26	(77)
Southeast 0.9x	0.77	x	7.63	x	104.39	X	0.56	x [	0.7	=	215.6	(77)
Southeast 0.9x	0.77	X	7.63	x	92.85	X	0.56	x [	0.7	=	191.77	(77)
Southeast 0.9x	0.77	x	7.63	x	69.27	X	0.56	x [	0.7	=	143.06	(77)
Southeast 0.9x	0.77	X	7.63	x	44.07	X	0.56	x	0.7	=	91.02	(77)
Southeast 0.9x	0.77	x	7.63	x	31.49	X	0.56	x [	0.7	=	65.03	(77)
South 0.9x	0.77	x	3.82	x	46.75	x	0.56	x	0.7		48.34	(78)
South 0.9x	0.77	x	3.82	x	76.57	x	0.56	×	0.7	_	79.17	(78)
South 0.9x	0.77	x	3.82	x	97.53	X	0.56	x	0.7	=	100.85	(78)
South 0.9x	0.77	x	3.82	x	110.23	x	0.56	x	0.7	=	113.98	(78)
South <sub>0.9x</sub>	0.77	x	3.82	x	114.87	x	0.56	×	0.7	=	118.78	(78)
South 0.9x	0.77	x	3.82	x	110.55	X	0.56	x	0.7	=	114.31	(78)
South 0.9x	0.77	x	3.82	x	108.01	x	0.56	x	0.7	=	111.69	(78)
South <sub>0.9x</sub>	0.77	x	3.82	x	104.89	x	0.56	×	0.7	=	108.46	(78)
South 0.9x	0.77	x	3.82	x	101.89	X	0.56	x	0.7	=	105.35	(78)
South 0.9x	0.77	X	3.82	x	82.59	X	0.56	x	0.7	=	85.4	(78)
South 0.9x	0.77	x	3.82	x	55.42	X	0.56	x [	0.7		57.3	(78)
South 0.9x	0.77	x	3.82	x	40.4	x	0.56	x [	0.7	=	41.77	(78)
West 0.9x	0.77	x	8.35	x	19.64	x	0.56	x [	0.7		44.39	(80)
West 0.9x	0.77	X	8.35	x	38.42	X	0.56	x [	0.7	=	86.84	(80)
West 0.9x	0.77	X	8.35	x	63.27	X	0.56	x [	0.7	=	143.01	(80)
West 0.9x	0.77	X	8.35	x	92.28	X	0.56	x [	0.7	=	208.57	(80)
West 0.9x	0.77	X	8.35	x	113.09	X	0.56	x	0.7	=	255.62	(80)
West 0.9x	0.77	X	8.35	x	115.77	X	0.56	x [	0.7	=	261.67	(80)
West 0.9x	0.77	X	8.35	x	110.22	X	0.56	x [	0.7	=	249.12	(80)
West 0.9x	0.77	X	8.35	x	94.68	X	0.56	x	0.7	=	213.99	(80)
West 0.9x	0.77	X	8.35	x	73.59	x	0.56	x [	0.7	=	166.33	(80)
West 0.9x	0.77	X	8.35	x	45.59	X	0.56	x [	0.7	=	103.04	(80)
West 0.9x	0.77	X	8.35	x	24.49	X	0.56	x [	0.7	=	55.35	(80)
West 0.9x	0.77	X	8.35	x	16.15	X	0.56	x [	0.7	=	36.51	(80)
Solar gains in	watte calcul	ated	for each mon	th		(83)m	ı = Sum(74)m	(82)m				
(83)m= 168.73		0.97	542 620.1		620 596.07	538		331.5	203.67	143.31		(83)
Total gains – ir	nternal and	solar	(84)m = $(73)$ n	n + (	33)m , watts							
(84)m= 552.37	677.2 790	0.86	892.8 951.7	1 9	32.83 896.67	844	.14 779.26	666.6	560.95	517.1		(84)
7. Mean inter	nal temperat	ture (	heating seaso	on)								
Temperature		•			area from Tab	ole 9,	, Th1 (°C)				21	(85)
Utilisation fac	•	•		_		·	. ,				L	
Stroma FSAP201	<del>`</del>			Ť		A	ug Sep	Oct	Nov	Dec	Page	5 of 8
									-			

			_	
(86)m= 0.91 0.85 0.76 0.63 0.49 0.35 0.26 0.28 0.45 0.69	0.86	0.92		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)			_	
(87)m= 19.72 20.06 20.42 20.73 20.9 20.98 20.99 20.99 20.95 20.7	20.17	19.66		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)			_	
(88)m= 20.23 20.23 20.24 20.25 20.25 20.26 20.26 20.26 20.26 20.26 20.26	5 20.24	20.24		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)			_	
(89)m= 0.9 0.84 0.74 0.61 0.46 0.32 0.21 0.24 0.41 0.66	0.85	0.92		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)				
(90)m= 18.53 19 19.5 19.93 20.14 20.24 20.26 20.26 20.2 19.9		18.44		(90)
fLA = Li	iving area ÷ (	4) =	0.45	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$			_	
(92)m= 19.07 19.48 19.91 20.29 20.49 20.57 20.59 20.59 20.54 20.20	6 19.63	18.99		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1		1	(22)
(93)m= 19.07 19.48 19.91 20.29 20.49 20.57 20.59 20.59 20.54 20.29	6 19.63	18.99		(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 an	d ro cold	sulato	
the utilisation factor for gains using Table 9a	=(70)111 a11	iu re-caic	Julate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oc	t Nov	Dec		
Utilisation factor for gains, hm:				
(94)m= 0.88 0.82 0.73 0.61 0.47 0.33 0.23 0.26 0.42 0.66	0.83	0.9		(94)
Useful gains, hmGm, W = (94)m x (84)m  (95)m=	15 465.65	164.46	1	(95)
(95)m= 488.18   556.14   579.83   542.31   446.34   309.75   209.56   218.79   329.19   441.1 Monthly average external temperature from Table 8	465.65	464.46		(93)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6	7.1	4.2	]	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]		<u> </u>	l	
(97)m= 813.3 800.32 734.08 613.88 472.03 315.76 210.96 220.77 342.68 519.0	01 677.18	804.57		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x	<del>`                                    </del>		1	
(98)m= 241.89 164.09 114.76 51.53 19.12 0 0 0 57.93		253.04		<b>-</b>
Total per year (kWh/y	ear) = Sum(9	98) <sub>15,912</sub> =	1054.66	(98)
Space heating requirement in kWh/m²/year			15.81	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating provided by a com Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	nmunity scl	heme.	0	(301)
, , , , , , , , , , , , , , , , , , , ,			0	╡`
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 fo includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	ur other heat	sources; t		7(2025)
Fraction of heat from Community CHP			0.6	(303a)
Fraction of community heat from heat source 2			0.4	(303b)
Fraction of total space heat from Community CHP	(302) x (303	8a) =	0.6	(304a)
Fraction of total space heat from community heat source 2	(302) x (303	8b) =	0.4	(304b)
Factor for control and charging method (Table 4c(3)) for community heating system			1	(305)

Distribution loss factor (Table 12c) for o	community heating syst	em		1.05	(306)
Space heating				kWh/year	_
Annual space heating requirement				1054.66	╛
Space heat from Community CHP		(98) x (304a) x	(305) x (306) =	664.43	(307a)
Space heat from heat source 2		(98) x (304b) x	(305) x (306) =	442.96	(307b)
Efficiency of secondary/supplementary	heating system in % (fr	rom Table 4a or Appen	dix E)	0	(308
Space heating requirement from secon	dary/supplementary sy	stem (98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				1997.37	7
If DHW from community scheme: Water heat from Community CHP		(64) x (303a) x	(305) x (306) =	1258.34	(310a)
Water heat from heat source 2		(64) x (303b) x		838.89	(310b)
Electricity used for heat distribution		0.01 × [(307a)(307	e) + (310a)(310e)] =	32.05	(313)
Cooling System Energy Efficiency Rati	0			0	(314)
Space cooling (if there is a fixed coolin	g system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra	<b>-</b> ,	n outside		129.38	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	ır	=(330a) + (330b	o) + (330g) =	129.38	(331)
Energy for lighting (calculated in Apper	ndix L)			298.32	(332)
12b. CO2 Emissions – Community hea	ting scheme				
Electrical efficiency of CHP unit				29.73	(361)
Heat efficiency of CHP unit				45.95	(362)
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) (30	07a) × 100 ÷ (362) =	1445.99 ×	0.22	312.33	(363)
less credit emissions for electricity -(3	307a) × (361) ÷ (362) =	429.89 ×	0.52	-223.12	(364)
Water heated by CHP (31	0a) × 100 ÷ (362) =	2738.5 ×	0.22	591.52	(365)
less credit emissions for electricity -(3	310a) × (361) ÷ (362) =	814.16 ×	0.52	-422.55	(366)
Efficiency of heat source 2 (%)	If there is CHP usi	ing two fuels repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 2	[(307b)	)+(310b)] x 100 ÷ (367b) x	0.22	304.26	(368)
Electrical energy for heat distribution		[(313) x	0.52	16.63	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(372	) =	579.08	(373)
CO2 associated with space heating (se	econdary)	(309) x	0 =	0	(374)
CO2 associated with water from immer	sion heater or instantar	neous heater (312) x	0.22	0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =		579.08	(376)

CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 67.15 0.52 CO2 associated with electricity for lighting (379) (332))) x 0.52 154.83 Total CO2, kg/year sum of (376)...(382) = (383) 801.06 **Dwelling CO2 Emission Rate**  $(383) \div (4) =$ 12.01 (384)El rating (section 14) (385) 90.39

			lloor D	) otoilo:						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
A diducaci	4F-10, Bertram Str			Address	06-18-6	69419 4	F-10			
Address: 1. Overall dwelling dim	·	eet, Lond	IOH							
1. Overall dwelling diff	1011310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.4	(2a) =	207.74	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	36.56	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	207.74	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	+ [	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī <b>-</b> [	0	x	20 =	0	(6b)
Number of intermittent f	ans				, <u> </u>	0	x -	10 =	0	(7a)
Number of passive vent	ts				F	0	x	10 =	0	(7b)
Number of flueless gas					L F	0	x	40 =	0	(7c)
rumber er naerece gae									U U	(10)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	00-6						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre-				•	uction			0	(11)
	nings); if equal user 0.35	sportaing to	rile great	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unsea	ıled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2			(45)		0	(15)
Infiltration rate		L:t		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeab	e, q50, expressed in cultivity value, then $(18) = 10$		•	•	•	etre or e	envelope	area	3	(17)
·	lies if a pressurisation test ha					is beina u	sed		0.15	(18)
Number of sides shelter				, ,	,	3			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spee	d							•	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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 <i>∸ 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	1	
(-20/11)	25   1.1   1.00	1 0.00	L 3.55	1 0.02		L	I ''' <sup>2</sup>	Lo	J	

	Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
If mechanical ventilation:	I	' '		· ·	-	I -	· ·	0.12	0.13	0.14	0.14	0.15	]	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =     Tys.			•	ial <del>e</del> ioi l	пе аррп	cable ca	3E						0.5	(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100]	If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
24a)m 0.26 0.26 0.26 0.24 0.24 0.22 0.22 0.22 0.23 0.24 0.24 0.25   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	If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				79.9	(23
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	a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(24
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)			
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24d)m	24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d)m = 0	,				•	•				.5 × (23b	o)			
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d/m=	24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  25)m= 0.26  0.26  0.26  0.24  0.24  0.22  0.22  0.22  0.23  0.24  0.24  0.25  3. Heat losses and heat loss parameter:  ELEMENT Gross Parameter:  ELEMENT Gross Parameter:  Windows Type 1  Windows Type 1  Windows Type 1  Windows Type 2  Walls Type1  52.25  25.67  26.58  x  0.15  =  3.99  14  372.12  Walls Type2  17.09  0  17.09  x  0.14  =  2.41  14  239.26  Roof  86.56  0  86.56  x  0.11  =  9.52  9  779.04  Fotal area of elements, m²  Party wall Party floor  88.56  40  346.24  The rindows and roof windows, use effective window U-value calculated using formula 1/f(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)  Heat capacity Cm = S(A x k)  (26)(30) + (32) =  50.1  Roof details of the construction are not known precisely the indicative values of TMP in Table 11 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 x (31)  Total fabric heat loss  (33) + (36) =  62.47	,									0.5]				
3. Heat losses and heat loss parameter:  ELEMENT Gross Openings Met Area W/m2K (W/K) k-value kJ/m²-K k	24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
3. Heat losses and heat loss parameter:  ELEMENT Gross A, m² U-value (W/K) k-value (M/K) kJ/m²-K kJ/m²	Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
Net Area   U-value   A X U   K-value   KJ/m²-K   KJ/m²	(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25
area (m²) m² A ,m² W/m2K (W/K) kJ/m²-K	3. Heat losse	s and he	at loss p	paramet	er:									
Windows Type 1    15.22   x1/[1/(1.4) + 0.04] =   20.18	LEMENT		_	•	=						<b>〈</b> )			X k J/K
Windows Type 2  Walls Type1 52.25 25.67 26.58 × 0.15 = 3.99 14 372.12  Walls Type2 17.09 0 17.09 × 0.14 = 2.41 14 239.26  Roof 86.56 0 86.56 × 0.11 = 9.52 9 779.04  Total area of elements, m² 155.9  Party wall 32.95 × 0 = 0 20 659  Party floor 86.56 40 3462.4  Internal wall ** 163.2 9 1468.8  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) = 50.1  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 6980.62  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 80.64  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K (12.37)  Fortal fabric heat loss (33) + (36) = 62.47	Doors					2.1	x	1.4	=	2.94				(20
Walls Type1       52.25       25.67       26.58       x       0.15       =       3.99       14       372.12         Walls Type2       17.09       0       17.09       x       0.14       =       2.41       14       239.26         Roof       86.56       0       86.56       x       0.11       =       9.52       9       779.04         Fortal area of elements, m²       155.9       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       2       0	Nindows Type	e 1				15.22	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	20.18				(27
Nalls Type2	Nindows Type	2				8.35	x1	/[1/( 1.4 )+	0.04] =	11.07				(27
Roof 86.56 0 86.56 $\times$ 0.11 = 9.52 9 779.04  Fotal area of elements, m² 155.9  Party wall 32.95 $\times$ 0 = 0 20 659  Party floor 86.56 40 3462.4  Internal wall ** 163.2 9 1468.8  If or windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  If or windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  Fabric heat loss, W/K = S (A $\times$ U) (26)(30) + (32) = 50.1  Heat capacity Cm = S(A $\times$ K) ((28)(30) + (32) + (32a)(32e) = 6980.62  Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 80.64  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the same be used instead of a detailed calculation.  Thermal bridges: S (L $\times$ Y) calculated using Appendix K  If details of thermal bridging are not known (36) = 0.15 $\times$ (31)  Fotal fabric heat loss (33) + (36) = 62.47	Walls Type1	52.2	5	25.6	7	26.58	3 x	0.15	<b>-</b>	3.99		14	372.1	2 (2
Fotal area of elements, $m^2$	Walls Type2	17.0	9	0		17.09	) x	0.14	<u> </u>	2.41		14	239.2	6 (2
Party wall  32.95 $\times$ 0 = 0 20 659  Party floor  86.56 40 3462.4  Internal wall **  163.2 9 1468.8  If 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  The particulation are not known precisely the indicative values of TMP in Table 1fternal bridges: S (L x Y) calculated using Appendix K  Intermal bridges: S (L x Y) calculated using Appendix K  Intermal bridging are not known (36) = 0.15 x (31)  Intertal fabric heat loss  (33) + (36) = 62.47	Roof	86.5	6	0		86.56	3 x	0.11	<u> </u>	9.52		9	779.0	4 (3
Party floor  Internal wall **  It 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  If 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  In the areas on both sides of internal walls and partitions  In the areas on both sides of interna	Total area of e	elements	, m²			155.9	)							(3
Internal wall **  Internal wal	Party wall					32.95	5 X	0	=	0		20	659	(3:
** 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) =  (28)(30) + (32) + (32a)(32e) =  (34) ÷ (4) =  (34) ÷ (4) =  (35) **  ** include the areas on both sides of internal walls and partitions  ** include the areas on both sides of internal walls and partitions  (26)(30) + (32) =  (32) **  (32) **  (32) **  (33) + (36) =  (34) ÷ (4) =  (35) **  (36) **  (37) **  (38) **  (38) + (36) =  (38	Party floor					86.56	3					40	3462.	4 (32
The remainder of the areas on both sides of internal walls and partitions abric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  ((26)(30) + (32) = 50.1  ((28)(30) + (32) + (32a)(32e) = 6980.62  The rmal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K  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.  The rmal bridges: S (L x Y) calculated using Appendix K  If details of the rmal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	nternal wall **	:				163.2	2				Ī	9	1468.	8 (3:
Heat capacity Cm = S(A x k) $((28)(30) + (32) + (32a)(32e) = 6980.62$ Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K $= (34) \div (4) = 80.64$ 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 x (31)  Total fabric heat loss $(33) + (36) = 62.47$							ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	1 3.2	
Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 80.64  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 x (31)  Total fabric heat loss (33) + (36) = 62.47	abric heat los	ss, W/K =	= S (A x	U)				(26)(30)	) + (32) =				50.1	(3:
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  I details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	6980.62	(34
Thermal bridges: S (L x Y) calculated using Appendix K  I details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			80.64	(3
f details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) = 62.47	J				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Fotal fabric heat loss $(33) + (36) = 62.47$	_	,	•		• .	•	<						12.37	(3
<u> </u>			are not kn	own (36) =	= 0.15 x (3	31)			(22) -	(26) -				
continuon near 1055 Calculated monthly (30/III = 0.33 x (25/III x (5)			aloulotos	1 manthl	.,						25\m v (F)	\ \	62.47	(3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		r 1		· ·		lı	li d	۸	· · ·	<u> </u>	<del></del>	_	]	

(38)m= 18.03	17.82	17.6	16.5	16.29	15.19	15.19	14.98	15.63	16.29	16.72	17.16		(38)
Heat transfer of			10.5	10.29	15.19	13.19	14.90		= (37) + (37)	<u> </u>	17.10		(00)
(39)m= 80.51	80.29	80.07	78.98	78.76	77.67	77.67	77.45	78.11	78.76	79.2	79.64		
Heat loss para	meter (l	-II D) \\\/	m2K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	78.92	(39)
(40)m= 0.93	0.93	0.93	0.91	0.91	0.9	0.9	0.89	0.9	0.91	0.91	0.92		
( )								,	Average =	Sum(40) <sub>1</sub>		0.91	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/atau   a a a											1-10/1- /		
4. Water heat	ing ene	rgy requ	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.58		(42)
if TFA £ 13.9 Annual average	,	ater usad	ne in litre	es ner da	ıv Vd av	erane –	(25 x N)	+ 36		05	5.37		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	welling is	designed t			se target o		0.37		(40)
not more that 125		· ·	, ,			<u> </u>	1			1			
Jan Hot water usage ii	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 1c v	Aug	Sep	Oct	Nov	Dec		
	101.09	97.28	93.46	89.65	85.83	85.83	89.65	93.46	97.28	101.09	104.91		
(44)m= 104.91	101.09	97.20	93.46	69.00	00.00	65.63	69.00	l		m(44) <sub>112</sub> =	<del></del>	1144.46	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		
(45)m= 155.58	136.07	140.41	122.41	117.46	101.36	93.92	107.78	109.06	127.1	138.74	150.67		
If instantaneous w	ator hoati	na at noint	of use (no	n hot water	· storage)	enter∩in	hoves (46		Γotal = Su	m(45) <sub>112</sub> =	=	1500.57	(45)
(46)m= 23.34	20.41	21.06	18.36	17.62	15.2	14.09	16.17	16.36	19.07	20.81	22.6		(46)
Water storage	_	21.00	10.30	17.02	13.2	14.09	10.17	10.30	19.07	20.01	22.0		(40)
Storage volum	e (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			, ,			`			
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								00		(51)
If community h	_			IC Z (KVV	ii/iiti <del>c</del> /ua	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	. , .	•	or oach	manth			//EG\~~ /	EE) (44):	~	1.	.03		(55)
Water storage					20.00		((56)m = (			20.00	20.04		(EC)
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 om Appendix	кH	(56)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	•	(57)
(57)m= 32.01	20.92	JZ.U1	30.96	32.01	30.96	32.01	32.01	30.96	32.01	30.96	32.01		(37)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 210.85 186 195.69 175.91 172.74 154.85 149.2 163.05 162.56 182.38	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	and to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	1
(64)m= 210.85 186 195.69 175.91 172.74 154.85 149.2 163.05 162.56 182.38	192.24 205.94
Output from water heat	<del></del>
· · · · · · · · · · · · · · · · · · ·	
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>
(65)m= 95.95 85.18 90.91 83.5 83.28 76.5 75.45 80.06 79.06 86.48	88.93 94.32 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78	128.78 128.78 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 20.74 18.42 14.98 11.34 8.48 7.16 7.73 10.05 13.49 17.13	19.99 21.31 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 232.6 235.02 228.94 215.99 199.64 184.28 174.02 171.6 177.68 190.63	206.98 222.34 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<del></del>
(69)m= 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88	35.88 35.88 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -103.03	3 -103.03 -103.03 (71)
	100.00
Water heating gains (Table 5)	123.51 126.77 (72)
(72)m= 128.97   126.76   122.19   115.97   111.93   106.24   101.41   107.6   109.8   116.24	
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (68)m$	
(73)m= 443.94 441.83 427.74 404.93 381.68 359.32 344.8 350.89 362.61 385.64	412.12 432.06 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux flux flux flux flux flux flux flux	
Orientation: Access Factor Area Flux g_ Table 6d m <sup>2</sup> Table 6a Table 6b	FF Gains Table 6c (W)
North 0.9x 0.77 × 8.35 × 10.63 × 0.558 ×	0.7 = 24.03 (74)
North 0.9x 0.77 x 8.35 x 20.32 x 0.558 x	0.7 = 45.93 (74)

North 0.9x 0.77		_									-			_					_
North	North	0.9x	0.77			8.35		X	3	34.53	X		0.558	X	0.7		=	78.05	(74)
North	North	0.9x	0.77	)		8.35		X	5	5.46	X		0.558	X	0.7		=	125.36	(74)
North	North	0.9x	0.77	)		8.35		X	7	4.72	X		0.558	X	0.7		=	168.87	(74)
North	North	0.9x	0.77	)		8.35		X	7	9.99	X		0.558	X	0.7		=	180.79	(74)
North	North	0.9x	0.77	)		8.35		X	7	4.68	X		0.558	X	0.7		=	168.79	(74)
North	North	0.9x	0.77	)		8.35		X	5	9.25	X		0.558	X	0.7		=	133.91	(74)
North	North	0.9x	0.77	)		8.35		X	4	1.52	X		0.558	X	0.7		=	93.84	(74)
North	North	0.9x	0.77	)		8.35		X	2	4.19	x		0.558	x	0.7		=	54.67	(74)
Solid	North	0.9x	0.77	)		8.35		X	1	3.12	X		0.558	x	0.7		=	29.65	(74)
East	North	0.9x	0.77	)		8.35		X		3.86	x		0.558	×	0.7		=	20.04	(74)
East	East	0.9x	1	)		15.22		X	1	9.64	X		0.56	x	0.7		=	80.91	(76)
East	East	0.9x	1	)	(	15.22		X	3	8.42	X		0.56	x	0.7		=	158.29	(76)
East	East	0.9x	1	)		15.22		x	6	3.27	x		0.56	×	0.7		=	260.68	(76)
East	East	0.9x	1	)		15.22		x	9	2.28	x		0.56	×	0.7		=	380.18	(76)
East	East	0.9x	1	,		15.22		x	1	13.09	x		0.56	×	0.7		=	465.92	(76)
East	East	0.9x	1	<u> </u>		15.22		X	1	15.77	x		0.56	×	0.7		=	476.96	(76)
East 0.9x 1 x 15.22 x 73.59 x 0.56 x 0.7 = 303.18 (76)  East 0.9x 1 x 15.22 x 45.59 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 66.54 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(62)m  (83)m= 104.95 204.22 338.72 505.54 634.8 657.74 622.87 523.96 397.01 242.49 130.54 86.58 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	East	0.9x	1	,		15.22		X	1	10.22	x		0.56	×	0.7		=	454.08	(76)
East 0.9x 1 x 15.22 x 45.59 x 0.56 x 0.7 = 187.82 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 66.54 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m= 104.95 204.22 338.72 505.54 634.8 657.74 622.87 523.96 397.01 242.49 130.54 86.58 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	East	0.9x	1	,		15.22		X	9	4.68	x		0.56	×	0.7		=	390.05	(76)
East	East	0.9x	1	)		15.22		X	7	3.59	x		0.56	×	0.7		=	303.18	(76)
East	East	0.9x	1	)		15.22		X	4	5.59	х		0.56	×	0.7		=	187.82	(76)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 104.95   204.22   338.72   505.54   634.8   657.74   622.87   523.96   397.01   242.49   130.54   86.58    Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 548.89   646.05   766.46   910.47   1016.48   1017.06   967.66   874.85   759.63   628.13   542.66   518.64    7. Mean internal temperature (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 = 0.94   0.91   0.85   0.74   0.6   0.45   0.34   0.38   0.59   0.81   0.91   0.95   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.88   19.2   19.7   20.28   20.88   20.89   20.96   20.95   20.77   20.21   19.44   18.83   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.14   20.14   20.15   20.16   20.16   20.17   20.17   20.17   20.17   20.16   20.15   20.15   (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.93   0.9   0.84   0.72   0.56   0.4   0.28   0.32   0.54   0.79   0.9   0.94   (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 17.29   17.74   18.45   19.26   19.8   20.07   20.14   20.13   19.93   19.18   18.11   17.21   (90)	East	0.9x	1	)		15.22		X	2	4.49	x		0.56	×	0.7		=	100.89	(76)
(83)m=	East	0.9x	1	)		15.22		X	1	6.15	х		0.56	×	0.7		=	66.54	(76)
(83)m=		_												_					_
Total gains — internal and solar (84)m = (73)m + (83)m , watts  (84)m = 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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 = 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.88 19.2 19.7 20.28 20.88 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Solar g	ains in	watts, ca	alculate	d for e	ach m	onth	1			(83)m	n = Si	um(74)m .	(82)m					
(84)m=       548.89       646.05       766.46       910.47       1016.48       1017.06       967.66       874.85       759.63       628.13       542.66       518.64       (84)         7. Mean internal temperature (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=         0.94       0.91       0.85       0.74       0.6       0.45       0.34       0.38       0.59       0.81       0.91       0.95       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       18.88       19.2       19.7       20.28       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.17       20.17       20.17	` '										523	.96	397.01	242.4	9 130.54	. 86	.58		(83)
7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Total g	ains – ii	nternal a	nd sola	ır (84)	m = (7	'3)m	+ (	83)m	, watts								•	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	(84)m=	548.89	646.05	766.46	910	47 10	16.48	10	17.06	967.66	874	.85	759.63	628.1	3 542.66	518	3.64		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	7. Me	an inter	nal temp	erature	(hea	ing se	asor	n)											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Temp	erature	during h	eating	period	s in th	e livi	ing	area	from Tal	ole 9	, Th	1 (°C)					21	(85)
(86)m=       0.94       0.91       0.85       0.74       0.6       0.45       0.34       0.38       0.59       0.81       0.91       0.95         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=         18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.17       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	Utilisa	ition fac	tor for g	ains for	living	area,	h1,n	า (ร	ee Ta	ble 9a)									_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)		Jan	Feb	Mar	A	or I	May		Jun	Jul	А	ug	Sep	Oc	t Nov		Эес		
(87)m=       18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.16       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	(86)m=	0.94	0.91	0.85	0.7	4 (	0.6		0.45	0.34	0.3	38	0.59	0.81	0.91	0.	95		(86)
(87)m=       18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.16       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	Mean	interna	l temper	ature in	living	area -	T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	e 9c)						
(88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	(87)m=	18.88	19.2	19.7	20.	.8 20	0.68	2	20.89	20.96	20.	95	20.77	20.2	19.44	18	.83		(87)
(88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Temp	erature	durina h	eating	nerio	s in re	est of	. dw	ellina	from Ta	able 9	——. 9 Th	n2 (°C)		•	- <b>!</b>			
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	· .							_		i	1		<u> </u>	20.10	6 20.15	20	.15		(88)
(89)m=     0.93     0.9     0.84     0.72     0.56     0.4     0.28     0.32     0.54     0.79     0.9     0.94       Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)m=     17.29     17.74     18.45     19.26     19.8     20.07     20.14     20.13     19.93     19.18     18.11     17.21     (90)			tor for a	oina far	root	f dural	lina	<u>ь</u>	m (00	L Toblo	0e/	!			<b>!</b>	_!			
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	1		Ť	1	1			1	•	i	T	32	0.54	0.79	1 0 9	1 0	94		(89)
(90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)					<u> </u>					<u> </u>					1 0.5		J-i		(==)
	I				1			Ť			·		i		1 40.44	1 4-	. 04	1	(00)
$ILA = Living area \div (4) = 0.28 \tag{91}$	(90) <b>m</b> =	17.29	17.74	18.45	19.	.ο   1	9.8	<u> </u>	20.07	∠0.14	20.	13					.∠1	0.00	_
													'	_/ \ — LI	ing ar <del>c</del> a ∓	(¬) -		0.28	(al)

Mean	internal temp	erature (fo	or the wh	ole dwe	llina) = f	LA × T1	+ (1 – fl	A) × T2					
(92)m=	17.73 18.14	<del></del>	19.55	20.04	20.3	20.37	20.36	20.17	19.47	18.48	17.66		(92)
Apply	adjustment to	the mea	n interna	l temper	ature fro	m Table	4e, whe	ere appr	opriate			l	
(93)m=	17.73 18.14	18.8	19.55	20.04	20.3	20.37	20.36	20.17	19.47	18.48	17.66		(93)
8. Spa	ace heating re	quiremen	t										
	to the mean ilisation factor		•		ed at st	ep 11 of	Table 9	b, so tha	nt Ti,m=(	76)m an	d re-calc	ulate	
tile ut	Jan Fel	<del></del>	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion factor for						19						
(94)m=	0.91 0.87	0.81	0.7	0.56	0.41	0.29	0.34	0.54	0.76	0.88	0.92		(94)
Usefu	l gains, hmGr		4)m x (8	4)m	1		•	,	,	•			
(95)m=	498.31 563.3		633.32	564.9	414	284.33	294.23	411.81	479.05	475.16	475.68		(95)
I	nly average ex	1	<del>i                                     </del>	T T	r		l			<del></del>			(00)
(96)m=	4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	oss rate for m	1	840.83	657.14	442.6	292.9	306.62	473.72	698.45	901.19	1071.87		(97)
` '	e heating requ		Į		l	l	l	l	l	l	107 1.07		(-1)
(98)m=	433.69 336.0	1	149.41	68.63	0	0	0	0	163.24	306.74	443.57		
•	Į.		1		I.		Tota	l per year	(kWh/yea	r) = Sum(9	98) <sub>15,912</sub> =	2173.98	(98)
Space	e heating requ	irement ir	n kWh/m²	²/year								25.12	(99)
9b. En	ergy requirem	ents – Co	mmunity	heating	scheme	)							
	art is used for									unity sch	heme.		_
Fractio	n of space he	at from se	econdary	/supplen	nentary	heating	(Table 1	1) '0' if n	one			0	(301)
Fractio	n of space he	at from co	mmunity	/ system	1 – (30	1) =						1	(302)
	munity scheme r	-							up to four	other heat	sources; ti	he latter	
	boilers, heat pun n of heat from	-		asie neai i	rom powe	i Stations.	See Appe	ridix C.				0.6	(303a)
Fractio	n of communi	ty heat fro	m heat s	source 2								0.4	(303b)
Fractio	n of total spac	e heat fro	m Comr	nunity C	HP				(3	602) x (303	8a) =	0.6	(304a)
Fractio	n of total space	e heat fro	m comm	nunity he	at sourc	e 2			(3	602) x (303	8b) =	0.4	(304b)
Factor	for control an	d charging	g method	l (Table	4c(3)) fo	or commi	unity hea	ating sys	tem			1	(305)
Distribu	ution loss fact	or (Table	12c) for (	commun	ity heati	ng syste	m					1.05	(306)
	heating	`	,		•	0 ,						kWh/yea	 r
•	space heatin	g requirer	nent									2173.98	
Space	heat from Co	nmunity (	CHP					(98) x (3	04a) x (30	5) x (306)	=	1369.61	(307a)
Space	heat from hea	it source 2	2					(98) x (3	04b) x (30	5) x (306)	=	913.07	(307b)
Efficier	ncy of second	ary/supple	ementary	heating	system	in % (fro	om Table	e 4a or A	ppendix	ΞE)		0	(308)
Space	heating requi	ement fro	m secon	idary/su	oplemen	itary sys	tem	(98) x (3	01) x 100 ·	÷ (308) =		0	(309)
·					-								
	<b>heating</b> water heating	g requiren	nent									2151.41	
	from commu	•								_,	· ·		<b>_</b> <b>_</b>
Water	heat from Cor	nmunity C	HP					(64) x (3	u3a) x (30	5) x (306)	=	1355.39	(310a)

	r		7
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	903.59	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	45.42	(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	167.91	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	167.91	(331)
Energy for lighting (calculated in Appendix L)		366.22	(332)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit	[	29.73	(361)
Heat efficiency of CHP unit	[	45.95	(362)
	Energy Emission factor I kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2980.64 × 0.22	643.82	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	886.15 × 0.52	-459.91	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2949.7 × 0.22	637.13	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	876.95 × 0.52	-455.13	(366)
Efficiency of heat source 2 (%)	ng two fuels repeat (363) to (366) for the second fuel	91	(367b)
CO2 associated with heat source 2 [(307b)-	+(310b)] x 100 ÷ (367b) x 0.22 =	431.21	(368)
Electrical energy for heat distribution	[(313) x 0.52 =	23.57	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372) =	820.69	(373)
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantan	eous heater (312) x 0.22 =	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =	820.69	(376)
CO2 associated with electricity for pumps and fans within dwell	ling (331)) x 0.52 =	87.14	(378)
CO2 associated with electricity for lighting	(332))) x 0.52 =	190.07	(379)
Total CO2, kg/year sum of (376)(382) =		1097.9	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	Ī	12.68	(384)
El rating (section 14)	]	88.82	(385)

			User	Details:						
Assessor Name:	Matthew St	tainrad	OSCI I	Strom	o Nives	hor:		STD (	0023501	
Software Name:	Stroma FS			Softwa					on: 1.0.4.16	
Software Name:	Stroma FS	AP 2012	Duonout				ГО	versio	)II. 1.0. <del>4</del> .10	
Address .	4E 0 Portro	m Street, Lo	Property	Address	: 06-18-0	09419 4	F-9			
Address: 1. Overall dwelling dime		m Street, Loi	laon							
1. Overall dwelling diffie	ensions.		۸۳۵	o(m²)		۸۷ ۵۰	iaht/m\		Volume(m <sup>3</sup>	31
Ground floor				ea(m²) 86.56	(1a) x		eight(m) 2.4	(2a) =	207.74	) (3a)
	a) . (4b) . (4a) . (	4 -1) . (4 -) .					2.4	(24) =	207.74	(34)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1u)+(1e)+	.(111)	86.56	(4)			<i>i</i>		_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	207.74	(5)
2. Ventilation rate:										
	main heating	secon heatir		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	=	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0		0	X	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vents	<b>S</b>				F	0	X	10 =	0	(7b)
Number of flueless gas fi					Ļ		<u> </u>	40 =		= ' '
Trumber of flueless gas in	li es				L	0	^		0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a)+(6b	))+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	•				continue fr		(16)	÷ (5) =	U	(6)
Number of storeys in t			( ),			(-)	( -/		0	(9)
Additional infiltration	<b>.</b> .	,					[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame	or 0.35 fc	r mason	ry consti	ruction			0	(11)
if both types of wall are p			ng to the grea	ter wall are	a (after					_
deducting areas of openial If suspended wooden to	• / .		ır N 1 (spal	ad) alsa	enter ()					7(12)
If no draught lobby, en		•	11 U. 1 (Seal	eu), eise	CITICI U				0	(12)
Percentage of window	•		d						0	= ' '
Window infiltration	s and doors die	augiit strippe	u	0.25 - [0.2	) x (14) ÷ 1	1001 =			0	(14)
Infiltration rate				(8) + (10)	` '	_	+ (15) =		0	(16)
Air permeability value,	a50 expresse	d in cubic me	etres ner h					e area	3	(17)
If based on air permeabil			-		•	0110 01 0	on voiop	o aroa	0.15	(18)
Air permeability value applie	,					is being u	ısed		0.15	(10)
Number of sides sheltere						•			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified f	for monthly win	d speed							_	
Jan Feb	Mar Apr	May Ju	ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
		•							-	
Wind Factor $(22a)m = (2$	2)m ÷ 4							_	-	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate (allow	ing for she	elter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16 0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effec	_	rate for th	e applic	cable ca	se	!	!	!	!	1	J	_
If mechanica		andiv N. (22)	h) - (22a	) v Emy (c	aguation (I	VEVV otho	muioo (22h	v) = (33a)			0.5	(23a)
	at pump using App							)) = (23a)			0.5	(23b)
	heat recovery: effi	-	_					Ol- \ /	005) [	4 (00-)	79.9	(23c)
· -	d mechanical v 0.26 0.26		0.24	0.22	0.22	HR) (248	a)m = (2) 0.23	2b)m + ( 0.24	23b) × [ 0.24	1 – (23c) 0.25	i ÷ 100] I	(24a)
(24a)m= 0.26		0.24					<u> </u>	ļ		0.25		(24a)
(24b)m= 0	d mechanical v	entilation v	o I	neat rec		0 (240 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	26)m + (. T 0	230)	0	1	(24b)
( ',	ouse extract ve	<u> </u>										(210)
,	$< 0.5 \times (23b)$ ,		•	•				.5 × (23h	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural v	entilation or wl	hole house	positiv	e input	ventilati	on from	loft	<u> </u>		Į	ı	
,	= 1, then (24d		•	•				0.5]			_	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change rate - e	nter (24a)	or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.26	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losses	and heat loss	parameter	r:									
ELEMENT	Gross area (m²)	Opening m <sup>2</sup>	S	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		X k /K
Doors	( )			2.1	x	1.4		2.94				(26)
Windows Type	1			15.22		/[1/( 1.4 )+	- 0.04] =	20.18	Ħ			(27)
Windows Type	2			8.35		/[1/( 1.4 )+	- 0.04] =	11.07	=			(27)
Walls Type1	51.14	25.67	$\neg$	25.47	7 X	0.15	=	3.82		14	356.58	(29)
Walls Type2	8.21	0	=	8.21	x	0.14	=	1.16	Ħ i	14	114.94	(29)
Walls Type3	9.98	0		9.98	x	0.13	<del>-</del>	1.32		14	139.72	(29)
Roof	86.56	0		86.56	3 x	0.11	=	9.52	i i	9	779.04	(30)
Total area of el	ements, m <sup>2</sup>			155.8	9							(31)
Party wall				32.95	5 X	0	=	0		20	659	(32)
Party floor				86.56	5					40	3462.4	(32a)
Internal wall **				163.2	2					9	1468.8	(32c)
* for windows and i					lated using	g formula 1	1/[(1/U-valu	ue)+0.04] á	as given in	paragraph	1 3.2	_
Fabric heat loss	s, W/K = S (A >	(U)				(26)(30	) + (32) =				50.01	(33)
Heat capacity C	Cm = S(A x k)						((28).	(30) + (32	2) + (32a)	(32e) =	6980.48	(34)
Thermal mass	naramatar /TM	D 0	TEA) in	l 1/m2l/			- (34)	) ÷ (4) =			80.64	(35)
man mass	parameter (Tivi	$P = Cm \div$	11 7) 111	i KJ/III~K			- (34)	( -)			00.04	(/
For design assessi	ments where the d	etails of the c	,			recisely the	` '		TMP in T	able 1f	00.04	(==)
For design assessi	ments where the d ad of a detailed cal	etails of the c	constructi	ion are no	t known pi	recisely the	` '		TMP in T	able 1f	12.37	(36)
For design assessi can be used instea	ments where the dand of a detailed calcons: S:S(LxY) callo bridging are not k	etails of the c culation. Ilculated us	constructi	on are not	t known pi	recisely the	` '		TMP in T	able 1f		

Ventila	tion hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.03	17.82	17.6	16.5	16.29	15.19	15.19	14.98	15.63	16.29	16.72	17.16		(38)
Heat tr	ansfer c	oefficier	nt, W/K	•	•	•	•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	80.41	80.19	79.97	78.88	78.66	77.57	77.57	77.35	78.01	78.66	79.1	79.54		
Heat Ic	ss para	meter (H	HLP), W	m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> · (4)	12 /12=	78.83	(39)
(40)m=	0.93	0.93	0.92	0.91	0.91	0.9	0.9	0.89	0.9	0.91	0.91	0.92		
Numbe	er of day	s in moi	nth (Tab	le 1a)		•	•	•	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.91	(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	iter heat	ing enei	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	pancy, l	N								2	.58		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.				` '
								(25 x N)				5.37		(43)
		-	not water person pei	• .		-	-	to achieve	a water us	se target o	Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	Oct	INOV	Dec		
(44)m=	104.91	101.09	97.28	93.46	89.65	85.83	85.83	89.65	93.46	97.28	101.09	104.91		
( - 1,111									<u> </u>		m(44) <sub>112</sub> =	l	1144.46	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	155.58	136.07	140.41	122.41	117.46	101.36	93.92	107.78	109.06	127.1	138.74	150.67		
lf instant	taneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1500.57	(45)
1			· ·	·				· · ·	. , ,	40.07	00.04	00.0		(46)
(46)m= Water	23.34 storage	20.41 loss:	21.06	18.36	17.62	15.2	14.09	16.17	16.36	19.07	20.81	22.6		(46)
	_		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)					l	
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage			(		- (1.14/1	. / .1 \						l	
•			eclared I		or is kno	wn (kvvr	n/day):					0		(48)
			m Table					(10)				0		(49)
			storage eclared o			or is not		(48) x (49)	) =		1	10		(50)
			factor fr								0.	.02		(51)
			ee secti											
	e factor										1.	.03		(52)
			m Table									.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
	(50) or (	, ,	•					(/EC) :	==\		1.	.03		(55)
vvater:			culated 1					((56)m = (	55) × (41)ı	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)

•	ains 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= 32.0	1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	uit loss (ar	nnual) fro	m Table	 e 3						!	0		(58)
Primary circ	•	,			59)m = (	(58) ÷ 36	65 × (41)	m				'	
(modified	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= 23.2	6 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss	calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water he	eating ca	alculated	I for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 210.	85 186	195.69	175.91	172.74	154.85	149.2	163.05	162.56	182.38	192.24	205.94		(62)
Solar DHW inp	ut calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 210.	85 186	195.69	175.91	172.74	154.85	149.2	163.05	162.56	182.38	192.24	205.94		
	•						Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2151.41	(64)
Heat gains	from 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= 95.9	5 85.18	90.91	83.5	83.28	76.5	75.45	80.06	79.06	86.48	88.93	94.32		(65)
include (5	57)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic g				,									
Ja		1											
	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 128.		Mar 128.78	Apr 128.78	May 128.78	Jun 128.78	Jul 128.78	Aug 128.78	Sep 128.78	Oct 128.78	Nov 128.78	Dec 128.78		(66)
<u> </u>	78 128.78	128.78	128.78	128.78	128.78	128.78	128.78	128.78	<b>-</b>	-			(66)
(66)m= 128.	78 128.78 ns (calcula	128.78	128.78	128.78	128.78	128.78	128.78	128.78	<b>-</b>	-			(66) (67)
(66)m= 128. Lighting gai	78 128.78 ns (calcula 74 18.42	128.78 ted in Ap 14.98	128.78 opendix 11.34	128.78 L, equat 8.48	128.78 ion L9 oi 7.16	128.78 r L9a), a 7.73	128.78 Iso see	128.78 Table 5	128.78	128.78	128.78		
(66)m= 128. Lighting gai (67)m= 20.7	78 128.78 ns (calcula 4 18.42 gains (calc	128.78 ted in Ap 14.98	128.78 opendix 11.34	128.78 L, equat 8.48	128.78 ion L9 oi 7.16	128.78 r L9a), a 7.73	128.78 Iso see	128.78 Table 5	128.78	128.78	128.78		
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232	ns (calcula 4 18.42 gains (calc 6 235.02	128.78 ted in Ap 14.98 culated in 228.94	128.78 opendix 11.34 n Append 215.99	128.78 L, equat 8.48 dix L, eq 199.64	128.78 ion L9 or 7.16 uation L	128.78 r L9a), a 7.73 13 or L1 174.02	128.78 Iso see 10.05 3a), also	128.78 Table 5 13.49 see Tal 177.68	128.78 17.13 ble 5 190.63	128.78	128.78 21.31		(67)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances	ns (calcula 4 18.42 gains (calc 6 235.02 ins (calcula	128.78 ted in Ap 14.98 culated in 228.94	128.78 opendix 11.34 n Append 215.99	128.78 L, equat 8.48 dix L, eq 199.64	128.78 ion L9 or 7.16 uation L	128.78 r L9a), a 7.73 13 or L1 174.02	128.78 Iso see 10.05 3a), also	128.78 Table 5 13.49 see Tal 177.68	128.78 17.13 ble 5 190.63	128.78	128.78 21.31		(67)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8	128.78 ns (calcula 14 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88	128.78  tted in Ap 14.98 culated in 228.94 ated in Ap 35.88	128.78  ppendix  11.34  Append  215.99  ppendix  35.88	128.78 L, equat 8.48 dix L, eq 199.64 L, equat	128.78 ion L9 or 7.16 uation L 184.28 ion L15	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a)	128.78 Iso see 10.05 3a), also 171.6	128.78 Table 5 13.49 see Tal 177.68 ee Table	128.78 17.13 ble 5 190.63 5	128.78 19.99 206.98	128.78 21.31 222.34		(67) (68)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and	128.78 ns (calcula 14 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88	128.78  tted in Ap 14.98 culated in 228.94 ated in Ap 35.88	128.78  ppendix  11.34  Append  215.99  ppendix  35.88	128.78 L, equat 8.48 dix L, eq 199.64 L, equat	128.78 ion L9 or 7.16 uation L 184.28 ion L15	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a)	128.78 Iso see 10.05 3a), also 171.6	128.78 Table 5 13.49 see Tal 177.68 ee Table	128.78 17.13 ble 5 190.63 5	128.78 19.99 206.98	128.78 21.31 222.34		(67) (68)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0	ns (calcula 4 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88 fans gains	128.78  ted in Ap 14.98 culated in 228.94 ated in Ap 35.88 c (Table 5	128.78  ppendix 11.34  Append 215.99  ppendix 35.88  5a)  0	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78  17.13 ble 5  190.63  5  35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatio	ted in Ap 14.98 culated in 228.94 ated in Ap 35.88 c (Table 5	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5)	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78  17.13 ble 5  190.63  5  35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103.	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatic 03 -103.03	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  c (Table 5 0  on (negation)	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78  17.13 ble 5  190.63  5  35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69) (70)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and (70)m= 0  Losses e.g. (71)m= -103.  Water heati	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatio 03 -103.03 ng gains (7	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  c (Table 5 0  on (negation)	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tall 177.68 ee Table 35.88 0	128.78  17.13 ble 5  190.63 5  35.88  0	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128.	78   128.78   128.78   128.78   18.42	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G (Table 5 0  on (negation of the content of the	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88 0 -103.03	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88 0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03	128.78 19.99 206.98 35.88 0 -103.03	128.78 21.31 222.34 35.88 0 -103.03		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr	128.78  ns (calcular 18.42  gains (calcular 235.02  ns (calcular 8 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7 126.76  nal gains =	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  (Table 5 0 on (negation of the column	128.78 ppendix 11.34 Appendix 215.99 ppendix 35.88 5a) 0 tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 le 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0  -103.03  101.41 m + (67)m	128.78 lso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88  0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72)	128.78  21.31  222.34  35.88  0  -103.03		(67) (68) (69) (70) (71) (72)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr (73)m= 443.	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7  126.76  nal gains =	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G (Table 5 0  on (negation of the content of the	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88 0 -103.03	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88 0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03	128.78 19.99 206.98 35.88 0 -103.03	128.78 21.31 222.34 35.88 0 -103.03		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 8 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7  126.76  nal gains = 94 441.83  iins:	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  (Table 5 0 on (negated in 103.03)  Table 5) 122.19	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03  115.97	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03  111.93	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03  106.24 (66) 359.32	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0  -103.03  101.41 m + (67)m 344.8	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03  107.6 1+(68)m+ 350.89	128.78 Table 5 13.49 See Tal 177.68 See Table 35.88  0 -103.03  109.8 + (69)m	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7  385.64	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72) 412.12	128.78  21.31  222.34  35.88  0  -103.03  126.77		(67) (68) (69) (70) (71) (72)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr (73)m= 443. 6. Solar ga	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporatio 3 -103.03  ng gains (7  97   126.76  nal gains = 94   441.83  ins: re calculated	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  In (negation of the context) 122.19  427.74  Using sola	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03  115.97	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03  111.93	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03  106.24 (66) 359.32	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0 -103.03  101.41 m + (67)m 344.8	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03  107.6 1+(68)m+ 350.89	128.78 Table 5 13.49 See Tal 177.68 See Table 35.88  0 -103.03  109.8 + (69)m	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7  385.64	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72) 412.12	128.78  21.31  222.34  35.88  0  -103.03  126.77	Gains	(67) (68) (69) (70) (71) (72)

North	0.9x	0.77		x	8.3	5	x	1	0.63	1 x		0.558	7 x	0.7			24.03	(74)
North	0.9x	0.77		x	8.3		X	$\vdash$	0.32	] x		0.558	X	0.7	= =		45.93	(74)
North	0.9x	0.77		x	8.3		x		4.53	] x	_	0.558	] x	0.7	= =		78.05	(74)
North	0.9x	0.77	$\equiv$	x	8.3		x		5.46	] ]	<b>—</b>	0.558	」 기 x	0.7	╡.	$\vdash$	125.36	(74)
North	0.9x	0.77		x	8.3		x	_	4.72	] ]	<b>-</b>	0.558	X	0.7	╡.		168.87	(74)
North	0.9x	0.77		x	8.3		x	<u> </u>	9.99	] ] x		0.558	X	0.7	= =		180.79	(74)
North	0.9x	0.77		x	8.3		х	_	4.68	)   x		0.558	X	0.7		. –	168.79	(74)
North	0.9x	0.77		x	8.3	5	х	5	9.25	X		0.558	X	0.7			133.91	(74)
North	0.9x	0.77		x	8.3	5	x	4	1.52	x		0.558	x	0.7	= =		93.84	(74)
North	0.9x	0.77		x	8.3	5	х	2	4.19	x		0.558	x	0.7			54.67	(74)
North	0.9x	0.77		x	8.3	5	x	1	3.12	x		0.558	x	0.7	_ =		29.65	(74)
North	0.9x	0.77		x	8.3	5	x	8	3.86	x		0.558	x	0.7			20.04	(74)
West	0.9x	0.77		x	15.2	22	x	1	9.64	x		0.56	x	0.7			80.91	(80)
West	0.9x	0.77		x	15.2	22	x	3	8.42	x		0.56	x	0.7			158.29	(80)
West	0.9x	0.77		x	15.2	22	x	6	3.27	X		0.56	х	0.7	=		260.68	(80)
West	0.9x	0.77		x	15.2	22	x	9	2.28	x		0.56	x	0.7			380.18	(80)
West	0.9x	0.77		x	15.2	22	x	1	13.09	x		0.56	x	0.7	-		465.92	(80)
West	0.9x	0.77		x	15.2	22	x	1	15.77	X		0.56	X	0.7	=		476.96	(80)
West	0.9x	0.77		x	15.2	22	x	1	10.22	X		0.56	X	0.7	-		454.08	(80)
West	0.9x	0.77		x	15.2	22	x	9	4.68	X		0.56	X	0.7	=		390.05	(80)
West	0.9x	0.77		x	15.2	22	x	7	3.59	X		0.56	X	0.7	=		303.18	(80)
West	0.9x	0.77		x	15.2	22	x	4	5.59	X		0.56	X	0.7	=		187.82	(80)
West	0.9x	0.77		x	15.2	22	x	2	4.49	X		0.56	X	0.7	=		100.89	(80)
West	0.9x	0.77		x	15.2	22	X	1	6.15	X	(	0.56	X	0.7	=		66.54	(80)
Ť		watts, ca					1	F7 74		r	-	n(74)m		2 1 400 54	00.50	7		(02)
(83)m=   Total o		1 204.22 nternal a	338.		505.54 (84)m =	634.8 (73)m		57.74 83\m	622.87	523	.96	397.01	242.4	9 130.54	86.58			(83)
(84)m=	548.89	646.05	766.		910.47	, ,	<u> </u>	03)111	967.66	874	. 85	759.63	628.1	3 542.66	518.64	П		(84)
` ′ [								711100	007.00	<u> </u>	.00		020	7 0 .2.00	0.0.0			
		nal temp during h			Ĭ			oroo f	rom Tok	olo O	Th1	(°C)						7(05)
•		ctor for ga		٠.			·			JIE 9	, 1111	( C)					21	(85)
	Jan	Feb	M	-	Apr	May	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec			
(86)m=	0.94	0.91	0.8	$\rightarrow$	0.74	0.6	_	0.45	0.34	0.3	<del>-</del> -	0.59	0.81	0.91	0.95			(86)
L	intorno	ıl tempera	aturo	Lin li	vina ora	22 T1 /	(follo	w cto	nc 3 to 7	I 7 in T		00)						
(87)m=	18.89	19.2	19.	$\overline{}$	20.28	20.68	<del>`</del>	20.9	20.96	20.		20.77	20.21	19.45	18.83			(87)
				!								<u> </u>			10100			, ,
(88)m=	20.14	during h	20.	<del></del>	20.16	20.16	$\neg$	20.17	20.17	20.		20.17	20.16	20.16	20.15	7		(88)
							_!_				''	20.17	20.10	20.10	20.10			(55)
ı		ctor for ga		-			i, h2 T			T	, T	0.54	0.70		0.04	1		(89)
(89)m=	0.93	0.9	0.8		0.72	0.56		0.4	0.28	0.3		0.54	0.79	0.9	0.94			(03)
Mean	interna	ıl tempera	ature	in tl	he rest	of dwe	lling	T2 (fo	ollow ste	eps 3	3 to 7	in Table	9c)					

(90)m=   17.29   17.74   18.46   19.27   19.8   20.07   20.14   20.13   19.93   19.19   18.11   17.21	(90)
(90)m= 17.29 17.74 18.46 19.27 19.8 20.07 20.14 20.13 19.93 19.19 18.11 17.21 fLA = Living area ÷ (4) = 0.28	(90)
	(01)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 17.73   18.15   18.8   19.55   20.05   20.3   20.37   20.36   20.17   19.47   18.48   17.66	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(02)
(93)m= 17.73 18.15 18.8 19.55 20.05 20.3 20.37 20.36 20.17 19.47 18.48 17.66	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	
Utilisation factor for gains, hm:	
(94)m= 0.91 0.87 0.81 0.7 0.56 0.41 0.29 0.34 0.54 0.76 0.88 0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 498.3 563.28 618.28 633.13 564.59 413.68 284.08 293.98 411.58 478.95 475.13 475.67	(95)
Monthly average external temperature from Table 8	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	(96)
(97)m= $\begin{vmatrix} 1080.25 & 1062.47 & 983.92 & 840.02 & 656.47 & 442.13 & 292.59 & 306.3 & 473.24 & 697.8 & 900.37 & 1070.9 \end{vmatrix}$	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 432.98 335.46 272.03 148.97 68.36 0 0 0 162.83 306.17 442.85	
Total per year (kWh/year) = $Sum(98)_{15.912}$ = 2169.64	(98)
Space heating requirement in kWh/m²/year 25.07	(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	
Tradition of opade float from ecocinally outplotted floating (rable 11) of it florid	(301)
Fraction of space heat from community system 1 – (301) –	(301)
Fraction of space heat from community system 1 – (301) = 1	(301)
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.	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter	<b>=</b>  ` `
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.	(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 CHP  0.6	(302) (303a)
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 CHP  0.6  Fraction of community heat from heat source 2	(302) (303a) (303b)
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 CHP  0.6  Fraction of community heat from heat source 2  0.4  Fraction of total space heat from Community CHP  (302) x (303a) = 0.6	(302) (303a) (303b) (304a)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  (302) x (303a) = 0.6  Fraction of total space heat from community heat source 2  (302) x (303b) = 0.4	(302) (303a) (303b) (304a) (304b)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  (302) x (303a) = 0.6  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fractor for control and charging method (Table 4c(3)) for community heating system	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Construction of community heat from heat source 2  Fraction of total space heat from Community CHP  Construction of total space heat from community CHP  Construction of total space heat from community heat source 2  Construction of total space heat from community heat	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  kWh/yea	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fractor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Authorized Appendix C.  0.6  0.6  0.6  1.05  8	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  (98) x (304a) x (305) x (306) = 1366.88	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat from community heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fr	(302) (303a) (303b) (304a) (304b) (305) (306) (307a) (307b)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  (98) × (304a) × (305) × (306) =  1366.88  Space heat from heat source 2  (98) × (304b) × (305) × (306) =  911.25  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	(302) (303a) (303b) (304a) (304b) (305) (306)  Ir (307a) (307b) (308

If DHW from community scheme:

Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1355.39	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	903.59	](310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	45.37	(313)
Cooling System Energy Efficiency Ratio	Kee ay (ee ay (e aa)	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):	(10.7)		](0.0)
mechanical ventilation - balanced, extract or positive input from	om outside	167.91	(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) =	167.91	(331)
Energy for lighting (calculated in Appendix L)		366.22	(332)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2974.7 × 0.22	642.54	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	884.38 × 0.52	-458.99	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2949.7 × 0.22	637.13	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	876.95 × 0.52	-455.13	(366)
Efficiency of heat source 2 (%)	sing two fuels repeat (363) to (366) for the second fue	91	(367b)
CO2 associated with heat source 2 [(307	b)+(310b)] x 100 ÷ (367b) x 0.22	430.78	(368)
Electrical energy for heat distribution	[(313) x 0.52	23.55	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	819.87	(373)
CO2 associated with space heating (secondary)	(309) x	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) =	819.87	(376)
CO2 associated with electricity for pumps and fans within dw	elling (331)) x 0.52	87.14	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	190.07	(379)
Total CO2, kg/year sum of (376)(382) =		1097.08	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		12.67	(384)

		l Iser I	Details:							
Assessor Name: Software Name:	Matthew Stainrod Stroma FSAP 2012	<u> </u>	Strom Softwa					0023501 on: 1.0.4.16		
Software Name.		Property	Address			F-1	VEISIC	лі. т.ט. <del>4</del> .то		
Address :	GF-1, Bertram Street, Lond		Addiess	00 10 0	33413 C	'				
1. Overall dwelling dime	ensions:									
		Are	a(m²)		Av. He	ight(m)	-	Volume(m <sup>3</sup>	<u> </u>	
Ground floor			73.52	(1a) x		2.4	(2a) =	176.45	(3a)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	73.52	(4)						
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	176.45	(5)	
2. Ventilation rate:										
	main seconda heating heating	ry	other		total			m³ per hou	ır	
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)	
Number of open flues	0 + 0	<b>-</b> + -	0	Ī <b>-</b> [	0	x 2	20 =	0	(6b)	
Number of intermittent fa	ins				0	x '	10 =	0	(7a)	
Number of passive vents	3			F	0	x -	10 =	0	(7b)	
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)	
· ·				L					`	
							Air ch	nanges per ho	our	
	ys, flues and fans = $(6a)+(6b)+($				0		÷ (5) =	0	(8)	
	peen carried out or is intended, proceed	ed to (17),	otherwise (	continue fr	rom (9) to	(16)				
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(Q).	-1]x0.1 =	0	(9) (10)	
	.25 for steel or timber frame o	r 0.35 fo	r masoni	v constr	ruction	[(0)	1].0.1 =	0	(11)	
if both types of wall are p	resent, use the value corresponding t			•					`	
deducting areas of opening	<i>ngs); if equal user 0.35</i> floor, enter 0.2 (unsealed) or 0	1 (cool	od) olco	ontor O					<b>—</b> (40)	
If no draught lobby, en	,	. i (Seal	eu), eise	enter o				0	(12)	
•	s and doors draught stripped							0	(14)	
Window infiltration	3		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)	
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)	
Air permeability value,	q50, expressed in cubic metro	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)	
•	lity value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)	
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7(10)	
Shelter factor	<del>c</del> u		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.78	(19) (20)	
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)	
Infiltration rate modified f	for monthly wind speed									
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7			
Wind Factor (22a)m = (2	2)m <i>÷ 1</i>									
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]		
(-20)	1 0.30	1 0.00	1 3.02	<u> </u>	L	12		J		

Adjusted infiltra	ation rate	e (allowi	ng for st	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effec		_	rate for t	he appli	cable ca	se	•	•	•	•	•		
If mechanica If exhaust air he			andiv N. (S	3h) - (23	a) v Emy (	aguation (I	VE)) otho	nuico (22h	) - (232)			0.5	(23
If balanced with		0 11		, ,	,	. `	,, .	,	) = (23a)			0.5	(23
		-	-	_					Ol- \	00h) [4	(OO = )	79.9	(23
a) If balance	0.25	o.24	0.23	0.23	at recov	0.21	1R) (248 0.21	0.22	2b)m + ( 0.23	23b) × [* 0.23	0.24	÷ 100]	(24
b) If balance					L		<u> </u>	L		L	0.24		(_
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho								<u> </u>					(-
if (22b)m				•	•				.5 × (23k	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v	ـــــــــــــــــــــــــــــــــــــ	on or wh	ole hous	e positi	ve input	ventilatio	on from I	loft	!	!	!		
if (22b)m									0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)					
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(2
3. Heat losses	and he	eat loss r	paramet	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-ł		X k J/K
oors					2.1	x	1.4	=	2.94				(2
Vindows Type	1				3.8	x1	/[1/( 1.4 )+	0.04] =	5.04	=			(2
Vindows Type	2				15.96	3 x1	/[1/( 1.4 )+	0.04] =	21.16	=			(2
loor					73.52	2 X	0.11	i	8.08719	9 [	110	8087	.2 (2
Valls Type1	47.6	64	21.80	6	25.78	3 x	0.15	<b>=</b>	3.87	<b>=</b>	14	360.9	2 (2
Valls Type2	2.4	=	0		2.4	X	0.14	<b>=</b>	0.34	<b>=</b>	14	33.6	=
otal area of el					123.5	_	<u> </u>		0.0 .				\` (3
arty wall		,			37.13	=	0		0	<b>—</b> [	20	742.	`
arty ceiling					73.52	=			<u> </u>		30	2205	=
nternal wall **					110.4	_				L			=
for windows and it					alue calcui		ı formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	9 paragraph	993.	<u>o (</u> (
abric heat los				о ини раг			(26)(30)	) + (32) =				41.43	(3
eat capacity (		•	-,				•		(30) + (3	2) + (32a).	(32e) =	12423.52	(3
hermal mass	,	,	o = Cm -	- TFA) ir	n kJ/m²K				÷ (4) =	, ( - <i>f</i> -	` '	168.98	= (3
or design assessi an be used instea	ments wh	ere the de	tails of the	•			ecisely the	` '		TMP in Ta	able 1f	100.30	
hermal bridge				using Ar	pendix l	K						9.46	(3
details of thermai	l bridging	,		• •	•			(33) +	(36) =			50.89	(3
								\-~/ ·					110
entilation hea	t loss ca	alculated	l monthly	/						(25)m x (5)	) )	00.00	`

(00)	1 44 04	T 4444	40.0	40.40	40.00	40.00	T 40.44	40.00	40.40	10.47	1004		(20)
(38)m= 14.48	14.31	14.14	13.3	13.13	12.28	12.28	12.11	12.62	13.13	13.47	13.81		(38)
Heat transfer (39)m= 65.37	65.2	nt, W/K 65.03	64.19	64.02	63.17	63.17	63	(39)m 63.51	64.02	38)m 64.36	64.7		
(39)111=   03.37	03.2	03.03	04.19	04.02	03.17	03.17	03			Sum(39) <sub>1</sub>	<del>                                     </del>	64.15	(39)
Heat loss par	ameter (I	HLP), W	/m²K			_	_		= (39)m ÷		127	00	<b></b> ` ′
(40)m= 0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.88	0.88		_
Number of da	ıvs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.87	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ	unanev	N											(42)
if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.33		(42)
if TFA £ 13 Annual avera	•	ater usac	no in litro	se nar da	v Vd av	orano –	(25 v NI)	<b>+</b> 36		0/	2.5		(42)
Reduce the annu	ial average	hot water	usage by	5% if the a	welling is	designed t			se target o		9.5		(43)
not more that 12:	5 litres per	person pei	r day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	<del>,</del>		ı			1	· <i>'</i>				T 1		
(44)m= 98.45	94.87	91.29	87.71	84.13	80.55	80.55	84.13	87.71	91.29	94.87	98.45	4074.04	7(44)
Energy content of	of hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1074.01	(44)
(45)m= 146	127.69	131.77	114.88	110.23	95.12	88.14	101.14	102.35	119.28	130.2	141.39		
									Γotal = Su	m(45) <sub>112</sub> =	=	1408.2	(45)
If instantaneous	_	ng at point		hot water	storage),	enter 0 in	boxes (46 <sub>)</sub>	) to (61)					
(46)m= 21.9 Water storage	19.15	19.77	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21		(46)
Storage volur		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						` ,
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage		oolorod l	ana fant	ar ia kaa	/Id\A/k	2/dox/\							(40)
<ul><li>a) If manufact</li><li>Temperature</li></ul>				JI 15 KI10	WII (KVVI	i/uay).					0		(48)
Energy lost fr				ar			(48) x (49)	· –			0		(49) (50)
b) If manufac		_	-		or is not		(40) X (40)	_		'	10		(30)
Hot water sto	•			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community Volume factor	_		on 4.3										(50)
Temperature			2b							-	.6		(52) (53)
Energy lost fr				ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				( ) (- )	(- )	,		.03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = (	55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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 Appendix	¢Н	
(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 (annual) fr	om Table 3			(	)	(58)
Primary circuit loss calculated		$n = (58) \div 365 \times$	(41)m			
(modified by factor from Tal	ole H5 if there is solar	water heating a	nd a cylinder t	hermostat)		
(59)m= 23.26 21.01 23.26	22.51 23.26 22.	51 23.26 23	.26 22.51	23.26 22.51	23.26	(59)
Combi loss calculated for eac	h month (61)m = (60)	÷ 365 × (41)m				
(61)m= 0 0 0	0 0 0	<del>- i - ` i -</del>	0 0	0 0	0	(61)
Total heat required for water h	neating calculated for	each month (62)	)m = 0.85 × (45	5)m + (46)m +	 (57)m + (59)m + (61)n	n
(62)m= 201.28 177.62 187.04	<del></del>		<del>`                                    </del>	174.56 183.7	196.67	(62)
Solar DHW input calculated using Ap				ontribution to wate	r heating)	
(add additional lines if FGHRS						
(63)m= 0 0 0	0 0 0	<del>- i - i -</del>	0 0	0 0	0	(63)
Output from water heater	1 1					
(64)m= 201.28 177.62 187.04	168.37 165.5 148	.61 143.42 156	6.42 155.85 1	174.56 183.7	196.67	
	1 1 1			er heater (annual)		(64)
Heat gains from water heating	r k\//h/month 0 25 ′ [0	) 85 v (45)m ± (1				<b>_</b> '` ′
(65)m= 92.77 82.4 88.03	80.99 80.87 74.	1 1	1 1	83.88 86.09	91.23	(65)
` '	<u> </u>					(55)
include (57)m in calculation	. ,	ier is in the awe	lling or not wat	er is from comi	munity neating	
5. Internal gains (see Table	, in the second					
Metabolic gains (Table 5), Wa		<del></del>	1 - 1	_		
Jan Feb Mar	+		lug Sep	Oct Nov	Dec	(2.5)
(66)m= 116.42 116.42 116.42	116.42   116.42   116	.42 116.42 116	6.42   116.42   1	116.42   116.42	116.42	(66)
Lighting gains (calculated in A	ppendix L, equation L	.9 or L9a), also				
(67)m= 18.31 16.26 13.22	10.01 7.48 6.3	32 6.83 8.	87 11.91	15.12 17.65	18.82	(67)
Appliances gains (calculated i	n Appendix L, equation	on L13 or L13a),	also see Table	e 5		
(68)m= 205.37 207.5 202.13	190.7 176.27 162	2.7 153.64 15 <sup>4</sup>	1.51 156.88 1	168.31 182.74	196.31	(68)
Cooking gains (calculated in A	Appendix L, equation L	_15 or L15a), als	so see Table 5	;		
(69)m= 34.64 34.64 34.64	34.64 34.64 34.	64 34.64 34	.64 34.64	34.64 34.64	34.64	(69)
Pumps and fans gains (Table	5a)			-		
(70)m= 0 0 0	0 0 0	0	0 0	0 0	0	(70)
Losses e.g. evaporation (nega	ative values) (Table 5)		•			
(71)m= -93.14 -93.14 -93.14	-93.14 -93.14 -93		3.14 -93.14 -	-93.14 -93.14	-93.14	(71)
Water heating gains (Table 5)	I I			l		
(72)m= 124.69 122.62 118.33		.36 98.83 104	4.64 106.7 1	112.74 119.57	122.63	(72)
Total internal gains =	1 1 1 1 1	(66)m + (67)m + (6		!!		
(73)m= 406.29 404.31 391.61	371.13 350.38 330	<del>-   -   -   -   -   -   -   -   -   -  </del>	<del> </del>	354.11 377.89	395.68	(73)
6. Solar gains:	071.10 000.00 000	.01 017.22 022	2.50 000.42	504.11 077.00	000.00	(1-5)
Solar gains are calculated using sol	ar flux from Table 6a and a	ssociated equations	to convert to the	applicable orientati	on.	
Orientation: Access Factor	Area	Flux	g_	 FF	Gains	
Table 6d	m <sup>2</sup>	Table 6a	Table 6b	Table 6c	(W)	
North 0.9x 0.77	3.8 ×	10.63 ×	0.48	x 0.7	= 9.41	(74)
0.77	3.8 X	20.32 X	0.48	x 0.7	= 17.98	(74)
0.11	3.0 ^ _	20.02	0.40	0.7	17.90	

N I o willo						_	_		1			_	г				<b>-</b>	٦
North	0.9x	0.77		X	3.8	_  '	`	34.53	X		0.48	X	Ļ	0.7		=	30.55	<b>(74)</b>
North	0.9x	0.77		X	3.8		× L	55.46	X		0.48	X	Ļ	0.7		=	49.08	(74)
North	0.9x	0.77		x	3.8	<u> </u>	<u>د</u> لــ	74.72	X		0.48	X	Ļ	0.7		=	66.11	(74)
North	0.9x	0.77		X	3.8	<u> </u>	· L	79.99	X		0.48	X	Ļ	0.7		=	70.77	(74)
North	0.9x	0.77		x	3.8	<u> </u>	×	74.68	X		0.48	X	L	0.7		=	66.08	(74)
North	0.9x	0.77		х	3.8	] ;	x	59.25	X		0.48	X		0.7		=	52.42	(74)
North	0.9x	0.77		x	3.8	] ;	× _	41.52	X		0.48	X		0.7		=	36.73	(74)
North	0.9x	0.77		x	3.8	] ;	x	24.19	X		0.48	X		0.7		=	21.4	(74)
North	0.9x	0.77		x	3.8	] ;	x [	13.12	X		0.48	X		0.7		=	11.61	(74)
North	0.9x	0.77		x	3.8	] ;	x	8.86	X		0.48	X		0.7		=	7.84	(74)
East	0.9x	1		x	15.96	] ;	× [	19.64	X		0.48	X		0.7		=	72.99	(76)
East	0.9x	1		x	15.96	] ;	x [	38.42	X		0.48	X		0.7		=	142.78	(76)
East	0.9x	1		х	15.96	] ;	x 🗌	63.27	x		0.48	X		0.7		=	235.14	(76)
East	0.9x	1		x	15.96	Ī,	× $$	92.28	X		0.48	X	Ī	0.7		=	342.94	(76)
East	0.9x	1		x	15.96	Ī,	× 🗏	113.09	X		0.48	x	Ī	0.7		=	420.28	(76)
East	0.9x	1		х	15.96	Ī,	x 🗏	115.77	x		0.48	X	Ī	0.7		=	430.23	(76)
East	0.9x	1		x	15.96	Ī,	х <u> </u>	110.22	x		0.48	X	Ī	0.7		=	409.6	(76)
East	0.9x	1		x	15.96	Ī,	٠ <u> </u>	94.68	X		0.48	X	Ī	0.7		=	351.84	(76)
East	0.9x	1		x	15.96	<b>j</b> ,	, <u> </u>	73.59	j x		0.48	= x	Ī	0.7		=	273.48	(76)
East	0.9x	0.0.77																
East	0.9x	No.																
East	0.9x	1		x	15.96	ij,	νĒ	16.15	X		0.48	X	Ť	0.7		=	60.02	<b>–</b> (76)
	L					_	_		_			_	_					_
Solar g	ains in	watts, ca	alculate	ed	for each mo	nth			(83)m	n = Sı	um(74)m .	(82)r	n					
(83)m=	82.4	160.76	265.69	7	392.01 486.	39	501.	01 475.67	404	.26	310.21	190.	82	102.61	67	.87		(83)
Total g	ains – iı	nternal a	nd sol	ar	(84)m = (73)	m +	(83	)m , watts									•	
(84)m=	488.69	565.07	657.3		763.14 836.	77	831.	32 792.9	727	'.21	643.63	544.	93	480.5	463	3.55		(84)
7. Me	an inter	nal temp	eratur	e (I	heating seas	on)												
							g ar	ea from Tal	ble 9	, Th	1 (°C)						21	(85)
Utilisa	tion fac	tor for g	ains fo	r liv	ving area, h1	,m	(see	Table 9a)										_
	Jan			$\neg$	<del></del>	$\overline{}$	•		A	ug	Sep	Od	ct	Nov		Эес		
(86)m=	0.99	0.97	0.93	T	0.83 0.6	3	0.4	8 0.35	0.	4	0.64	0.8	9	0.97	0.	99		(86)
Mean	interna	l temner	ature ii	ı Li	ving area T1	(fo	llow	stens 3 to 3	7 in 7	' Γahle	- 9c)			-!				
(87)m=	19.88	<del></del>		T	<del> </del>			i	1			20.6	57	20.21	19	.84		(87)
		<u> </u>	!		l l		امييا	lina franc Ta										
(88)m=	20.18			÷				<u> </u>	1		· · · · · ·	20.1	a	20.10	20	10	]	(88)
		<u> </u>	ļ			!			<u>!</u>		20.2	20.1	9	20.19		.10		(00)
Ī			ı	rre		Ť		· 1	T -	. 1			_	1			1	(00)
(89)m=	0.98	0.97	0.92	$\perp$	0.8 0.6	2	0.4	2 0.29	0.3	33	0.58	0.8	7	0.97	0.	99		(89)
Mean		l temper	ature ii	n th	he rest of dw	ellir	ng T	2 (follow ste	eps 3	3 to 7	7 in Tabl	e 9c)		,			1	
(90)m=	18.68	18.97	19.41		19.88 20.1	1	20.1	19 20.2	20	.2						.63		¬`´
											f	LA = L	.ivi	ng area ÷ (4	4) =		0.36	(91)

Mean ir	nternal tempe	rature (fo	or the wh	nole dwe	llina) = f	LA × T1	+ (1 – fL	.A) × T2					
	19.11 19.37	19.76	20.19	20.4	20.48	20.49	20.49	20.44	20.12	19.54	19.07		(92)
Apply a	djustment to	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.11 19.37	19.76	20.19	20.4	20.48	20.49	20.49	20.44	20.12	19.54	19.07		(93)
8. Spac	e heating req	uirement											
	o the mean in		•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	sation factor f  Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisati	on factor for g			I May	Juli	Jui	Aug	Оер	001	INOV	Dec		
	0.98 0.96	0.91	0.8	0.63	0.44	0.31	0.35	0.6	0.86	0.96	0.98		(94)
Useful (	gains, hmGm	, W = (9	4)m x (8	4)m		•							
(95)m= 4	77.41 541.42	598.73	609.7	525.19	366.34	244.81	256.15	384.15	470.74	460.79	454.76		(95)
Monthly	/ average 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)
	ss rate for me	1	<del></del>	<del></del>		<del>-``</del>	<del>-``</del>	<del>`</del>	<del></del>		i		(0=)
` '	943.27	862.61	724.47	557.25	371.27	245.55	257.48	402.74	609.34	800.81	961.73		(97)
· —	neating requir	196.33	82.63	23.85	/vn/mon	$\frac{th = 0.02}{0}$	24 x [(97	)m - (95 0	103.12	1)m 244.82	377.19		
(90)111=	270.04	190.55	02.03	23.03	0			l per year			Į	1663.08	(98)
0	(*		1.14/1.//	2/			1018	ıı pei yeai	(KVVII/yeai	) = Sum(9	70)15,912 =		╡
·	neating requir			•								22.62	(99)
	gy requireme		· ·	Ĭ									
	is used for solof space hear									unity sch	neme.	0	(301)
Fraction	of space hear	t from co	mmunity	/ system	1 – (30	1) =						1	(302)
The comm	unity scheme ma	ay obtain he	eat from se	everal soui	rces. The p	procedure	allows for	CHP and i	up to four (	other heat	sources; ti	he latter	
	oilers, heat pump			aste heat f	rom powe	r stations.	See Appe	ndix C.			,		_
Fraction	of heat from (	Commun	ity CHP									0.6	(303a)
Fraction	of community	heat fro	m heat s	source 2								0.4	(303b)
Fraction	of total space	heat fro	m Comr	nunity C	HP				(3	02) x (303	sa) =	0.6	(304a)
Fraction	of total space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	8b) =	0.4	(304b)
Factor fo	or control and	charging	method	l (Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distributi	ion loss factor	(Table 1	12c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space h	eating										•	kWh/year	-
Annual s	pace heating	requiren	nent									1663.08	
Space he	eat from Com	munity C	HP					(98) x (30	04a) x (30	5) x (306)	=	1047.74	(307a)
Space he	eat from heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	=	698.49	(307b)
Efficienc	y of secondar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space he	eating require	ment fro	m secor	ndary/sur	oplemen	itary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water he	-												_
	vater heating	•										2059.04	
	rom communicat from Com							(64) x (3)	03a) x (30	5) x (306) :	<u> </u>	1297.19	(310a)
vvator ric	at nom com	marinty O						(UT) A (UI	JJU/ A (UU)	c, x (000)		1231.13	(J1Ja)

Water heat from heat source 2	(64) x (303b) x (305) x (306) =	864.8	(310b)
Electricity used for heat distribution			
·	0.01 x [(307a)(307e) + (310a)(310e)] =		](313)
Cooling System Energy Efficiency Ratio	(407) . (044)	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	outside	142.61	(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) =	142.61	(331)
Energy for lighting (calculated in Appendix L)		323.34	(332)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$			7(262)
5 · · · · · · · · · · · · · · · · · · ·	2280.17 X 0.22	492.52	<u></u> (363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	677.9 X 0.52	-351.83	<u> </u> (364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2823.06 × 0.22	609.78	(365)
less credit emissions for electricity -(310a) × (361) ÷ (362) =	839.29 <sup>X</sup> 0.52	-435.59	(366)
Efficiency of heat source 2 (%)  If there is CHP using	two fuels repeat (363) to (366) for the second fu	el 91	(367b)
CO2 associated with heat source 2 [(307b)+(3	310b)] x 100 ÷ (367b) x 0.22	371.07	(368)
Electrical energy for heat distribution	(313) x 0.52	= 20.28	(372)
Total CO2 associated with community systems	363)(366) + (368)(372)	706.23	(373)
CO2 associated with space heating (secondary)	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	373) + (374) + (375) =	706.23	(376)
CO2 associated with electricity for pumps and fans within dwelling	ng (331)) x 0.52	= 74.02	(378)
CO2 associated with electricity for lighting	332))) x 0.52	= 167.81	(379)
Total CO2, kg/year sum of (376)(382) =		948.06	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		12.9	(384)
El rating (section 14)		89.28	(385)

		l Iser I	Details:							
Assessor Name:	Matthew Stainrod	– <u>036</u> FL	Strom					0023501		
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.4.16		
Address :	GF-2, Bertram Street, Lond		Address	: 06-18-0	69419 G	iF-2				
1. Overall dwelling dime		OH								
		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	<sup>3</sup> )	
Ground floor		9	90.93	(1a) x	2	2.4	(2a) =	218.23	(3a)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) = = = =	90.93	(4)						
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	218.23	(5)	
2. Ventilation rate:										
	main seconda heating heating	ry	other		total			m³ per hou	ır	
Number of chimneys	0 + 0	+ [	0	=	0	X 4	40 =	0	(6a)	
Number of open flues	0 + 0	<u> </u>	0	<u> </u>	0	x	20 =	0	(6b)	
Number of intermittent fa	ins				0	x .	10 =	0	(7a)	
Number of passive vents	3			F	0	x -	10 =	0	(7b)	
Number of flueless gas f	ires			_ [	0	X 4	40 =	0	(7c)	
_				L						
							Air ch	anges per ho	our	
	ys, flues and fans = $(6a)+(6b)+($				0		÷ (5) =	0	(8)	
If a pressurisation test has be Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otherwise (	continue fr	rom (9) to	(16)		0	(9)	
Additional infiltration	ne aweiling (113)					[(9)	-1]x0.1 =	0	(10)	
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction	,	•	0	(11)	
	resent, use the value corresponding t	o the grea	ter wall are	a (after					_	
deducting areas of openial lf suspended wooden	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	.1 (seal	ed). else	enter 0				0	(12)	
If no draught lobby, en	,	(***	/,					0	(13)	
Percentage of window	s and doors draught stripped							0	(14)	
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)	
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)	
,	q50, expressed in cubic metro	-	•	•	etre of e	envelope	area	3	(17)	
•	lity value, then $(18) = [(17) \div 20] + (18)$ es if a pressurisation test has been do				io boing u	and		0.15	(18)	
Number of sides sheltere		ne or a de	gree air pe	ппеаышу	is being u	seu		2	(19)	
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			0.85	(20)	
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.13	(21)	
Infiltration rate modified f	for monthly wind speed									
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7			
Wind Factor (22a)m = (2	2)m ÷ 4									
(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			
	II		-		-		<u> </u>	ı		

· —		<del></del>		1	<del>i i</del>	<del>`                                    </del>	<del>`                                    </del>	1	1	1	1	
		1	l '	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
	_	rate for t	пе аррп	cable ca	13 <b>C</b>						0.5	
If exhaust air heat	0.16											
If balanced with he	eat recovery: effi	ciency in %	allowing	for in-use f	actor (fror	n Table 4h	) =					=
a) If balanced	mechanical v	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)		`
· —	1	1	i		<del>-                                    </del>	<del>1                                    </del>	<del>í `</del>	<del>,                                    </del>	<del>-                                    </del>	<del>````</del>	]	(2
b) If balanced	mechanical v	entilation	without	heat red	covery (	л МV) (24k	m = (2)	2b)m + (	23b)	1	J	
· ·			ı	1	<del> </del>	<del>,                                    </del>	<del>í `</del>	<del>- ^ `</del>	<del></del>	0	]	(2
,			•	•				.5 × (23b	) )	•	ı	
24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24
,								0.5]		•	1	
24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24
Effective air ch	nange rate - e	nter (24a	) or (24l	o) or (24	c) or (24	ld) in bo	x (25)	•			•	
25)m= 0.26	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(2
3. Heat losses a	and heat loss	paramet	er:									
ELEMENT									K)			
Doors				2.1	X	1.4	=	2.94				(2
Vindows Type 1				12.15	5 x1	/[1/( 1.4 )+	0.04] =	16.11				(2
Vindows Type 2				7.63	x1	/[1/( 1.4 )+	0.04] =	10.12				(2
loor				90.93	3 x	0.11	=	10.0023	3	110	10002.	.3 (2
Valls Type1	77.99	21.8	8	56.1	1 x	0.15	=	8.42		14	785.54	4 (2
Valls Type2	3.6	0		3.6	x	0.14	=	0.51		14	50.4	(2
Valls Type3	4.8	0		4.8	x	0.15	=	0.72		14	67.2	(2
otal area of ele	ments, m <sup>2</sup>			177.3	2							 (3
Party wall				22.8	x	0	=	0		20	456	(3
Party ceiling				90.93	3					30	2727.9	9 (3:
nternal wall **				153.6	<u>=</u>					9	1382.4	4 (3
	### MET   Gross   Openings   Ope											
abric heat loss,	W/K = S (A x)	( U)				(26)(30	) + (32) =				48.81	(3
leat capacity Cr	shaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)      1											
hermal mass pa	0.26											
an be used instead	of a detailed cald	culation.				recisely the	e indicative	e values of	TMP in T	able 1f		_
			- ' A -	ايدالم محمد	1						1	/3
hermal bridges	: S (L x Y) ca	liculated	using Ap	ppenaix i	n.						12.2	(5

Γ	i	Feb	alculated Mar	· ·	<del></del>	lun	Jul	۸۰۰۰	Sep	`	25)m x (5) Nov	Dec		
0)	Jan			Apr	May	Jun	1	Aug		Oct		-		(3
8)m=	18.94	18.72	18.49	17.34	17.11	15.96	15.96	15.73	16.42	17.11	17.57	18.03		(3
Г		oefficier		Γ	Γ	I	Ι	ı		= (37) + (3				
9)m=	79.96	79.73	79.5	78.35	78.12	76.97	76.97	76.74	77.43	78.12	78.58	79.04		<b>—</b> ,,
eat lo	ss para	meter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> (4)	12 /12=	78.29	(3
0)m=	0.88	0.88	0.87	0.86	0.86	0.85	0.85	0.84	0.85	0.86	0.86	0.87		
umbe	r of day	rs in mor	nth (Tab	le 1a)				•	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.86	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
				-	-	_	-	-			-			
. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ar:	
ssum	ed occu	pancy, I	N									.64		(4
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	013 x (	ΓFA -13.		.04		(
	A £ 13.9	•						(O.E. N.I)	00					
						ay Vd,av Iwelling is				se target o		5.86		(
		_		• •		not and co	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t wate						ctor from 7								
4)m=	106.54	102.67	98.8	94.92	91.05	87.17	87.17	91.05	94.92	98.8	102.67	106.54		
L								<u> </u>	-	Γotal = Su	<u>l</u> m(44) <sub>112</sub> =	=	1162.3	(
ergy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	158	138.19	142.6	124.32	119.29	102.94	95.39	109.46	110.76	129.09	140.91	153.02		
_										Γotal = Su	m(45) <sub>112</sub> =	=	1523.96	(
nstanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)		•			
6)m=	23.7	20.73	21.39	18.65	17.89	15.44	14.31	16.42	16.61	19.36	21.14	22.95		(
	storage		includin	a any c	olar or M	/WHRS	ctorogo	within co	mo voc	col				,
_		` ,		•		nter 110	•		une ves	3 <b>C</b> I		0		(
	•	•			•	nstantar		` '	ers) ente	er 'O' in <i>(</i>	47)			
	storage			(					,		,			
) If ma	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(
empe	rature fa	actor fro	m Table	2b								0		(
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(
) If ma	anufact	urer's de	eclared o	cylinder l	oss fact	or is not								•
					e 2 (kW	h/litre/da	ıy)				0.	.02		(
	-	eating s from Tal	ee secti	on 4.3										,
			ole 2a m Table	2h								.03		(
•								(AZ) (E 1)	(50)	F0)		0.6		(
		m water 54) in (5	storage	, KVVN/ye	ar			(47) x (51)	x (52) X (	o3) =	-	.03		(
. 11 <u>0</u> 1 (	. , .		•	for ooob				((56) <del>~</del> = (	FF) (44).	_	1.	.03		(
0t0= -														
ater s	32.01	28.92	32.01	30.98	32.01		32.01	32.01	55) × (41)ı 30.98	32.01		32.01		(

,	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	t loss (ar	nual) fro	m Table	 e 3		•	•	•	•		0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified by	/ factor fi	rom Tabl	le H5 if t	here is s	olar 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 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 heat req	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 213.28	188.12	197.88	177.81	174.57	156.43	150.66	164.73	164.26	184.36	194.4	208.29		(62)
Solar DHW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 213.28	188.12	197.88	177.81	174.57	156.43	150.66	164.73	164.26	184.36	194.4	208.29		_
							Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	2174.8	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	]	
(65)m= 96.76	85.89	91.64	84.13	83.89	77.02	75.94	80.62	79.62	87.14	89.65	95.1		(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Internal ga	ains (see	Table 5	and 5a	):									
Metabolic gair	ns (Table	5). Wat	ts										
Jan	Feb	Mar											
(00)			Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 131.91	131.91	131.91	131.91	131.91	Jun 131.91	Jul 131.91	Aug 131.91	Sep 131.91	Oct 131.91	Nov 131.91	Dec 131.91		(66)
Lighting gains	l		131.91	131.91	131.91	131.91	131.91	131.91	<b>—</b>	-	_		(66)
` ′	l		131.91	131.91	131.91	131.91	131.91	131.91	<b>—</b>	-	_		(66) (67)
Lighting gains	(calcula	ted in Ap	131.91 ppendix 11.75	131.91 L, equat	131.91 ion L9 oi 7.41	131.91 r L9a), a 8.01	131.91 Iso see	131.91 Table 5	131.91 17.75	131.91	131.91		` '
Lighting gains (67)m= 21.48	(calcula	ted in Ap	131.91 ppendix 11.75	131.91 L, equat	131.91 ion L9 oi 7.41	131.91 r L9a), a 8.01	131.91 Iso see	131.91 Table 5	131.91 17.75	131.91	131.91		` '
Lighting gains (67)m= 21.48 Appliances ga	(calcula 19.08 ins (calc 243.28	ted in Ap 15.52 ulated in 236.98	131.91 opendix 11.75 Append 223.58	131.91 L, equati 8.78 dix L, equati 206.66	131.91 ion L9 or 7.41 uation L	131.91 r L9a), a 8.01 13 or L1 180.13	131.91 Iso see 10.41 3a), also	131.91 Table 5 13.98 see Ta	131.91 17.75 ble 5 197.33	20.71	131.91 22.08		(67)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78	(calcula 19.08 ins (calc 243.28	ted in Ap 15.52 ulated in 236.98	131.91 opendix 11.75 Append 223.58	131.91 L, equati 8.78 dix L, equati 206.66	131.91 ion L9 or 7.41 uation L	131.91 r L9a), a 8.01 13 or L1 180.13	131.91 Iso see 10.41 3a), also	131.91 Table 5 13.98 see Ta	131.91 17.75 ble 5 197.33	20.71	131.91 22.08		(67)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains	(calcula 19.08 ins (calc 243.28 (calcula 36.19	ted in Ap 15.52 ulated in 236.98 ted in Ap 36.19	131.91 opendix 11.75 Append 223.58 opendix 36.19	131.91 L, equati 8.78 dix L, equati 206.66 L, equat	131.91 ion L9 or 7.41 uation L 190.75 ion L15	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a	131.91 lso see 10.41 3a), also 177.63	131.91 Table 5 13.98 See Ta 183.93 ee Table	131.91 17.75 ble 5 197.33	20.71 214.25	22.08 230.15		(67) (68)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19	(calcula 19.08 ins (calc 243.28 (calcula 36.19	ted in Ap 15.52 ulated in 236.98 ted in Ap 36.19	131.91 opendix 11.75 Append 223.58 opendix 36.19	131.91 L, equati 8.78 dix L, equati 206.66 L, equat	131.91 ion L9 or 7.41 uation L 190.75 ion L15	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a	131.91 lso see 10.41 3a), also 177.63	131.91 Table 5 13.98 See Ta 183.93 ee Table	131.91 17.75 ble 5 197.33	20.71 214.25	22.08 230.15		(67) (68)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains	ted in Ap 15.52 ulated in 236.98 tted in Ap 36.19 (Table 5	131.91 ppendix 11.75 Append 223.58 ppendix 36.19 5a)	131.91 L, equati 8.78 dix L, eq 206.66 L, equat 36.19	131.91 fon L9 or 7.41 uation L 190.75 ion L15 36.19	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatic	ted in Ap 15.52 ulated in 236.98 tted in Ap 36.19 (Table 5	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91 L, equati 8.78 dix L, eq 206.66 L, equat 36.19	131.91 fon L9 or 7.41 uation L 190.75 ion L15 36.19	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 /aporatio	ted in Ap 15.52 ulated in 236.98 ted in Ap 36.19 (Table 5 0 on (negat	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91 L, equati 8.78 dix L, eq 206.66 L, equat 36.19  0 es) (Tab	131.91 ion L9 or 7.41 uation L 190.75 ion L15 36.19 0 le 5)	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69) (70)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 /aporatio	ted in Ap 15.52 ulated in 236.98 ted in Ap 36.19 (Table 5 0 on (negat	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91 L, equati 8.78 dix L, eq 206.66 L, equat 36.19  0 es) (Tab	131.91 ion L9 or 7.41 uation L 190.75 ion L15 36.19 0 le 5)	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69) (70)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 /aporatio -105.53 gains (T	ted in Ap 15.52  ulated in 236.98  ted in Ap 36.19  (Table 5 0 on (negate) -105.53  Table 5) 123.17	131.91 ppendix 11.75 Append 223.58 opendix 36.19 5a) 0 ciive valu	131.91 L, equati 8.78 dix L, equati 206.66 L, equati 36.19  0 es) (Tab	131.91 ion L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19 0 -105.53	131.91 Iso see 10.41 3a), also 177.63 ), also se 36.19 0 -105.53	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19 0 -105.53	131.91 17.75 ble 5 197.33 5 36.19 0 -105.53	131.91 20.71 214.25 36.19 0 -105.53	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 /aporatio -105.53 gains (T	ted in Ap 15.52  ulated in 236.98  ted in Ap 36.19  (Table 5 0 on (negate) -105.53  Table 5) 123.17	131.91 ppendix 11.75 Append 223.58 opendix 36.19 5a) 0 ciive valu	131.91 L, equati 8.78 dix L, equati 206.66 L, equati 36.19  0 es) (Tab	131.91 ion L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19 0 -105.53	131.91 Iso see 10.41 3a), also 177.63 ), also se 36.19 0 -105.53	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19 0 -105.53	131.91 17.75 ble 5 197.33 5 36.19 0 -105.53	131.91 20.71 214.25 36.19 0 -105.53	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05  Total internal	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 /aporatio -105.53 gains (T 127.81 gains =	ted in Ap 15.52 ulated in 236.98 tted in Ap 36.19 (Table 5 0 n (negat -105.53 able 5) 123.17	131.91 opendix 11.75 Append 223.58 opendix 36.19 5a) 0 tive valu -105.53	131.91 L, equati 8.78 dix L, eq 206.66 L, equat 36.19  0 es) (Tab -105.53	131.91 ion L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19  0  -105.53  102.07 m + (67)m	131.91 lso see 10.41 3a), also 177.63 1, also se 36.19 0 -105.53 108.35	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19  0  -105.53  110.59 + (69)m +	131.91 17.75 ble 5 197.33 5 36.19 0 -105.53 117.13 (70)m + (7	131.91 20.71 214.25 36.19 0 -105.53 124.51 1)m + (72)	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71) (72)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05  Total internal (73)m= 454.88	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio 127.81 gains = 452.74 s:	ted in Ap 15.52 ulated in 236.98 tted in Ap 36.19 (Table 5 0 n (negat -105.53 able 5) 123.17	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 6a) 0 tive valu -105.53 116.85	131.91 L, equati 8.78 dix L, eq 206.66 L, equat 36.19  0 es) (Tab -105.53  112.75	131.91 ion L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53  106.97 (66) 367.72	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19  0  -105.53  102.07 m + (67)m 352.78	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19 0 -105.53 108.35 1 + (68)m - 358.97	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19  0  -105.53  110.59 + (69)m	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53  117.13  (70)m + (7  394.78	131.91 20.71 214.25 36.19 0 -105.53 124.51 1)m + (72) 422.05	131.91 22.08 230.15 36.19 0 -105.53 127.82		(67) (68) (69) (70) (71) (72)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_									_			_					_
Southea	1St 0.9x	0.77		X	7.6	3	X	3	6.79	X	0.44		X	0.7	=	59.	92	(77)
Southea	st 0.9x	0.77		X	7.6	3	x	6	2.67	X	0.44		X	0.7		102	07	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	8	5.75	X	0.44		X	0.7	-	139	.65	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	10	06.25	X	0.44		x	0.7	-	173	.04	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	1	19.01	X	0.44		x	0.7	-	193	.82	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	11	18.15	X	0.44		X	0.7		192	.42	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	11	13.91	X	0.44		x	0.7	=	185	.51	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	10	04.39	X	0.44		x	0.7		170	.01	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	9	2.85	X	0.44		X	0.7	=	151	.22	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	6	9.27	X	0.44		x	0.7	-	112	81	(77)
Southea	st <sub>0.9x</sub>	0.77		x	7.6	3	x	4	4.07	X	0.44		X	0.7	=	71.	77	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	3	1.49	X	0.44		X	0.7	=	51.	28	(77)
South	0.9x	0.77		x	12.1	15	x	4	6.75	X	0.44		x	0.7	=	121	.24	(78)
South	0.9x	0.77		x	12.1	15	x	7	6.57	X	0.44		X	0.7	=	198	.57	(78)
South	0.9x	0.77		x	12.1	15	x	9	7.53	X	0.44		x	0.7	-	252	.94	(78)
South	0.9x	0.77		x	12.1	15	x	11	10.23	X	0.44		x	0.7	=	285	.88	(78)
South	0.9x	0.77		x	12.1	15	x	11	14.87	X	0.44		X	0.7	-	29	7.9	(78)
South	0.9x	0.77		x	12.1	15	X	11	10.55	X	0.44		X	0.7	=	286	.69	(78)
South	0.9x	0.77		x	12.1	15	x	10	08.01	X	0.44		x	0.7		280	.11	(78)
South	0.9x	0.77		x	12.1	15	X	10	04.89	X	0.44		x	0.7		272	.03	(78)
South	0.9x	0.77		x	12.1	15	x	10	01.89	X	0.44		x	0.7		264	.22	(78)
South	0.9x	0.77		x	12.1	15	x	8	2.59	X	0.44		x	0.7		214	.17	(78)
South	0.9x	0.77		x	12.1	15	X	5	5.42	X	0.44		x	0.7		143	.72	(78)
South	0.9x	0.77		x	12.1	15	X		10.4	X	0.44		X	0.7	=	104	.77	(78)
Solar g	ains in	watts, ca	lcula	ted	for each	n mon	:h			(83)m	n = Sum(74	)m(8	82)m					
(83)m=	181.17	300.64	392.	59	458.91	491.72	2 4	79.11	465.62	442	.04 415.	44 3	326.98	215.49	156.0	5		(83)
Total ga	ains – i	nternal a	nd so	olar	(84)m =	(73)n	า + (	83)m	, watts									
(84)m=	636.05	753.38	830.	83	873.66	882.48	3 8	46.82	818.4	801	.01 786.	51 7	'21.76	637.53	598.68	3		(84)
7. Mea	an inter	nal temp	eratu	ıre (	heating	seaso	n)											
Tempe	erature	during h	eatin	g pe	eriods in	the li	ving	area f	from Tal	ble 9	, Th1 (°C	)				2	1	(85)
Utilisa	tion fac	tor for ga	ains f	or li	ving are	a, h1,	m (s	ee Ta	ble 9a)							L		
ſ	Jan	Feb	Ma	ar	Apr	May	/	Jun	Jul	А	ug Se	эр	Oct	Nov	Dec	;		
(86)m=	0.98	0.96	0.9	3	0.86	0.74		0.56	0.41	0.4	4 0.6	4	0.87	0.96	0.99	7		(86)
Mean	interna	l tempera	ature	in li	ving are	ea T1	follo	w ste	ns 3 to 7	7 in T	able 9c)	•		•				
(87)m=	19.95	20.17	20.4	$\overline{}$	20.7	20.88	<del>`</del>	20.98	21	20.	<del></del>	95 2	20.72	20.29	19.91	7		(87)
Temp	oraturo	during h	oatin	a ne	riode in	roct	of du	بماالم	from To	abla (	<b>_</b> 9, Th2 (°(			•				
(88)m=	20.19	20.19	20.1	<del></del>	20.2	20.2	$\neg$	20.21	20.21	20.	<del></del> _		20.2	20.2	20.19			(88)
L											1			1				
Utilisa (89)m=	0.98	tor for ga	0.9	-	0.83	0.69	$\overline{}$	,m (se <sub>0.5</sub>	0.34	9a) 0.3	36 0.5	, T	0.84	0.96	0.98	$\neg$		(89)
L											!			0.90	0.96			(50)
Mean	interna	I tempera	ature	in th	ne rest (	of dwe	lling	T2 (fo	ollow ste	eps 3	to 7 in T	able	9c)					

(00) 40.70 40.4 40.47 40.05 20.00 20.40 20.04 20.04	00.47	40.00	40.00	40.70	1	(90)
(90)m= 18.78 19.1 19.47 19.85 20.08 20.19 20.21 20.21	20.17 fl	19.89 A = Livin	19.28 g area ÷ (4	18.73	0.34	(91)
			<b>5</b> (	,	0.54	(01)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fl)$ (92)m= 19.18 19.47 19.8 20.14 20.36 20.46 20.48 20.48	_A) × 12   <sub>20.44</sub>	20.18	19.63	19.13		(92)
Apply adjustment to the mean internal temperature from Table 4e, wh	1 1		10.00	10.10		(/
(93)m= 19.18 19.47 19.8 20.14 20.36 20.46 20.48 20.48	20.44	20.18	19.63	19.13		(93)
8. Space heating requirement						
Set Ti to the mean internal temperature obtained at step 11 of Table 9	b, so that	t Ti,m=(7	76)m an	d re-calc	ulate	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:	1 CCP 1	001	1407	DCO		
(94)m= 0.97 0.95 0.9 0.83 0.7 0.52 0.36 0.39	0.6	0.84	0.95	0.98		(94)
Useful gains, hmGm , W = (94)m x (84)m						
(95)m= 618.76 713.65 751.74 722.16 617.84 440.19 297.12 310.97	469.28	604.82	604.91	585.61		(95)
Monthly average external temperature from Table 8  (96)m=	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , $W = [(39)m \times [(93)m]]$			7.1	4.2		(30)
(97)m= 1190.1 1161.88 1057.64 880.88 676.51 451.29 298.75 313.22	490.87	748.08	984.74	1180.29		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97	')m – (95)	m] x (41	l)m			
(98)m= 425.07 301.21 227.59 114.28 43.66 0 0 0	0	106.59	273.47	442.44		
Total	al per year (	kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1934.31	(98)
Space heating requirement in kWh/m²/year					21.27	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating provided						
Fraction of space heat from secondary/supplementary heating (Table 1			unity sch	neme.	0	(301)
			unity sch	neme.	0	(301)
Fraction of space heat from secondary/supplementary heating (Table 1	1) '0' if no	one	·		1	<b>=</b>  ` `
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appe	1) '0' if no	one	·		1 he latter	(302)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP	1) '0' if no	one	·		1	(302) (303a)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appe	1) '0' if no	one	·		1 he latter	(302)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP	1) '0' if no	one up to four d	·	sources; ti	1 he latter 0.6	(302) (303a)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2	1) '0' if no	one up to four d	other heat	sources; ti	1 he latter 0.6 0.4	(302) (303a) (303b)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP	1) '0' if no	one up to four o (30	other heat 02) x (303	sources; ti	1 he latter 0.6 0.4 0.6	(302) (303a) (303b) (304a)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2	1) '0' if no	one up to four o (30	other heat 02) x (303	sources; ti	1 he latter 0.6 0.4 0.6 0.4	(302) (303a) (303b) (304a) (304b)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system  Space heating	1) '0' if no	one up to four o (30	other heat 02) x (303	sources; ti	1 0.6 0.4 0.6 0.4 1	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system	1) '0' if no	one up to four o (30	other heat 02) x (303	sources; ti	1 he latter  0.6 0.4 0.6 0.4 1 1.05	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system  Space heating	1) '0' if no	one (3) (3)	02) x (303 02) x (303	sources; ti a) = b) =	1 he latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement	1) '0' if no	(30) em	02) x (303 02) x (303 02) x (306) =	sources; ti	1 he latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea 1934.31	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP	1) '0' if no CHP and upondix C.  ating system  (98) x (30)  (98) x (30)	(30) (30) (31) (31) (32) (31) (32) (33) (34) (30) (30) (30)	02) x (303 02) x (303 02) x (306) =	sources; ti	1 he latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea 1934.31 1218.61	(302) (303a) (303b) (304a) (304b) (305) (306) ar
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  Space heat from heat source 2	1) '0' if no CHP and upondix C.  ating system  (98) x (30)  (98) x (30)	(30) (30) (30) (30) (30) (30) (30) (30)	5) x (306) = 5) x (306) =	sources; ti	1 he latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea 1934.31 1218.61 812.41	(302) (303a) (303b) (304a) (304b) (305) (306) ar (307a) (307b)
Fraction of space heat from secondary/supplementary heating (Table 1 Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heat Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  Space heat from heat source 2  Efficiency of secondary/supplementary heating system in % (from Table	1) '0' if no control of CHP and upondix C.  (98) x (30) (98) x (30	(30) (30) (30) (30) (30) (30) (30) (30)	5) x (306) = 5) x (306) =	sources; ti	1 he latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea 1934.31 1218.61 812.41 0	(302) (303a) (303b) (304a) (304b) (305) (306)  ar (307a) (307b) (308

If DHW from community scheme:

Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1370.12	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	913.41	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	43.15	(313)
Cooling System Energy Efficiency Ratio	Kee sy (see sy (see so) (see so)	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	176.39	(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) =	176.39	(331)
Energy for lighting (calculated in Appendix L)		379.38	(332)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2652.04 × 0.22	572.84	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	788.45 × 0.52	-409.21	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2981.77 × 0.22	644.06	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	886.48 × 0.52	-460.08	(366)
Efficiency of heat source 2 (%)  If there is CHP us	sing two fuels repeat (363) to (366) for the second fue	91	(367b)
CO2 associated with heat source 2 [(307)	b)+(310b)] x 100 ÷ (367b) x 0.22	409.65	(368)
Electrical energy for heat distribution	[(313) x 0.52	22.39	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	779.65	(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) =	779.65	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x 0.52	91.54	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	196.9	(379)
Total CO2, kg/year sum of (376)(382) =		1068.09	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		11.75	(384)

			5							
			User D	vetails:						
Assessor Name:	Matthew Stain				a Num				023501	
Software Name:	Stroma FSAP	_•			are Ve		1.0		n: 1.0.4.16	
A 11	Haves 44 Darts		· ·	Address	: 06-18-6	59419 H	ouse-11			
Address: 1. Overall dwelling dimer	House-11, Bertra	am Street, L	ondon							
1. Overall dwelling diffier	1510115.		۸ro	a(m²)		Av. Hei	iaht(m)		Volume(m³)	\
Ground floor				57.15	(1a) x		2.4	(2a) =	161.16	(3a)
First floor			6	61.15	(1b) x	2.	.47	(2b) =	151.04	(3b)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+	+(1e)+(1n	) 1	28.3	(4)			_		_
Dwelling volume					(3a)+(3b	)+(3c)+(3d	l)+(3e)+	(3n) =	312.2	(5)
2. Ventilation rate:										
	main heating	secondary heating	/	other		total			m³ per hour	r
Number of chimneys	0 +		] + [	0	=	0	X	40 =	0	(6a)
Number of open flues	0 +	0	] + [	0	=	0	X	20 =	0	(6b)
Number of intermittent fan	IS					4	X	10 =	40	(7a)
Number of passive vents						0	X	10 =	0	(7b)
Number of flueless gas fire	es					0	X	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans =	= (6a)+(6b)+(7a	a)+(7b)+(	7c) =	Γ	40	$\neg$	÷ (5) =	0.13	(8)
If a pressurisation test has be	en carried out or is int	ended, proceed	to (17),	otherwise	continue fr	om (9) to (		· /	****	``
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	)-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		orresponding to	the great	ter wall are	ea (after					
If suspended wooden flo		sealed) 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 draugh	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in	cubic metres	s per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabilit	y value, then (18)	= [(17) ÷ 20]+(8	), otherw	ise (18) =	(16)				0.28	(18)
Air permeability value applies		t has been don	e or a de	gree air pe	ermeability	is being us	sed			_
Number of sides sheltered	d			(20) – 1	[0.075 x (1	10)1 –			1	(19)
Shelter factor						[9)] =			0.92	(20)
Infiltration rate incorporation	_	1		(21) = (18	) X (∠U) =				0.26	(21)
Infiltration rate modified fo	<del></del>	1 1			<u> </u>	·			1	
Jan   Feb   1	Mar   Apr   M	lay   Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe					<u> </u>		•			

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2 (22a)m= 1.27	22a)m = 1.25	(22)m ÷	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]
, ,	<u> </u>				!	<u> </u>			1		1	I
Adjusted infiltra		<u> </u>			1	<del>` `</del>	<del>`</del>	<del>`</del>	I 0.00	0.00	T 00	1
0.33 Calculate effect	0.32 Ctive air	0.32 change i	0.28 rate for t	0.28 he appli	0.24 cable ca	0.24 S <b>e</b>	0.24	0.26	0.28	0.29	0.3	l
If mechanica	al ventila	ation:										0 (23a)
If exhaust air he	eat pump	using Appe	endix N, (2	(3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0 (23b)
If balanced with		-	•	_								0 (23c)
a) If balance		1		·	1	<del>- ` ` </del>	<del>- ^ `</del>	<del>```</del>	<del>,                                    </del>	<del></del>	<del>1 ` '</del>	,
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24a)
b) If balance		1		i	1	<u> </u>	<u> </u>	<del>``</del>	<del>r ´       `</del>	<del></del>	Ι ,	] (246)
(24b)m = 0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole h		tract ven < (23b), t		•	•				5 x (23h	))		
(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	!	ļ	!	J
,		en (24d)		•	•				0.5]			_
(24d)m = 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(24d)
Effective air	change	rate - en	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)				
(25)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(25)
2 Hoot loose	م ما امما											
3. Heat losse	s and ne	eat loss p	paramete	er:								
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-	
	Gros	SS	Openin	gs						<) 		
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	K =	(W/I	<) 		K kJ/K
<b>ELEMENT</b> Doors	Gros area	SS	Openin	gs	A ,r	m <sup>2</sup> x x10	W/m2	K =   0.04] =	(W/l	<) 		K kJ/K (26)
ELEMENT  Doors  Windows Type	Gros area e 1	SS	Openin	gs	A ,r 2.1 2.88	m <sup>2</sup> x x10 x10	W/m2 1.4 /[1/( 1.4 )+	0.04] = 0.04] =	2.94 3.82	<)		K kJ/K (26) (27)
ELEMENT  Doors  Windows Type  Windows Type	Gros area e 1 e 2 e 1	SS	Openin	gs	A ,r 2.1 2.88 11.61	x1. x1. x1.	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{c}  K  \\ \hline 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array} $	2.94 3.82 15.39	<)		K kJ/K (26) (27) (27)
ELEMENT  Doors  Windows Type Windows Type Rooflights Type	Gros area e 1 e 2 e 1	SS	Openin	gs	A ,r 2.1 2.88 11.61 4.05	x1. x1. x1. x1.	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) +	$ \begin{array}{c}  K  \\ \hline 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array} $	2.94 3.82 15.39 5.67			K kJ/K (26) (27) (27)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ	Gros area e 1 e 2 e 1	ss (m²)	Openin	gs <sub>1</sub> 2	A ,r 2.1 2.88 11.61 4.05 5.4	x1.	W/m2  1.4  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/(1.4) +  /[1/(1.4) +	0.04] = 0.04] = 0.04] = 0.04] =	2.94 3.82 15.39 5.67 7.56		kJ/m²-	K kJ/K (26) (27) (27) (27b)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor	Gros area e 1 e 2 e 1 e 2	ss (m²)	Openin m	gs <sub>1</sub> 2	A ,r 2.1 2.88 11.61 4.05 5.4 67.15	x1.	W/m2  1.4  /[1/( 1.4 )+  /[1/( 1.4 )+  /[1/(1.4) +  /[1/(1.4) +  0.13	K	2.94 3.82 15.39 5.67 7.56 8.7295		kJ/m²-	K kJ/K (26) (27) (27) (27b) (27b) (27b) (28)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls	Gros area e 1 e 2 e 1 e 2	64 31	Openin m	gs 1 <sup>2</sup>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) + 0.13  0.15	K	2.94 3.82 15.39 5.67 7.56 8.7295		110 150	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (28) (29)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1	Gros area  e 1  e 2  e 1  e 2  104.  40.3  30.9	64 31	16.55 0	gs 1 <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 ) + /[1/(1.4) +  0.13  0.15  0.11	0.04] = 0.04]	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43		110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (30)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2	Gros area  e 1  e 2  e 1  e 2  104.  40.3  30.9	64 31	16.55 0	gs 1 <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 ) + /[1/(1.4) +  0.13  0.15  0.11	0.04] = 0.04]	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43		110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (29) (30) (30) (30)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls  Roof Type1  Roof Type2  Total area of e	Gros area  e 1  e 2  e 1  e 2  104.  40.3  30.9	64 31	16.55 0	gs 1 <sup>2</sup>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15 88.05 40.31 21.54	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) + 0.13  0.15  0.11	K	2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37		110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (28) (28) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall	Gros area  e 1  e 2  e 1  e 2  104.  40.3  30.9	64 31	16.55 0	gs 1 <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) + 0.13  0.15  0.11	K	2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37		110 150 9 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (29) (362.79 (30) (31) (31) (2768.5 (32)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall **	Gros area  e 1  e 2  e 1  e 2  fe 2  104.  40.3  30.9	64 31	16.55 0	gs 1 <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55	x10	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) + 0.13  0.15  0.11	K	2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37		110 150 9 9 70	K kJ/K (26) (27) (27) (27b) (29) (362.79) (30) (31) (31) (2768.5) (32) (32) (32b) (32c) (3
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor	Gros area  e 1  e 2  e 1  e 2  fe 2  fo 30.5  lelements	64 31 99 s, m <sup>2</sup>	Openin m  16.59  0  9.45	gs 1 <sup>2</sup> 9	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15  alue calcul	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 ) + /[1/(1.4) +  0.13  0.15  0.11  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37		110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27) (27b) (29) (362.79) (30) (31) (31) (31) (2768.5) (32) (32b) (32c) (32
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and	Gros area  e 1  e 2  le 1  40.3  30.5  elements	64 B1 B9 G, m <sup>2</sup> ows, use e	16.50  9.45	gs 1 <sup>2</sup> 9	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15  alue calcul	x1.	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 ) + /[1/(1.4) +  0.13  0.15  0.11  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37		110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27) (27b) (29) (362.79) (30) (31) (31) (31) (2768.5) (32) (32b) (32c) (32
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area	Gros area  e 1  e 2  e 1  f 2  f 30.5  elements	64 31 39 39 30, m <sup>2</sup> 30, m <sup>2</sup> 30, m <sup>2</sup>	16.50  9.45	gs 1 <sup>2</sup> 9	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15  alue calcul	x1.	W/m2  1.4  /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13  0.15  0.11  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	as given in	110 150 9 9 70 9 18 9	K kJ/K (26) (27) (27) (27b) (29) (30) (30) (31) (31) (31) (32c) (31) (32c) (32
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area Fabric heat los	Gros area  e 1  e 2  e 1  e 2  fe 2  fe 3  froof winders on both ss, W/K:  Cm = S(	64 31 39 3, m <sup>2</sup> 3, m <sup>2</sup> 3, m <sup>2</sup>	16.50 9.45	gs p g g g g g g g g g g g	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  61.15  alue calcultitions	x1 x	W/m2  1.4  /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13  0.15  0.11  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37 0	as given in	110 150 9 9 70 9 18 9	K kJ/K (26) (27) (27) (27b) (29) (30) (31) (31) (31) (31) (32c) (31) (32c) (32c) (32c) (32c) (33c) (32c) (33c) (32c) (33c) (33

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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  if details of themal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss calculated monthly  Ventilation heat loss based in the calculated monthly  Ventilation heat loss calculated monthly  Ventilation heat loss based in the calculated monthly in the calculat
State   Stat
Ventilation 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) me
Heat transfer coefficient, W/K  (39)m= 140.25   140.03   139.82   138.83   138.65   137.78   137.78   137.62   138.12   138.65   139.02   139.41    Average = Sum(39)v/12=   138.83   (39)    Heat loss parameter (HLP), W/m²K  (40)m=   1.09   1.09   1.09   1.09   1.08   1.08   1.07   1.07   1.07   1.08   1.08   1.08   1.09    Average = Sum(40)v/12=   1.08   (40)    Number of days in month (Table 1a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    (41)m=   31   28   31   30   31   30   31   31   30   31   30   31   30   31    4. Water heating energy requirement:    Assumed occupancy, N   2.89   (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 TFA £ 13.9, N = 1 Annual average hot water usage in litres per day (valverage = (25 x N) + 36   102.85    Reduce the annual average hot water usage in litres per day (valverage)   (43)    Reduce the annual average hot water usage in litres per day (valverage)   (44)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    Hot water usage in litres per day (valverage)   (44)    Langle   Lan
(39)m=
Average = Sum(39), /12=   138.83   (39)
Heat loss parameter (HLP), W/m²K  (40)m = 1.09
Number of days in month (Table 1a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
Number of days in month (Table 1a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41)m= 31 28 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 (41)  4. Water heating energy requirement:  **Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36
4. Water heating energy requirement:    KWh/year:
4. Water heating energy requirement:  Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>1-12</sub> = 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>1-12</sub> = 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 (46)  Water storage loss:
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>1-12</sub> = 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>1-12</sub> = 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 Water storage loss:
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>1-12</sub> = 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>1-12</sub> = 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 Water storage loss:
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>112</sub> 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>112</sub> 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 (46)  Water storage loss:
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>12</sub> 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>12</sub> 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 (46)  Water storage loss:
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>112</sub> = 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>112</sub> = 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 (46)  Water storage loss:
not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)  (44)m= 113.13 109.02 104.91 100.79 96.68 92.56 92.56 96.68 100.79 104.91 109.02 113.13  Total = Sum(44) <sub>112</sub> = 1234.18 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48  Total = Sum(45) <sub>112</sub> = 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 (46)  Water storage loss:
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)           (44)m=         113.13         109.02         104.91         100.79         96.68         92.56         92.56         96.68         100.79         104.91         109.02         113.13           Total = Sum(44)12 =         1234.18         (44)           Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)           (45)m=         167.77         146.74         151.42         132.01         126.67         109.3         101.29         116.23         117.61         137.07         149.62         162.48           Total = Sum(45)112 =         1618.2         (45)           If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)           (46)m=           25.17         22.01         22.71         19.8         19         16.4         15.19         17.43         17.64         20.56         22.44         24.37         24.37
Hot water usage in litres per day for each month $Vd$ , $m = factor from Table 1c x (43)$ (44) $m = 113.13   109.02   104.91   100.79   96.68   92.56   92.56   92.56   96.68   100.79   104.91   109.02   113.13    Total = Sum(44)_{112} = 1234.18  (44)  Energy content of hot water used - calculated monthly = 4.190 \times Vd, m \times nm \times DTm / 3600 \times Wh / month (see Tables 1b, 1c, 1d)  (45) m = 167.77   146.74   151.42   132.01   126.67   109.3   101.29   116.23   117.61   137.07   149.62   162.48    Total = Sum(45)_{112} = 1618.2  (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46) m = 25.17   22.01   22.71   19.8   19   16.4   15.19   17.43   17.64   20.56   22.44   24.37  (46)  Water storage loss:$
Total = Sum(44) <sub>112</sub> = 1234.18 (44) Energy content of hot water used - calculated monthly = $4.190 \times Vd$ , $m \times nm \times DTm / 3600 \times Wh/month$ (see Tables 1b, 1c, 1d) (45)m= 167.77 146.74 151.42 132.01 126.67 109.3 101.29 116.23 117.61 137.07 149.62 162.48 Total = Sum(45) <sub>112</sub> = 1618.2 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 (46) Water storage loss:
Energy content of hot water used - calculated monthly = $4.190 \times Vd$ , $m \times nm \times DTm / 3600 \text{ kWh/month}$ (see Tables 1b, 1c, 1d)  (45)m= 167.77     146.74     151.42     132.01     126.67     109.3     101.29     116.23     117.61     137.07     149.62     162.48      Total = Sum(45) <sub>112</sub>   1618.2     (45)  (46)m= 25.17     22.01     22.71     19.8     19     16.4     15.19     17.43     17.64     20.56     22.44     24.37      Water storage loss:
Total = Sum(45) <sub>112</sub> = 1618.2 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) $(46)m = 25.17  22.01  22.71  19.8  19  16.4  15.19  17.43  17.64  20.56  22.44  24.37$ Water storage loss:
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 Water storage loss:
(46)m= 25.17 22.01 22.71 19.8 19 16.4 15.19 17.43 17.64 20.56 22.44 24.37 Water storage loss:
Water storage loss:
If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:
a) If manufacturer's declared loss factor is known (kWh/day):  0 (48)
Temperature factor from Table 2b 0 (49)
Energy lost from water storage, kWh/year (48) x (49) = 0 (50)
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  0 (51)
If community heating see section 4.3
Volume factor from Table 2a 0 (52)
Temperature factor from Table 2b 0 (53)

Energy lost fro		•	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or	. , ,	,									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n			•	
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	/)m = (56)	m where (	H11) is fro	m Append	IX H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Primary circuit				•	•	` '	` '						
(modified by						i	<del></del>	<del></del>		<del></del>	i	1	,,
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m					_	
(61)m= 50.96	46.03	50.96	49.32	49.27	45.65	47.17	49.27	49.32	50.96	49.32	50.96		(61)
Total heat req	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= 218.73	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	contribut	ion to wate	er heating)	•	
(add additiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 218.73	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2207.36	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n1 + 0 8 x	[(46)m	+ (57)m	+ (59)m	1	
							. (0.)	.,	( TO)	· (01)	1 (00)111	J	
(65)m= 68.52	60.3	63.09	56.22	54.43	47.76	45.47	50.96	51.44	58.32	62.08	66.76	, 	(65)
(65)m= 68.52 include (57)				54.43	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57)	m in calc	culation o	of (65)m	54.43 only if c	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57) 5. Internal ga	m in cald ains (see	culation of Table 5	of (65)m and 5a	54.43 only if c	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57)	m in cald ains (see	culation of Table 5	of (65)m and 5a	54.43 only if c	47.76	45.47	50.96 dwelling	51.44	58.32	62.08	66.76		(65)
include (57)  5. Internal game	m in calc ains (see as (Table	culation of Table 5	of (65)m and 5a	54.43 only if c	47.76 ylinder i	45.47	50.96	51.44 or hot w	58.32 ater is fr	62.08 om com	66.76 munity h		(65) (66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52	m in cald ains (see as (Table Feb 144.52	e Table 5 e 5), Wat Mar	of (65)m and 5a ts Apr 144.52	54.43 only if c : May 144.52	47.76 ylinder is Jun 144.52	45.47 s in the o	50.96 dwelling Aug 144.52	51.44 or hot w Sep	58.32 ater is fr	62.08 om com	66.76 munity h		
include (57)  5. Internal games  Metabolic gain  Jan	m in cald ains (see as (Table Feb 144.52	e Table 5 e 5), Wat Mar	of (65)m and 5a ts Apr 144.52	54.43 only if c : May 144.52	47.76 ylinder is Jun 144.52	45.47 s in the o	50.96 dwelling Aug 144.52	51.44 or hot w Sep	58.32 ater is fr	62.08 om com	66.76 munity h		
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52	m in calconnum in	ETable 5 E Table 5 E 5), Wate Mar 144.52 ted in Ap	of (65)m and 5a ts Apr 144.52 ppendix 14.5	54.43 only if c : May 144.52 L, equati	47.76  ylinder is  Jun  144.52 ion L9 of  9.15	45.47 s in the o  Jul 144.52 r L9a), a 9.89	Aug 144.52 Iso see 12.86	51.44 or hot w Sep 144.52 Table 5	58.32 ater is fr Oct 144.52 21.91	62.08 om com Nov 144.52	66.76 munity h		(66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games	m in calc	Evaluation of Table 5  Evaluation of Table 5  Evaluation of Table 5  Mar  144.52  Ited in Ap  19.16  ulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5	54.43 only if colors May 144.52 L, equati 10.84 dix L, equ	Jun 144.52 ion L9 of 9.15 uation L	45.47 s in the o  Jul 144.52 r L9a), a 9.89 13 or L1	50.96  dwelling  Aug 144.52 lso see 12.86 3a), also	51.44 or hot w Sep 144.52 Table 5 17.25 o see Tal	58.32 ater is fr Oct 144.52 21.91	62.08 om com Nov 144.52	Dec 144.52		(66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc	Evaluation of Table 5 E 5), Wate Mar 144.52 Ited in Ap 19.16 Evaluated in 291	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54	54.43 only if c :  May 144.52 L, equati 10.84 dix L, eq 253.76	Jun 144.52 ion L9 of 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12	51.44 or hot w Sep 144.52 Table 5 17.25 o see Tal 225.85	58.32  ater is fr  Oct 144.52  21.91  ole 5 242.31	62.08 om com Nov 144.52	66.76 munity h		(66) (67)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains	m in calc ains (see as (Table Feb 144.52 (calcula: 23.56 ins (calcula: 298.73 (calcula:	Table 5 5), Wate Mar 144.52 ted in Ap 19.16 ulated in Ap 291	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Append 274.54 ppendix	54.43 only if c :  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat	Jun 144.52 ion L9 o 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a)	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se	Sep 144.52 Table 5 17.25 see Table 225.85	58.32  ater is fr  Oct  144.52  21.91  ole 5  242.31  5	62.08 om com Nov 144.52 25.57	Dec 144.52 27.26 282.61		(66) (67) (68)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45	Table 5 2 5), Wate Mar 144.52 ted in Ap 19.16 ulated in 291 ated in Ap 37.45	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45	54.43 only if c :  May 144.52 L, equati 10.84 dix L, eq 253.76	Jun 144.52 ion L9 of 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12	51.44 or hot w Sep 144.52 Table 5 17.25 o see Tal 225.85	58.32  ater is fr  Oct 144.52  21.91  ole 5 242.31	62.08 om com Nov 144.52	Dec 144.52		(66) (67)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fain	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains	ted in Apulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45	54.43 only if c  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32  ater is fr  Oct 144.52  21.91  ble 5 242.31  5 37.45	62.08 om com Nov 144.52 25.57 263.09	Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3	ted in Aputed in	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Append 274.54 ppendix 37.45 5a) 3	54.43 only if co  May 144.52 L, equati 10.84 dix L, equati 253.76 L, equati 37.45	Jun 144.52 ion L9 o 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a)	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se	Sep 144.52 Table 5 17.25 see Table 225.85	58.32  ater is fr  Oct  144.52  21.91  ole 5  242.31  5	62.08 om com Nov 144.52 25.57	Dec 144.52 27.26 282.61		(66) (67) (68)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even	m in calc ains (see s (Table Feb 144.52 (calcular 23.56 ins (calcular 37.45 ns gains 3	ted in Apulated in	of (65)m ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 a) 3 tive valu	54.43 only if c  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat 37.45	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5)	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45	62.08  om com  Nov  144.52  25.57  263.09  37.45	66.76 munity h  Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calcula 37.45 as gains 3 raporatio -115.62	ted in Ap 19.16 ulated in 291 ted in Ap 37.45 (Table 5	of (65)m ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 a) 3 tive valu	54.43 only if co  May 144.52 L, equati 10.84 dix L, equati 253.76 L, equati 37.45	Jun 144.52 ion L9 o 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32  ater is fr  Oct 144.52  21.91  ble 5 242.31  5 37.45	62.08 om com Nov 144.52 25.57 263.09	66.76 munity h  Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3 raporatio -115.62 gains (T	ted in Apulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 5a) 3 tive valu -115.62	54.43 only if co  May 144.52 L, equati 10.84 dix L, equ 253.76 L, equat 37.45  3 es) (Tab	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se 37.45	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Table 225.85 ee Table 37.45  3	58.32 ater is fr  Oct 144.52 21.91 ble 5 242.31 5 37.45	62.08 om com Nov 144.52 25.57 263.09 37.45	Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1	m in calce is (Table Feb 144.52 (calcular 23.56 ins (calcular 37.45 ins gains 3 raporatio gains (Table 115.62 gains (Table 115	ted in Ap 19.16 ulated in Ap 37.45 (Table 5 3 on (negat -115.62 Table 5) 84.79	of (65)m ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 a) 3 tive valu	54.43 only if c  May 144.52 L, equati 10.84 dix L, eq 253.76 L, equat 37.45	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45  3  -115.62	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45  3  -115.62	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45 3 -115.62	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1  Total internal	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3 vaporatio -115.62 gains (T 89.73 gains =	ted in Ap 19.16 ulated in 291 ated in Ap 37.45 (Table 5 3 on (negate -115.62) able 5) 84.79	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 a) 3 tive valu -115.62	54.43 only if co :  May 144.52 L, equati 10.84 dix L, eqi 253.76 L, equati 37.45  3 es) (Tab -115.62	Jun 144.52 fon L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45 3 -115.62 m + (67)m	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45  3  -115.62	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tall 225.85 ee Table 37.45  3  -115.62  71.44 + (69)m + (	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45  3  -115.62  78.38 70)m + (7	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62  86.22  1)m + (72)	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62 89.74		(66) (67) (68) (69) (70) (71)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calcula 37.45 as gains 3 raporatio -115.62 gains (T 89.73 gains =	ted in Ap 19.16 ulated in Ap 37.45 (Table 5 3 on (negat -115.62 Table 5) 84.79	of (65)m and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 5a) 3 tive valu -115.62	54.43 only if co  May 144.52 L, equati 10.84 dix L, equ 253.76 L, equat 37.45  3 es) (Tab	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 ), also se 37.45  3  -115.62	51.44 or hot w  Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45  3  -115.62	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45 3 -115.62	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62		(66) (67) (68) (69) (70)

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

Orientation: Access Fac Table 6d	tor Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East 0.9x 1	x 2.88	x	19.64	x	0.76	x	0.7	=	20.85	(76)
East 0.9x 1	x 2.88	X	38.42	x	0.76	х	0.7	=	40.79	(76)
East 0.9x 1	x 2.88	X	63.27	х	0.76	х	0.7	<b>=</b>	67.18	(76)
East 0.9x 1	x 2.88	X	92.28	x	0.76	x	0.7	] =	97.98	(76)
East 0.9x 1	x 2.88	X	113.09	х	0.76	х	0.7	=	120.08	(76)
East 0.9x 1	x 2.88	X	115.77	x	0.76	х	0.7	=	122.92	(76)
East 0.9x 1	x 2.88	X	110.22	x	0.76	х	0.7	=	117.03	(76)
East 0.9x 1	x 2.88	X	94.68	x	0.76	x	0.7	=	100.53	(76)
East 0.9x 1	x 2.88	X	73.59	x	0.76	х	0.7	=	78.14	(76)
East 0.9x 1	x 2.88	X	45.59	x	0.76	x	0.7	=	48.41	(76)
East 0.9x 1	x 2.88	X	24.49	x	0.76	x	0.7	=	26	(76)
East 0.9x 1	x 2.88	X	16.15	x	0.76	x	0.7	=	17.15	(76)
West 0.9x 0.77	x 11.61	X	19.64	x	0.76	x	0.7	=	84.07	(80)
West 0.9x 0.77	x 11.61	X	38.42	x	0.76	x	0.7	=	164.45	(80)
West 0.9x 0.77	x 11.61	X	63.27	x	0.76	x	0.7	=	270.83	(80)
West 0.9x 0.77	x 11.61	X	92.28	x	0.76	x	0.7	=	394.99	(80)
West 0.9x 0.77	x 11.61	X	113.09	x	0.76	x	0.7	=	484.07	(80)
West 0.9x 0.77	x 11.61	X	115.77	x	0.76	x	0.7	=	495.54	(80)
West 0.9x 0.77	x 11.61	X	110.22	x	0.76	x	0.7	=	471.77	(80)
West 0.9x 0.77	× 11.61	X	94.68	x	0.76	х	0.7	=	405.24	(80)
West 0.9x 0.77	x 11.61	X	73.59	x	0.76	х	0.7	=	314.99	(80)
West 0.9x 0.77	x 11.61	X	45.59	x	0.76	x	0.7	=	195.14	(80)
West 0.9x 0.77	X 11.61	X	24.49	x	0.76	x	0.7	=	104.82	(80)
West 0.9x 0.77	x 11.61	X	16.15	x	0.76	x	0.7	=	69.13	(80)
Rooflights 0.9x 1	× 4.05	X	26.61	X	0.76	X	0.7	=	51.6	(82)
Rooflights 0.9x 1	× 5.4	X	26.61	X	0.76	X	0.7	=	68.79	(82)
Rooflights <sub>0.9x</sub> 1	x 4.05	X	53.79	x	0.76	x	0.7	=	104.31	(82)
Rooflights 0.9x 1	× 5.4	X	53.79	X	0.76	X	0.7	=	139.08	(82)
Rooflights 0.9x 1	× 4.05	X	92.95	X	0.76	X	0.7	=	180.24	(82)
Rooflights 0.9x 1	× 5.4	X	92.95	X	0.76	X	0.7	=	240.31	(82)
Rooflights 0.9x 1	× 4.05	X	142.44	X	0.76	X	0.7	=	276.21	(82)
Rooflights 0.9x 1	× 5.4	X	142.44	X	0.76	X	0.7	=	368.28	(82)
Rooflights 0.9x 1	x 4.05	X	180.71	x	0.76	x	0.7	=	350.43	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	180.71	x	0.76	x	0.7	=	467.24	(82)
Rooflights <sub>0.9x</sub> 1	x 4.05	X	187.72	x	0.76	х	0.7	=	364.02	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	187.72	x	0.76	х	0.7	=	485.36	(82)
Rooflights 0.9x 1	x 4.05	X	177.6	x	0.76	х	0.7	] =	344.39	(82)
Rooflights 0.9x 1	x 5.4	X	177.6	x	0.76	x	0.7	=	459.18	(82)
Rooflights 0.9x 1	x 4.05	x	148.43	x	0.76	x	0.7	=	287.83	(82)

Rooflights 0	).9x 1	X	5.	4	x	14	8.43	X		0.76	x	0.7	=	383.77	(82)
Rooflights 0	).9x 1	х	4.0	)5	x	11	0.34	x		0.76	x [	0.7	=	213.96	(82)
Rooflights 0	).9x 1	x	5.	4	x	11	0.34	X		0.76	x	0.7	=	285.28	(82)
Rooflights 0	).9x 1	x	4.0	)5	x	64	1.97	x		0.76	x	0.7	=	125.99	(82)
Rooflights 0	).9x 1	х	5.	4	x	64	1.97	x		0.76	x [	0.7	=	167.99	(82)
Rooflights 0	).9x	x	4.0	)5	x	33	3.49	x		0.76	x	0.7	=	64.94	(82)
Rooflights 0	).9x	x	5.	4	x	33	3.49	x		0.76	x	0.7	=	86.58	(82)
Rooflights 0	).9x	x	4.0	)5	x $\lceil$	21	1.68	x		0.76	x	0.7		42.04	(82)
Rooflights 0	).9x	x	5.	4	x F	21	1.68	x		0.76	x	0.7		56.06	(82)
		<del></del>			_										
Solar gain	s in watts, c	alculated	I for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 225	5.31 448.64	758.56	1137.47	1421.82	146	7.84	1392.37	1177	7.37	892.36	537.52	282.35	184.38		(83)
Total gains	s – internal a	and solar	(84)m =	= (73)m -	+ (83	3)m ,	watts		•			•	•	•	
(84)m= 708	3.95 930	1222.87	1573.95	1828.94	184	6.91	1753.92	154	6.2	1276.26	949.48	726.58	653.35		(84)
7. Mean i	nternal tem	perature	(heating	season	)										
	ture during l		, ,		<i>'</i>	rea fi	rom Tab	ole 9.	. Th′	1 (°C)				21	(85)
•	n factor for g	٠.			•			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	. ( •)					(、。,
	an Feb	Mar	Apr	May	Ė.	un	Jul	A	ug	Sep	Oct	Nov	Dec	1	
<u> </u>	1 0.99	0.96	0.85	0.66	┢	47	0.34	0.4	<del>-  </del>	0.69	0.95	0.99	1		(86)
	arnal tampa	roturo in	living or	00 T1 /fc	المال	, eter	o 2 to 7	l 7 in T	l	. 00)		1		1	
	ernal tempe .64 19.89	20.29	20.71	20.93	_	.99	21	2		20.94	20.55	19.99	19.59	1	(87)
. ,					l	L					20.00	10.00	10.00		(0.)
· -	ture during l	<del></del>		i		<del>-</del>			$\overline{}$	<u> </u>		1	·	1	(55)
(88)m= 20	.01 20.01	20.01	20.02	20.02	20	.02	20.02	20.	02	20.02	20.02	20.01	20.01		(88)
Utilisation	n factor for g	gains for	rest of d	welling,	h2,n	n (se	e Table	9a)						_	
(89)m=	1 0.99	0.95	0.82	0.6	0.	.4	0.27	0.3	32	0.61	0.93	0.99	1		(89)
Mean inte	ernal tempe	rature in	the rest	of dwelli	na T	Γ2 (fo	llow ste	eps 3	to 7	' in Tabl	e 9c)				
	.76 19.01	19.4	19.8	19.97	<u> </u>	.02	20.02	20.	$\overline{}$	19.99	19.66	19.12	18.71	]	(90)
					!					f	LA = Livi	ng area ÷ (4	4) =	0.26	(91)
Moon into	arnal tampa	ratura (fa	r tha wh	olo duro	llina	\ _ fl	Λ Τ1	. /1	fl	۸) T2					
	ernal tempe .98 19.23	19.63	20.03	20.22		.26	20.27	20.		20.23	19.89	19.34	18.94	1	(92)
` ′	ustment to											10.04	10.04		(/
· · · · · · · · · · · · · · ·	.83 19.08	19.48	19.88	20.07	_	.11	20.12	20.		20.08	19.74	19.19	18.79	1	(93)
	heating req	uirement										L			
•	the mean in			re obtain	ed a	at ste	p 11 of	Tabl	le 9b	o, so tha	t Ti.m=	(76)m an	d re-cal	culate	
	tion factor f		•							,	,	( )		_	
J	an Feb	Mar	Apr	May	J	un	Jul	Αı	ug	Sep	Oct	Nov	Dec		
Utilisation	n factor for g	gains, hm	:											-	
(94)m=	1 0.98	0.94	0.81	0.6	0.	41	0.28	0.3	33	0.61	0.92	0.99	1		(94)
	ins, hmGm	<del>- `</del>	<u> </u>	<del></del>										•	
(95)m= 705	5.47 915.15	1151.36	1275.34	1105.37	752	2.93	484.3	510	.14	784.54	872.75	718.26	651.1		(95)
	average exte	1	i –	i						-			1	1	
` '	.3 4.9	6.5	8.9	11.7	<u> </u>	4.6	16.6	16.		14.1	10.6	7.1	4.2	]	(96)
	rate for me	1	<u>.</u>	r			- ,	_ <u>-`</u>	<del>-</del> -	<u> </u>		1		1	/a=:
(97)m= 203	8.12 1986.09	1814.52	1524.66	1159.98	759	9.87	485.14	512	.04	825.88	1266.75	1680.54	2033.72	J	(97)

Space heating	g require	ement fo	r each m	nonth, k\	Nh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m= 991.49	719.67	493.39	179.51	40.63	0	0	0	0	293.14	692.84	1028.67		
							Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	4439.33	(98)
Space heating	g require	ement in	kWh/m²	?/year								34.6	(99)
9a. Energy red	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heatir	•			, ,							г		7,004
Fraction of sp			-		mentary	•		(004)			Ļ	0	(201)
Fraction of sp			•	` ,			(202) = 1 -		(000)1		Ļ	1	(202)
Fraction of to		_	•				(204) = (20	02) <b>x</b> [1 –	(203)] =		Ļ	1	(204)
Efficiency of r	-										Ļ	91.8	(206)
Efficiency of s	seconda	ry/suppl	ementar	y heating	g systen	า, % <del></del>						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating	g require 719.67	ement (c 493.39	alculated	d above;	0	0	0	0	293.14	692.84	1028.67		
							U	U	293.14	092.04	1020.07		(244)
$(211)m = \{[(98)]$	783.96	537.46	195.54	44.26	0	0	0	0	319.32	754.73	1120.56		(211)
								l (kWh/yea				4835.87	(211)
Space heating	g fuel (s	econdar	y), kWh/	month							L		
= {[(98)m x (20	1)]}x1	00 ÷ (20	8)										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<i>=</i>	0	(215)
Water heating		tor (oolo	ulatad al	hovo)									
Output from wa	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		
Efficiency of w	ater hea	ter										82.5	(216)
(217)m= 89.97	89.66	88.89	86.88	84.1	82.5	82.5	82.5	82.5	87.93	89.55	90.06		(217)
Fuel for water													
(219)m = (64) (219)m = 243.12	m x 100 214.98	) ÷ (217) 227.68	m 208.71	209.2	187.82	179.95	200.6	202.34	213.85	222.16	237.01		
(210)	21 1100							I = Sum(2			1 201.01	2547.4	(219)
Annual totals										Wh/year	. L	kWh/yea	
Space heating	fuel use	ed, main	system	1						•		4835.87	
Water heating	fuel use	d									Γ	2547.4	$\bar{1}$
Electricity for p	umps, fa	ans and	electric	keep-ho	t						_		_
central heatin	g pump:										30		(230c)
Total electricity	for the	above, l	«Wh/yea	r			sum	of (230a).	(230g) =			30	(231)
Electricity for li	ghting										Ī	468.38	(232)

**Energy** kWh/year

Emission factor kg CO2/kWh Emissions kg CO2/year

Space heating (main system 1)	(211) x	0.216	=	1044.55	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	550.24	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1594.79	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	243.09	(268)
Total CO2, kg/year	sum	of (265)(271) =		1853.45	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		14.45	(273)
El rating (section 14)				86	(274)



# APPENDIX B3 SAP OUTPUTS FOR SAMPLE UNITS "GREEN"

			Hoor	) otoilo						
Assessor Name: Software Name:	Matthew Stainrod Stroma FSAP 201	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
Address	1F-3, Bertram Stree			Address	06-18-6	59419 1	F-3			
Address: 1. Overall dwelling dim	•	et, Londo	)TI							
1. Overall awelling aim	C11310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.4	(2a) =	169.8	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) 7	70.75	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	169.8	(5)
2. Ventilation rate:										
		econdar neating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	<b>]</b> + [	0	] = [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive vent	S					0	x	10 =	0	(7b)
Number of flueless gas						0	X	40 =	0	(7c)
rtamber et naereee gae	00				L					(,,,)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	Sa)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
	been carried out or is intend	ed, procee	d to (17), (	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	O OF for atoal or timbor	f=====================================	0.25 (0.				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
deducting areas of open		sporialing to	o g. oa.		a (artor					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
ŭ	vs and doors draught s	tripped		0.05 (0.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	, q50, expressed in cul	nia matra	o por bo	. , , ,	, , ,	, , ,	, ,	aroa	0	(16)
If based on air permeab	• •		•	•	•	elle oi e	rivelope	alea	0.15	(17)
·	ies if a pressurisation test ha					is being u	sed		0.15	(10)
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind speed	d							1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7	•	•				•		•	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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	]	
						ь			1	

Adjusted infilt	ration rat	e (allow	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		•	rate for t	he appli	cable ca	se	•	•	•	•	•		(220)
If exhaust air h			endix N (2	23h) <i>- (23</i> :	a) × Fmv (4	equation (I	NS)) othe	rwise (23h	) = (23a)			0.5	(23a)
If balanced wit									) = (20a)			0.5	(23b) (23c)
a) If balance		•	•	_					2h)m + (	23h) 🗴 [¹	1 <i>– (2</i> 3c)	79.9 ÷ 1001	(230)
(24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	. 100]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	л ЛV) (24t	p)m = (22)	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 ver	ntilation o	or positiv	e input	ventilatio	n from o	outside					
if (22b)r	m < 0.5 >	<b>(</b> 23b), 1	then (24	c) = (23k	o); other	wise (24	c) = (22h	b) m + 0.	.5 × (23b	)	,	•	
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)ı	ventilation m = 1, th								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)	-	-			
(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openir		Net Ar A ,r		U-val W/m2		A X U (W/l		k-value kJ/m²-l		X k J/K
Doors		( )			2.1	x	1.4		2.94	$\stackrel{\prime}{\Box}$			(26)
Windows Type	e 1				3.8	x1	/[1/( 1.4 )+	0.04] =	5.04	一			(27)
Windows Type	e 2				15.96	3 x1	/[1/( 1.4 )+	0.04] =	21.16				(27)
Walls Type1	47.6	64	21.8	6	25.78	3 X	0.15	= i	3.87		14	360.9	(29)
Walls Type2	8.0	2	0		8.02	X	0.14	<del>-</del>	1.13	T i	14	112.2	28 (29)
Total area of	elements	s, m²	<u></u>		55.66	3							(31)
Party wall					31.5	1 x	0	=	0		20	630.	2 (32)
Party floor					70.75	5					40	2830	(32a)
Party ceiling					70.75	5				Ī	30	2122	.5 (32b)
Internal wall *	*				105.6	3				Ī	9	950.	4 (32c)
* for windows and ** include the are						lated using	formula 1	1/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)	) + (32) =				34.13	(33)
Heat capacity	Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	7006.3	(34)
Thermal mass	s parame	eter (TMI	⊃ = Cm -	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			99.03	(35)
For design asses can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		_
Thermal bridg	es : S (L	.xY) cal	culated	using Ap	pendix l	K						5.36	(36)
if details of therm		are not kr	nown (36) :	= 0.15 x (3	31)								_
Total fabric he		, .						. ,	(36) =	·> :		39.5	(37)
Ventilation he	1	1	<u> </u>	<u> </u>	1	11	<b>1</b>	<del>- `                                   </del>	= 0.33 × (		_	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

										l			(00)
` '	14.56	14.38	13.49	13.31	12.42	12.42	12.24	12.78	13.31	13.67	14.03		(38)
Heat transfer co			50.00	50.04	54.00	54.00		· · · ·	= (37) + (37)	<del></del>			
(39)m= 54.24	54.06	53.88	52.99	52.81	51.92	51.92	51.74	52.27	52.81	53.17	53.52	52.94	(39)
Heat loss param	neter (H	ILP), W/	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 / 1 Z=	52.94	(39)
(40)m= 0.77	0.76	0.76	0.75	0.75	0.73	0.73	0.73	0.74	0.75	0.75	0.76		<b>–</b> , .
Number of days	in mor	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	0.75	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heatir	ng ener	gy requi	rement:								kWh/ye	ar:	
Assumed occup	anay I	NI.											(40)
if TFA > 13.9, if TFA £ 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.26		(42)
Annual average	hot wa										<b>7</b> .97		(43)
Reduce the annual a							to achieve	a water us	se target o	f			
							Ι	0	0.1	NI.			
Jan Hot water usage in I	Feb litres per	Mar dav for ea	Apr ach month	May <i>Vd.m</i> = fa	Jun ctor from 7	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 96.77	93.25	89.73	86.22	82.7	79.18	79.18	82.7	86.22	89.73	93.25	96.77		
(44)111= 30.77	55.25	00.70	00.22	02.1	75.10	75.10	02.7			m(44) <sub>112</sub> =	<del></del>	1055.7	(44)
Energy content of he	ot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x E	OTm / 3600			· /	L		<b></b> ` ′
(45)m= 143.51	125.51	129.52	112.92	108.35	93.5	86.64	99.42	100.61	117.25	127.98	138.98		
If in atomton a cua was	tor booti	na ot noint	of upo (no	, hat water	· otorogo)	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	=	1384.18	(45)
If instantaneous wat								` ′					(40)
(46)m= 21.53 Water storage Id	18.83 OSS:	19.43	16.94	16.25	14.02	13	14.91	15.09	17.59	19.2	20.85		(46)
Storage volume		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	ating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage lo		adarad l	ooo foot	ar io kao		·/do./\							(40)
a) If manufacture  Temperature factors				DI IS KITO	WII (KVVI	i/uay).					0		(48)
Energy lost from				aar			(48) x (49)	١ _			0		(49)
b) If manufactur		-	-		or is not		(40) X (43)	_		1	10		(50)
Hot water storage	-			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community he	_		on 4.3								1		
Volume factor fr Temperature fac			2h							<b>—</b>	.03		(52) (53)
Energy lost from				oor			(47) v (51)	v (52) v (I	52) -		0.6		` '
Enter (50) or (5		_	, KVVII/ye	ai			(47) x (51)	) X (32) X (	55) =		.03		(54) (55)
Water storage lo	, ,	•	or each	month			((56)m = (	55) × (41)r	m		.00		(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains of												кH	(-2)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(= /			1							I			. ,

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m	
(modified by factor from Table H5 if there is solar water heating and a cylinder the	hermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51 2	23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0	0 0 0 (61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45	5)m + (46)m + (57)m + (59)m + (61)m
	172.52 181.48 194.26 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar co	ontribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	g,
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
	172.52 181.48 194.26
	er heater (annual) <sub>112</sub> 2035.02 (64)
Heat gains from water heating, kWh/month 0.25 $^{\circ}$ [0.85 × (45)m + (61)m] + 0.8 x [(	· · ·
	83.21 85.35 90.43 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water	er is from community neating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov Dec
(66)m= 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 113.21 1	113.21 113.21 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 17.74 15.76 12.82 9.7 7.25 6.12 6.62 8.6 11.54 1	14.66 17.11 18.24 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table	e 5
(68)m= 199.04 201.11 195.9 184.82 170.83 157.69 148.91 146.84 152.05 1	163.13 177.11 190.26 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 34.32 3	34.32 34.32 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57 -90.57	-90.57 -90.57 -90.57 (71)
Water heating gains (Table 5)	
	111.84 118.54 121.55 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)$	
g	346.58 369.73 387.01 (73)
6. Solar gains:	( )
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the a	applicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m <sup>2</sup> Table 6a Table 6b	Table 6c (W)
North 0.9x 0.77 × 3.8 × 10.63 × 0.558	x 0.7 = 10.94 (74)
North 0.9x 0.77 x 3.8 x 20.32 x 0.558	x 0.7 = 20.9 (74)
2 2	20.0

	_								_						_		
North	0.9x	0.77	x	:;	3.8	X	3	34.53	X		0.558	X	0.7	=	• <u>L</u>	35.52	(74)
North	0.9x	0.77	Х	; ;	3.8	X	5	55.46	X		0.558	X	0.7	-		57.05	(74)
North	0.9x	0.77	X	; ;	3.8	X	7	4.72	X		0.558	X	0.7	-		76.85	(74)
North	0.9x	0.77	Х	;	3.8	X	7	79.99	X		0.558	X	0.7	-		82.27	(74)
North	0.9x	0.77	х	;	3.8	x	7	4.68	X		0.558	X	0.7			76.81	(74)
North	0.9x	0.77	X	: ;	3.8	x	5	9.25	X		0.558	X	0.7			60.94	(74)
North	0.9x	0.77	х	: ;	3.8	x	4	1.52	X		0.558	X	0.7	=		42.7	(74)
North	0.9x	0.77	х	;	3.8	x	2	24.19	x		0.558	x	0.7	=		24.88	(74)
North	0.9x	0.77	х	; ;	3.8	x	1	3.12	x		0.558	x	0.7	-		13.49	(74)
North	0.9x	0.77	х	; ;	3.8	x		8.86	x		0.558	х	0.7	-		9.12	(74)
West	0.9x	0.77	х	1:	5.96	x	1	9.64	X		0.56	X	0.7			84.85	(80)
West	0.9x	0.77	×	1:	5.96	x	3	88.42	X		0.56	X	0.7		• [	165.98	(80)
West	0.9x	0.77	×	1:	5.96	x	6	3.27	x		0.56	x	0.7		• [	273.35	(80)
West	0.9x	0.77	×	1:	5.96	x	9	2.28	x		0.56	x	0.7	╗ -	· ┌	398.66	(80)
West	0.9x	0.77	×	1:	5.96	x	1	13.09	x		0.56	x	0.7	╡ =	• 🗖	488.58	(80)
West	0.9x	0.77	×	1:	5.96	×	1	15.77	x		0.56	x	0.7	╡ =	•	500.15	(80)
West	0.9x	0.77	×	1:	5.96	x	1	10.22	х		0.56	x	0.7		Ē	476.16	(80)
West	0.9x	0.77	×	1:	5.96	x	9	94.68	x		0.56	x	0.7		Ē	409.01	(80)
West	0.9x	0.77	×	1:	5.96	x	7	73.59	x		0.56	x	0.7		▗▕▔	317.92	(80)
West	0.9x	0.77	×	1:	5.96	x	4	l5.59	x		0.56	x	0.7		┇	196.95	(80)
West	0.9x	0.77	×	1:	5.96	×	2	24.49	x		0.56	x	0.7	╡ -	· F	105.8	(80)
West	0.9x	0.77	×	1:	5.96	×	1	6.15	x		0.56	x	0.7	╡ =	┇	69.78	(80)
	_					•			•						_		_
Solar g	ains in	watts, ca	lculate	d for ea	ch mon	th			(83)m	n = Su	m(74)m .	(82)m					
(83)m=	95.79	186.88	308.87	455.71	565.43	3 5	82.42	552.97	469	.95	360.62	221.83	3 119.29	78.89			(83)
Total g	ains – i	nternal a	nd sola	r (84)m	= (73)n	n + (	83)m	, watts									
(84)m=	493.11	582.26	691.87	818.79	908.3	4 9	05.81	863.61	786	5.23	687.07	568.42	489.01	465.9			(84)
7. Mea	an inter	nal temp	erature	(heatir	g seaso	on)											
		during h					area	from Tal	ole 9	, Th1	(°C)				Г	21	(85)
Utilisa	tion fac	ctor for ga	ains for	living a	rea, h1,	m (s	ee Ta	ıble 9a)							_		_
	Jan	Feb	Mar	Apr	Ma	y T	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	;		
(86)m=	0.94	0.9	0.82	0.67	0.51		0.36	0.26	0.	3	0.5	0.76	0.9	0.95			(86)
Mean	interna	l tempera	ature in	living a	rea T1	(follo	ow ste	ps 3 to 7	7 in T	able	9c)		-				
(87)m=	19.7	19.98	20.37	20.73	20.91	<del>`</del>	20.98	21	20.		20.94	20.66	20.12	19.65			(87)
Temp	oraturo	during h	eating	nerinde	in rest (	of dv	uelling	from Ta	hla (	a Th	2 (°C)			!	_		
(88)m=	20.28	20.28	20.29	20.3	20.3	$\neg$	20.31	20.31	20.		20.31	20.3	20.3	20.29	П		(88)
L								<u> </u>	<u> </u>				1		_		
(89)m=	0.93	tor for ga	0.8	0.65	0.48		,m (se 0.32	0.22	9a) 0.2	26	0.45	0.73	0.89	0.94	$\neg$		(89)
L		<u> </u>			<u> </u>			<u> </u>			!		0.09	1 0.94			(55)
T T		l tempera		1		-	•	i	·		1		1 40 45	40.47	$\neg$		(00)
(90)m=	18.53	18.93	19.47	19.97	20.21		20.29	20.31	20.	31	20.25	19.89	19.15 ring area ÷ (4	18.47	+	0.05	(90)
											"	LA - LI\	ing area + (	<del>-,,                                   </del>	L	0.35	(91)

Mean	internal tempe	rature (fo	or the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	18.94 19.3	19.79	20.24	20.46	20.54	20.55	20.55	20.5	20.16	19.49	18.89		(92)
Apply	adjustment to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.94 19.3	19.79	20.24	20.46	20.54	20.55	20.55	20.5	20.16	19.49	18.89		(93)
8. Spa	ce heating req	uirement											
	to the mean in		•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	lisation factor f	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisat	tion factor for g	ļ		I May	Juli	Jui	Aug	Оер	Oct	INOV	Dec		
(94)m=	0.91 0.87	0.79	0.64	0.48	0.34	0.24	0.27	0.47	0.73	0.87	0.92		(94)
Useful	gains, hmGm	, W = (9	4)m x (8	4)m									
(95)m=	450.78 506.49	543.95	527.39	439.31	303.51	204.1	213.06	319.76	413.59	427.41	430.77		(95)
Month	ly average 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)
Г	oss rate for me	1	<del></del>	1	i	<del> </del>			<del></del>	1	1		(0-)
` ' L	794.29 778.57	715.99	601.05	462.46	308.22	205.12	214.71	334.31	504.86	658.81	786.02		(97)
· · -	heating requir	128 ement fo	53.03	17.22	/Vn/mon <sup>-</sup>	th = 0.02	24 x [(97	)m - (95 0	67.91	1)m 166.61	264.3		
(98)111=	255.57 162.64	120	33.03	17.22	0			l per year	<u> </u>	<u> </u>		1135.49	(98)
Space	heating requir	omont in	k\\/h/m;	2/voor			1018	ii per year	(KVVII/yCai	) = Oum(o	(O)15,912 —		╡
	<u> </u>			•								16.05	(99)
	ergy requirement		· ·	Ĭ			ting prov	idad by	0.00mm	unity ool	nomo		
	rt is used for sport of space hear									urilly SCI	ieme.	0	(301)
Fraction	n of space hea	from co	mmunity	system	1 – (30	1) =					Ī	1	(302)
The comr	munity scheme ma	y obtain h	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and	up to four	other heat	sources; th	ne latter	
	boilers, heat pump			aste heat f	rom powe	r stations.	See Appe	ndix C.			Г		¬,,,,,
	n of heat from (		-								[	0.6	(303a)
	n of community											0.4	(303b)
Fraction	n of total space	heat fro	m Comr	nunity C	HP				(3	02) x (303	sa) =	0.6	(304a)
Fraction	n of total space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	8b) =	0.4	(304b)
Factor f	or control and	charging	method	l (Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribu	tion loss factor	(Table 1	12c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space I	heating										_	kWh/yeaı	<u>r_</u>
Annual	space heating	requiren	nent									1135.49	
Space h	neat from Com	munity C	HP					(98) x (30	04a) x (30	5) x (306)	= [	715.36	(307a)
											L		
Space h	neat from heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	= [	476.91	(307b)
	neat from heat cy of secondar			heating	system	in % (fro	om Table				= [ [	476.91 0	(307b) (308
Efficien		y/supple	mentary	_	-	,		e 4a or A		E)	= [ [		Ⅎ`
Efficien	cy of secondar	y/supple	mentary	_	-	,		e 4a or A	ppendix	E)	= [	0	(308
Efficiend Space h	cy of secondar	y/supple ment fro	mentary m secor	_	-	,		e 4a or A	ppendix	E)	= [ [ [	0	(308
Efficience Space h Water h Annual If DHW	cy of secondar neating require	y/supple ment fro requirem	mentary m secon ent ne:	_	-	,		e 4a or A (98) x (30	ppendix	÷ (308) =	]	0	(308

Water heat from heat source 2	(64) x (303b) x (305) x (306) =	854.71	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	33.29	](313)
Cooling System Energy Efficiency Ratio	0.01 × [(0014)(0010) + (0104)(0100)] =	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):	- (101) + (314) -	0	
mechanical ventilation - balanced, extract or positive input f	rom outside	137.24	(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) =	137.24	(331)
Energy for lighting (calculated in Appendix L)		313.38	(332)
Electricity generated by PVs (Appendix M) (negative quantit	ty)	-456.3	(333)
Electricity generated by wind turbine (Appendix M) (negative	e quantity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor		
Space heating from CHP) $(307a) \times 100 \div (362) =$	kWh/year kg CO2/kWh	kg CO2/year	7,,,,,
Space meaning meaning in	1556.82 X 0.22	336.27	(363) (363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	462.84 X 0.52	-240.22	<u></u> (364)
Water heated by CHP (310a) × 100 ÷ (362) =	2790.13 × 0.22	602.67	<u> </u> (365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	829.51 X 0.52	-430.51	<u></u> (366)
	using two fuels repeat (363) to (366) for the second fue	<u> </u>	(367b)
	07b)+(310b)] x 100 ÷ (367b) x 0.22	316.08	<u> </u> (368)
Electrical energy for heat distribution	[(313) x 0.52	17.28	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	601.57	(373)
CO2 associated with space heating (secondary)	(309) x 0	0	(374)
CO2 associated with water from immersion heater or instan	taneous heater (312) x 0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =	601.57	(376)
CO2 associated with electricity for pumps and fans within de	welling (331)) x 0.52 =	71.23	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	162.64	(379)
Energy saving/generation technologies (333) to (334) as ap Item 1	plicable 0.52 × 0.01 =	-236.82	(380)
Total CO2, kg/year sum of (376)(382) =		598.62	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		8.46	(384)
El rating (section 14)		93.07	(385)

			User_[	Details:						
Assessor Name: Software Name:	Matthew Stainro Stroma FSAP 20			Strom Softwa					0023501 on: 1.0.4.16	
			i i	Address	06-18-6	59419 1	F-4			
Address :	1F-4, Bertram Stre	eet, Londo	n							
1. Overall dwelling dime	ensions:		Λ	a/m²\		Av. Ha	! or lo 4 / roo \		Valuma/m³	`
Ground floor				<b>a(m²)</b> 58.06	(1a) x		2.4	(2a) =	Volume(m³	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	1e)+(1r	n) :	58.06	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	139.34	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	′y □ +	other 0	7 = [	total 0	x	40 =	m³ per hou	r
Number of open flues			<b>Ⅎ</b> ͺͰ		]		x	20 =		=
·	U	0		0	J Ū	0			0	(6b)
Number of intermittent fa					Ĺ	0		10 =	0	(7a)
Number of passive vents	S				L	0	X '	10 =	0	(7b)
Number of flueless gas t	fires					0	X 4	40 =	0	(7c)
								Air cl	nanges per ho	our
Infiltration due to chimne	evs. flues and fans =	(6a)+(6b)+(7	<sup>7</sup> a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has					ontinue fr	_		. (0) –		
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	present, use the value corr				•	ruction			0	(11)
deducting areas of open If suspended wooden	• / /	aled) or 0	1 (spal	معام (امد	antar N					(12)
If no draught lobby, er	•	,	. i (Scai	eu), eise	enter o				0	(13)
Percentage of window									0	(14)
Window infiltration	g			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 co	ubic metre	s per h	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeab	ility value, then (18) = [	(17) ÷ 20]+(	8), otherw	vise (18) = (	16)				0.15	(18)
Air permeability value appli		as been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelter Shelter factor	ed			(20) = 1 -	in n75 v (1	Q)1 <b>–</b>			3	(19)
Infiltration rate incorpora	ting shelter factor			(20) = 1 (21) = (18)	`	0/] =			0.78	(20)
Infiltration rate modified	-	ad		(21) - (10	/ X (20) =				0.12	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s		<u>, 1 </u>	1	1		1 - 50.	1		1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
	LL		I	1		l		1	1	
Wind Factor $(22a)m = (2a)m =$	<del>'</del>	1		1			T		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	]	

Adjusted infiltra	ation rate (allo	wing for sl	helter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.15	0.15 0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effect	•	e rate for i	the appli	cable ca	ise	•	•	•	•	•	<i>-</i>	
If mechanica	i ventilation: at pump using Ap	onendiy N. (3	23h) - (23:	a) v Emy (4	aguation (	N5N othe	rwise (23h	n) – (23a)			0.5	(23a
	heat recovery: ef							) = (20a)			0.5	(23b
	-	-	_					2h\m . (	22h) v [	1 (226)	79.9	(230
(24a)m= 0.25	d mechanical 0.25 0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24	) <del>-</del> 100] ]	(24a
` '	d mechanical		ļ	ļ		<u> </u>	<u> </u>	<u> </u>		0.24	]	(= :-
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	1	(24b
· ·	ouse extract v										_	
	$1 < 0.5 \times (23b)$							.5 × (23b	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(240
d) If natural v	/entilation or v	vhole hous	se positi	ve input	ventilati	on from	loft	ļ	<u>!</u>	<u> </u>	1	
,	1 = 1, then (24		•					0.5]			_	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(240
Effective air	change rate -	enter (24a	a) or (24l	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m= 0.25	0.25 0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25)
3. Heat losses	s and heat los	s paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value		X k J/K
Doors	aroa (m.)			2.1	 x	1.4		2.94		110/111		(26)
Windows Type	1			15.96	= ,	/[1/( 1.4 )+		21.16	=			(27)
Windows Type				2.4	_	/[1/( 1.4 )+		3.18	=			(27)
Floor	_				= "		=			75	4354	— ` <i>`</i>
Walls Type1	20.04	00.4		58.06	=	0.2	_	11.612		75	= =	=
Walls Type2	30.84	20.4	0	10.38	=	0.15	=	1.56		14	145.3	=
	24.12	0	_	24.12	<u> </u>	0.14	=	3.4	_	14	= =	(29)
Walls Type3	9.6	0		9.6	X	0.15	=	1.44		14	134.	``
Total area of el	ements, m <sup>2</sup>			122.6	2			_				(31)
Party wall				16.32	2 X	0	=	0		20	326.	4 (32)
Party ceiling				58.06	5				إ	30	1741	.8 (32b
Internal wall **				81.6						9	734.	4 (320
* for windows and ** include the area					lated using	g formula 1	1/[(1/U-valı	ue)+0.04] á	as given in	n paragrapi	h 3.2	
Fabric heat los	s, $W/K = S (A)$	x U)				(26)(30	) + (32) =				45.29	(33)
Heat capacity (	$Cm = S(A \times k)$	)					((28).	(30) + (32	2) + (32a)	(32e) =	7774.5	(34)
Thermal mass	parameter (TN	MP = Cm -	÷ TFA) ir	n kJ/m²K			= (34)	) ÷ (4) =			133.9	(35)
- , .	ments where the	details of the	e construct	tion are no	t known p	recisely the	e indicative	e values of	TMP in T	able 1f		
For design assess can be used instead												
-	nd of a detailed ca	alculation.			K						13.72	(36)
can be used instea	nd of a detailed ca es:S (L x Y) c I bridging are not	alculation. alculated	using Ap	pendix l	K						13.72	(36)

Ventilation	heat	loss ca	alculated	l monthly	<u>/</u>				(38)m	= 0.33 × (	25)m x (5)			
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 11	1.44	11.3	11.17	10.5	10.37	9.7	9.7	9.57	9.97	10.37	10.64	10.9		(38)
Heat trans	sfer co	efficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 70	).45	70.31	70.18	69.51	69.38	68.71	68.71	68.58	68.98	69.38	69.64	69.91		
Heat loss	param	neter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	69.48	(39)
(40)m= 1.	.21	1.21	1.21	1.2	1.19	1.18	1.18	1.18	1.19	1.19	1.2	1.2		
Number o	f days	in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.2	(40)
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water	heatir	ng ener	gy requi	irement:								kWh/ye	ear:	
Assumed	occun	ancy N	N								1	93		(42
	· 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		93		(42
Annual av	erage	hot wa										.95		(43
Reduce the a		_				_	_	to achieve	a water us	se target o	f			
			•			i .	·	Γ.			l			
J Hot water us	an	Feb litres per	Mar day for ea	Apr	May Vd m = fa	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	<del>-</del>		81.55			1	1	· <i>'</i>	70.05	81.55	04.75	07.04		
(44)m= 87	7.94	84.75	61.55	78.35	75.15	71.95	71.95	75.15	78.35		84.75 m(44) <sub>112</sub> =	87.94	959.39	(44
Energy conte	ent of h	ot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600					939.39	(
(45)m= 13	0.42	114.07	117.7	102.62	98.46	84.97	78.73	90.35	91.43	106.55	116.31	126.3		
lf instantane	ous wat	ter heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1257.91	(45
	- 1	17.11	17.66	15.39	14.77	12.75	11.81	13.55	13.71	15.98	17.45	18.95		(46
Water stor	•					/\/\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		201.2		1				
Storage vo		,		•			_		ame ves	sel		0		(47
lf commur Otherwise Water stoi	if no	stored			_			. ,	ers) ente	er '0' in (	47)			
a) If manu	•		eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(48
Temperati	ure fac	ctor fro	m Table	2b								0		(49
Energy los	st from	n water	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50
b) If manu				-										
Hot water					e 2 (kW	h/litre/da	ıy)				0.	02		(51
f commur Volume fa	-	-		on 4.3								00		(50
rolullie la Temperati				2b								.6		(52 (53
Energy los					ear			(47) x (51)	x (52) x (	53) =		03		(54
Enter (50)			_	,y(				( · · ) // ( <b>o</b> · )	, ( <del>==</del> )	/		03		(55
Water stoi	, ,	, ,	•	for each	month			((56)m = (	55) × (41)	m	<u>'</u>	-		, -
	<del>-</del> -	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56
		_0.0_	52.51	L 55.55	52.01	1 30.00	1 52.51	L 32.31	1 20.00	l	1 20.00	1 02.01		,,

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (5	<del>57</del> )
Primary circuit loss (annual) from Table 3 0 (5	8)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (5	9)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m =	51)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 185.7 163.99 172.98 156.11 153.74 138.46 134.01 145.63 144.92 161.83 169.8 181.58 (6	2)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (6	3)
Output from water heater	
(64)m= 185.7 163.99 172.98 156.11 153.74 138.46 134.01 145.63 144.92 161.83 169.8 181.58	
Output from water heater (annual) <sub>112</sub> 1908.75 (6	4)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 87.59 77.87 83.36 76.92 76.96 71.05 70.4 74.26 73.19 79.65 81.47 86.22 (6	55)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
	i7)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	,
(68)m=   168.03   169.77   165.38   156.02   144.22   133.12   125.71   123.96   128.36   137.71   149.52   160.62   (68)m=   168.03   169.77   165.38   156.02   160.62   (68)m=   168.03   169.77   165.38   169.77   169	(8)
	Ο,
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	.0/
	9)
Pumps and fans gains (Table 5a) (70)m=	<b>'</b> (0)
Losses e.g. evaporation (negative values) (Table 5)	٠,
(71)m= -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05 -77.05	'1)
Water heating gains (Table 5)	,
	<b>'</b> 2)
Total internal gains = $ (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m $	,
(73)m= 352.63 350.85 340.13 322.94 305.68 288.86 277.81 282.93 291.66 309.03 329 343.79 (7	<b>'3</b> )
6. Solar gains:	~,
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_			ii.						-			_					_
North	0.9x	0.77		X	2.4	1	X	1	0.63	X	(	0.558	X	0.7		=	6.91	(74)
North	0.9x	0.77		X	2.4	1	X	2	0.32	X	(	0.558	X	0.7		=	13.2	(74)
North	0.9x	0.77		X	2.4	1	X	3	4.53	X	(	0.558	X	0.7		=	22.43	(74)
North	0.9x	0.77		x	2.4	1	X	5	5.46	X	(	0.558	X	0.7		=	36.03	(74)
North	0.9x	0.77		x	2.4	1	x	7	4.72	X	(	0.558	X	0.7		=	48.54	(74)
North	0.9x	0.77		x	2.4	1	x	7	9.99	X	(	0.558	X	0.7		=	51.96	(74)
North	0.9x	0.77		x	2.4	1	x	7	4.68	X	(	0.558	X	0.7		=	48.51	(74)
North	0.9x	0.77		x	2.4	1	х	5	9.25	X	(	0.558	X	0.7		=	38.49	(74)
North	0.9x	0.77		x	2.4	1	х	4	1.52	X	(	0.558	X	0.7		=	26.97	(74)
North	0.9x	0.77		x	2.4	1	х	2	4.19	X	(	0.558	X	0.7		=	15.71	(74)
North	0.9x	0.77		x	2.4	1	x	1	3.12	X	(	0.558	x	0.7		=	8.52	(74)
North	0.9x	0.77		x	2.4	1	х	8	3.86	X	(	0.558	X	0.7		=	5.76	(74)
East	0.9x	1		x	15.9	96	x	1	9.64	X	(	0.56	X	0.7		=	84.85	(76)
East	0.9x	1		x	15.9	96	x	3	8.42	X	(	0.56	x	0.7		=	165.98	(76)
East	0.9x	1		x	15.9	96	х	6	3.27	X	(	0.56	X	0.7		=	273.35	(76)
East	0.9x	1		x	15.9	96	x	9	2.28	X	(	0.56	x	0.7		=	398.66	(76)
East	0.9x	1		x	15.9	96	x	1	13.09	X	(	0.56	x	0.7		=	488.58	(76)
East	0.9x	1		x	15.9	96	x	1	15.77	X	(	0.56	X	0.7		=	500.15	(76)
East	0.9x	1		x	15.9	96	x	1	10.22	X	(	0.56	×	0.7		=	476.16	(76)
East	0.9x	1		x	15.9	96	x	9	4.68	X	(	0.56	x	0.7		=	409.01	(76)
East	0.9x	1		x	15.9	96	x	7	3.59	X	(	0.56	×	0.7		=	317.92	(76)
East	0.9x	1		x	15.9	96	x	4	5.59	X	(	0.56	×	0.7		=	196.95	(76)
East	0.9x	1		x	15.9	96	x	2	4.49	X	(	0.56	×	0.7		=	105.8	(76)
East	0.9x	1		x	15.9	96	x	1	6.15	X	(	0.56	X	0.7		=	69.78	(76)
							•			_						•		
		watts, ca								_		n(74)m						
(83)m=	91.76	179.18	295.	.78	434.7	537.12	2 5	52.11	524.67	447	7.5	344.89	212.6	7 114.32	75.5	3		(83)
Total g	ains – i	nternal a	nd s	olar	(84)m =	: (73)n	า + (	83)m	, watts									
(84)m=	444.38	530.03	635.	.92	757.63	842.79	8	40.97	802.48	730	.43	636.54	521.7	443.32	419.	32		(84)
7. Me	an inter	nal temp	erati	ure (	heating	seaso	n)											
Temp	erature	during h	eatir	ng pe	eriods in	the li	ving	area f	from Tal	ble 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for g	ains	for li	ving are	a, h1,	m (s	ee Ta	ble 9a)							'		_
	Jan	Feb	M	ar	Apr	Ma	/	Jun	Jul	Α	ug	Sep	Oct	Nov	De	ЭС		
(86)m=	0.97	0.94	0.9	9	0.79	0.65		0.49	0.37	0.4	11	0.64	0.86	0.95	0.9	7		(86)
Mean	interna	l temper	ature	in li	ving are	ea T1	(follo	w ste	ps 3 to 7	7 in T	able	9c)			-			
(87)m=	19.13	19.41	19.8	$\overline{}$	20.39	20.75	<del>`</del>	20.92	20.98	20.		20.82	20.31	19.62	19.0	)7		(87)
Temn	erature	during h	eatir	na ne	eriode in	rest	of du	elling	from Ta	ahla (	a Tha	2 (°C)		<u>'</u>			l	
(88)m=	19.91	19.91	19.9	<del></del>	19.92	19.92	_	9.93	19.93	19.	$\overline{}$	19.93	19.92	19.92	19.9	2		(88)
																		•
(89)m=	0.96	tor for g	0.8	-	0.76	velling 0.59	$\overline{}$	,m (se <sub>0.42</sub>	e Table 0.28	9a) 0.3	32 T	0.57	0.83	0.94	0.9	7		(89)
														0.94	L 0.9	'		(00)
Mean	interna	I temper	ature	in t	he rest	of dwe	lling	T2 (fo	ollow ste	eps 3	to 7 i	in Table	e 9c)					

(90)m=	17.44	17.85	18.5	19.22	19.67	19.87	19.92	19.92	19.77	19.13	18.16	17.36		(90)
(50)111=	17.77	17.00	10.0	10.22	10.07	10.07	10.02	10.02	<u> </u>		g area ÷ (4		0.49	(91)
						\					<b>J</b> (	' L	0.40	(01)
(92)m=	18.26	18.61	ature (fo 19.17	r the wh	20.19	20.39	LA × 11	+ (1 – fL 20.43	20.29	19.71	18.87	18.2		(92)
			ne mean								10.07	10.2		(02)
(93)m=	18.26	18.61	19.17	19.79	20.19	20.39	20.44	20.43	20.29	19.71	18.87	18.2		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(	76)m and	d re-calcı	ulate	
the ut			or gains u			1	11	A	Con	0-4	Nev	Daa		
Utilis	Jan ation fac	Feb tor for a	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.95	0.92	0.86	0.75	0.61	0.45	0.32	0.37	0.59	0.82	0.92	0.96		(94)
Usefu	⊔⊔⊔ ul gains,	hmGm ,	W = (94)	1)m x (8	4)m	<u>I</u>	<u>I</u>	<u>I</u>	Į	<u> </u>				
(95)m=	421.77	487.76	548.26	571.29	512.42	375.91	257.88	267.63	375.83	428.59	409.68	400.79		(95)
Montl	hly 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)
		964.32	an intern 889.21	al tempe 756.99	589.29	·	=[(39)m : 263.58	x [(93)m <sub>276.22</sub>	- (96)m 426.63	-	040.00	978.45		(97)
(97)m=	983.55		ement fo		l	397.53	l	l		631.9	819.89	976.45		(97)
(98)m=	417.96	320.25	253.67	133.7	57.19	0	0.02	0	0	151.26	295.35	429.78		
` '								Tota	l per year	l (kWh/year	) = Sum(98	8) <sub>15,912</sub> =	2059.16	(98)
Spac	e heatin	a reauire	ement in	kWh/m²	2/vear								35.47	(99)
•		• •	nts – Con			scheme								
			ace hea		The state of the s			tina prov	rided by	a comm	unitv sch	neme.		
			from sec								. ,		0	(301)
Fractio	on of spa	ce heat	from cor	mmunity	system	1 – (30	1) =					Ī	1	(302)
The con	nmunity sc	heme may	/ obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and t	up to four o	other heat	sources; th	e latter	_
			s, geothern		aste heat f	rom powe	r stations.	See Appe	ndix C.			Г	0.0	(2020)
			Communi	-	_							Ĺ	0.6	(303a)
Fractio	on of con	nmunity	heat fror	m heat s	source 2							Ĺ	0.4	(303b)
Fraction	on of tota	al space	heat fror	m Comn	nunity C	HP				(3	02) x (303a	a) =	0.6	(304a)
Fractio	on of tota	al space	heat fror	m comm	nunity he	at sourc	e 2			(3	02) x (303l	b) =	0.4	(304b)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem		Ī	1	(305)
Distrib	ution los	s factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m				Ī	1.05	(306)
	heating			,		•						L	kWh/yea	 r
-	_	-	requirem	ent									2059.16	<u></u>
Space	heat fro	m Comr	nunity C	HP					(98) x (30	04a) x (305	5) x (306) =	<u> </u>	1297.27	(307a)
			-								5) x (306) =	L	864.85	(307b)
Space		iii iioat t	50 ai 00 Z						(00) // (01	)	)	L	004.00	(00.0)
Space		condor	//eunnlar	mantari	heating	evetom	in % /fra	m Table	12 or 1	nnendiv	E)	Γ	^	(300
Efficie	ncy of se	•	//suppler	•	_	•	,				,	[	0	(308
Efficie	ncy of se	•	//suppler	•	_	-	,			ppendix 01) x 100 -	,	]	0	(308
Efficier Space Water	ncy of se heating	requirer	ment fror	n secon	_	-	,				,	[ ] -		=
Efficien Space Water Annua	ncy of se heating heating I water h	requirer  I neating r		m secon	_	-	,				,	] ] ]		=

Water heat from Community CUD	(64) v (2020) v (205) v (206)	1000.54	7(2400)
Water heat from Community CHP	$(64) \times (303a) \times (305) \times (306) =$	1202.51	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	801.68	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	41.66	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter	$= (107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input f	rom outside	112.62	(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) =	112.62	(331)
Energy for lighting (calculated in Appendix L)		264.55	(332)
Electricity generated by PVs (Appendix M) (negative quanti	ty)	-456.3	(333)
Electricity generated by wind turbine (Appendix M) (negative	e quantity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2823.22 × 0.22	609.82	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	839.34 × 0.52	-435.62	(364)
Water heated by CHP (310a) × 100 ÷ (362) =	2617.01 × 0.22	565.27	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	778.04 × 0.52	-403.8	(366)
Efficiency of heat source 2 (%)	using two fuels repeat (363) to (366) for the second fue	91	(367b)
CO2 associated with heat source 2 [(30	07b)+(310b)] x 100 ÷ (367b) x 0.22	395.57	(368)
Electrical energy for heat distribution	[(313) x 0.52	21.62	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	752.86	(373)
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instan	ntaneous heater (312) x 0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =	752.86	(376)
CO2 associated with electricity for pumps and fans within d	welling (331)) x 0.52	58.45	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	137.3	(379)
Energy saving/generation technologies (333) to (334) as ap	oplicable 0.52 x 0.01 =	-236.82	<b>–</b> (380)
Total CO2, kg/year sum of (376)(382) =		711.8	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		12.26	(384)
El rating (section 14)		90.75	(385)

			lloor F	) otoilo						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
Address	2F-5, Bertram Stre		· ·	Address	06-18-6	59419 2	F-5			
Address: 1. Overall dwelling dim	•	et, Londo	)I I							
1. Overall awelling aim	C11310113.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				<u> </u>	(1a) x		2.4	(2a) =	121.08	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) <u> </u>	50.45	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	121.08	(5)
2. Ventilation rate:										
Number of chimneys	heating	secondar heating	'y □ + □	other	7 <sub>=</sub> [	total		40 =	m³ per hou	_
Number of chimneys		0	╛╘	0	╛╘	0			0	(6a)
Number of open flues	0 +	0	_	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vent	s					0	X	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	x	40 =	0	(7c)
					_					
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =		0		÷ (5) =	0	(8)
	been carried out or is intend	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			_
Number of storeys in Additional infiltration	the dwelling (ns)						[(0)	410.4	0	(9)
	0.25 for steel or timber	frame or	. 0 35 fo	r masoni	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
	present, use the value corre				•	dollon			0	(11)
deducting areas of open	• / .									_
·	floor, enter 0.2 (unsea	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
• •	nter 0.05, else enter 0	اد د دانده							0	(13)
Window infiltration	vs and doors draught s	strippea		0.25 - [0.2	x (14) ± 1	001 -			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
	, q50, expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	3	(17)
If based on air permeab			•	•	•				0.15	(18)
Air permeability value appli	ies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	red								3	(19)
Shelter factor				(20) = 1 -		[9)] =			0.78	(20)
Infiltration rate incorpora	-			(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified	<del></del>	1	<del></del>	Ι.			1	<del></del>	1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	·	1		T			T	<u>-</u>	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	J	
Wind Factor (22a)m = (2	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	]	
									-	

djusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effecture of the control o		•	rate for t	he appli	cable ca	se						0.5	(23
If exhaust air h			endix N. (2	3b) = (23a	a) x Fmv (e	eguation (I	N5)) . othe	rwise (23b	) = (23a)			0.5	(23
If balanced with									, (200)			0.5	(23
a) If balance		-	•	_					2h)m + (	23h) 🗴 ['	 1 <i>– (2</i> 3c)	79.9 ÷ 1001	(2\
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24	+ 100j	(24
b) If balance	<u> </u>	L anical ve	<u> </u>		heat red	covery (N	Į	$\lim_{n \to \infty} \frac{1}{(2n)^n} = \frac{(2n)^n}{(2n)^n}$	2b)m + (:	L 23h)	ļ	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					.5 × (23b	))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation ventilation			•					0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)	•		•		
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losse	s and he	at loss i	naramet	≏r·									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-ł		
Ooors					2.1	x	1.4		2.94				(20
Vindows Type	e 1				12.17	7 x1	/[1/( 1.4 )+	0.04] =	16.13	=			(27
Vindows Type	2				1.68	x1	/[1/( 1.4 )+	0.04] =	2.23				(2
Valls Type1	30.2	27	15.9	5	14.32	2 X	0.15	i	2.15		14	200.48	(2
Valls Type2	34.0	)6	0		34.06	3 x	0.14	<b>=</b>	4.8	<b>=</b>	14	476.84	(2
otal area of e	elements	 , m²	L		64.33	=							` (3
arty wall					10.8	=	0		0		20	216	) (3
arty floor					50.45	=					40	2018	(3
arty ceiling					50.45	=					30	1513.5	=
nternal wall **					76.8	=				_ Г	9	691.2	(3
for windows and include the area	roof wind				alue calcui		g formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in			(°
abric heat los							(26)(30)	) + (32) =				28.25	(3
leat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =	5116.02	
hermal mass		,	c = Cm ÷	- TFA) ir	n kJ/m²K	,		= (34)	÷ (4) =			101.41	) (3
or design assess an be used inste	sments wh	ere the de	tails of the	•			ecisely the	e indicative	e values of	TMP in Ta	able 1f		`
hermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	K						5.65	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)								_
otal fabric he									(36) =			33.9	(3
entilation hea	at loss ca	alculated	d monthly	<b>/</b>					= 0.33 × (	25)m x (5)	) 	I	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

			1		1			ı			ı			4
(38)m=	9.94	9.82	9.71	9.13	9.01	8.43	8.43	8.31	8.66	9.01	9.24	9.47		(38)
		coefficier							· · · ·	= (37) + (	<del></del>	T 1		
(39)m=	43.84	43.72	43.61	43.03	42.91	42.33	42.33	42.22	42.56	42.91	43.14	43.38	40	(39)
Heat Ic	ss para	meter (F	HLP), W	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	43	(39)
(40)m=	0.87	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		_
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.85	(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. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Δeeum	ed occu	ipancy, I	NI									<del>-</del> 1		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.7		(42)
		,	ater usag	ge in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		74	1.65		(43)
		•			5% if the d ater use, h	-	-	to achieve	a water us	se target o	f			
not more			<i>'</i>			_		ı .			·			
Hot wate	Jan er usage in	Feb	Mar day for ea	Apr	May Vd,m = fa	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
								. /	72.16	76.15	70.12	02.12		
(44)m=	82.12	79.13	76.15	73.16	70.18	67.19	67.19	70.18	73.16	76.15	79.13 m(44) <sub>112</sub> =	82.12	895.86	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /		093.00	(++)
(45)m=	121.78	106.51	109.91	95.82	91.94	79.34	73.52	84.37	85.37	99.49	108.61	117.94		
15.						, ,				Γotal = Su	m(45) <sub>112</sub> =	=	1174.61	(45)
It instant				of use (no	not water	storage),	enter 0 ın	boxes (46,	) to (61)					
(46)m= Water	18.27 storage	15.98	16.49	14.37	13.79	11.9	11.03	12.65	12.81	14.92	16.29	17.69		(46)
	_		includin	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Ū		` ,		•	elling, e		Ū							( )
	•	_			-			mbi boil	ers) ente	er '0' in (	47)			
	storage													
•					or is kno	wn (kWh	n/day):					0		(48)
•			m Table									0		(49)
			storage	-	ear loss fact	or ic not		(48) x (49)	) =		1	10		(50)
,				•	e 2 (kWl						0	.02		(51)
		_	ee secti		`		,							` '
Volum	e factor	from Tal	ble 2a								1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
• • • • • • • • • • • • • • • • • • • •			storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(54)
	. ,	(54) in (5	•								1.	.03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n				
(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)
It cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	u), else (5	/)m = (56)	m where (	H11) is fro	m Append	хН	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div (59)$ m = $(58)$	365 × (41)m
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	3     23.26     22.51     23.26     22.51     23.26     (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	
(61)m= 0 0 0 0 0 0 0	0 0 0 0 0 (61)
Total heat required for water heating calculated for each month	th $(62)$ m = $0.85 \times (45)$ m + $(46)$ m + $(57)$ m + $(59)$ m + $(61)$ m
(62)m= 177.06 156.44 165.19 149.32 147.22 132.83 128.8	
Solar DHW input calculated using Appendix G or Appendix H (negative quan	
(add additional lines if FGHRS and/or WWHRS applies, see A	
(63)m= 0 0 0 0 0 0 0	0 0 0 0 0 (63)
Output from water heater	
(64)m= 177.06 156.44 165.19 149.32 147.22 132.83 128.8	3 139.64 138.87 154.77 162.1 173.22
(**************************************	Output from water heater (annual) <sub>112</sub> 1825.45 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	` '
(65)m= 84.71 75.36 80.77 74.66 74.79 69.18 68.67	
include (57)m in calculation of (65)m only if cylinder is in the	a dwelling or not water is from community neating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec
(66)m= 85.17 85.17 85.17 85.17 85.17 85.17 85.17	85.17 85.17 85.17 85.17 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5
(67)m= 13.23 11.75 9.56 7.23 5.41 4.57 4.93	6.41 8.61 10.93 12.76 13.6 (67)
Appliances gains (calculated in Appendix L, equation L13 or L	-13a), also see Table 5
(68)m= 148.4 149.94 146.06 137.8 127.37 117.57 111.03	2 109.48 113.36 121.62 132.05 141.85 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15	ia), also see Table 5
(69)m= 31.52 31.52 31.52 31.52 31.52 31.52 31.52	2 31.52 31.52 31.52 31.52 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0	0 0 0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -68.13 -68.13 -68.13 -68.13 -68.13 -68.13 -68.13	3 -68.13 -68.13 -68.13 -68.13 (71)
Water heating gains (Table 5)	
(72)m= 113.86 112.14 108.56 103.69 100.53 96.08 92.29	97.14 98.86 103.9 109.59 112.15 (72)
	')m + (68)m + (69)m + (70)m + (71)m + (72)m
(73)m= 324.05 322.38 312.73 297.27 281.86 266.76 256.8	
6. Solar gains:	10.100   100.100   100.100   0.10.10
Solar gains are calculated using solar flux from Table 6a and associated eq	uations to convert to the applicable orientation.
Orientation: Access Factor Area Flux	g_ FF Gains
Table 6d m² Table 6a	Table 6b Table 6c (W)
North 0.9x 0.77 x 1.68 x 10.63	x 0.558 x 0.7 = 4.84 (74)
North 0.9x 0.77 x 1.68 x 20.32	x 0.558 x 0.7 = 9.24 (74)
20.02	

	_											_					_
North	0.9x	0.77	X	1.6	88	X	3	34.53	X		0.558	X	0.7		=	15.7	(74)
North	0.9x	0.77	X	1.6	68	X	5	55.46	X		0.558	X	0.7		=	25.22	(74)
North	0.9x	0.77	Х	1.6	88	X	7	4.72	X		0.558	X	0.7		=	33.98	(74)
North	0.9x	0.77	Х	1.6	88	X	7	79.99	X		0.558	X	0.7		=	36.37	(74)
North	0.9x	0.77	X	1.6	88	X	7	4.68	X		0.558	X	0.7		=	33.96	(74)
North	0.9x	0.77	Х	1.6	68	X	5	9.25	X		0.558	X	0.7		=	26.94	(74)
North	0.9x	0.77	Х	1.6	68	X	4	1.52	x		0.558	X	0.7		=	18.88	(74)
North	0.9x	0.77	X	1.6	88	X	2	24.19	X		0.558	x	0.7		=	11	(74)
North	0.9x	0.77	Х	1.6	68	X	1	3.12	x		0.558	x	0.7		=	5.97	(74)
North	0.9x	0.77	х	1.6	68	X		8.86	x		0.558	x	0.7		=	4.03	(74)
East	0.9x	1	X	12.	17	X	1	9.64	x		0.56	x	0.7		=	64.7	(76)
East	0.9x	1	X	12.	17	X	3	88.42	x		0.56	x	0.7		=	126.57	(76)
East	0.9x	1	X	12.	17	X	6	3.27	x		0.56	×	0.7		=	208.44	(76)
East	0.9x	1	X	12.	17	X	9	2.28	x		0.56	×	0.7		=	303.99	(76)
East	0.9x	1	X	12.	17	X	1	13.09	x		0.56	×	0.7		=	372.56	(76)
East	0.9x	1	X	12.	17	X	1	15.77	x		0.56	×	0.7		=	381.38	(76)
East	0.9x	1	X	12.	17	X	1	10.22	x		0.56	×	0.7		=	363.09	(76)
East	0.9x	1	Х	12.	17	X	9	94.68	x		0.56	x	0.7		=	311.89	(76)
East	0.9x	1	X	12.	17	X	7	73.59	x		0.56	×	0.7		=	242.42	(76)
East	0.9x	1	X	12.	17	X	4	l5.59	x		0.56	x	0.7		=	150.18	(76)
East	0.9x	1	X	12.	17	X	2	24.49	x		0.56	x	0.7	一	=	80.67	(76)
East	0.9x	1	X	12.	17	X	1	6.15	x		0.56	×	0.7		=	53.21	(76)
	_						-		-								
Solar g	ains in	watts, ca	alculate	d for eac	h montl	า			(83)m	n = Su	m(74)m .	(82)m					
(83)m=	69.54	135.81	224.14	329.22	406.53		17.75	397.05	338	.83	261.3	161.1	86.64	57.	24		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (	83)m	, watts									
(84)m=	393.58	458.19	536.87	626.49	688.39	6	84.51	653.85	600	.42	530.69	446.1	389.59	373	.39		(84)
7. Mea	an inter	nal temp	erature	(heating	seaso	n)											
Temp	erature	during h	eating p	periods i	n the liv	ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	D	ес		
(86)m=	0.93	0.89	0.82	0.69	0.53		0.38	0.28	0.3	32	0.51	0.76	0.89	0.9	94		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	follo	w ste	ps 3 to 7	in T	able	9c)			-			
(87)m=	19.58	19.85	20.25	20.65	20.87	_	20.97	20.99	20.		20.92	20.58	20.02	19.	52		(87)
Temp	erature	during h	eating r	periods in	n rest o	f dw	elling	from Ta	hle (	 9 Th	2 (°C)		<b>!</b>	•		l	
(88)m=	20.19	20.2	20.2	20.21	20.21		20.22	20.22	20.		20.22	20.21	20.21	20	.2		(88)
			<u> </u>					<u> </u>			!						
(89)m=	0.92	0.88	0.8	rest of d	weiling, 0.5		,m (se 0.34	0.23	9a) 0.2	<sub>27</sub> T	0.46	0.73	0.88	0.9	33		(89)
								<u> </u>					1 0.00	1 0.8			(55)
Г		· ·		the rest	i — —	Ť		i	·		- 1		40.00	1 45	00	1	(00)
(90)m=	18.29	18.68	19.24	19.78	20.07	2	20.19	20.21	20.	21	20.14	19.72		18.	22	0.50	(90)
											I	∟∧ = LI\	ving area ÷ (	<b>→</b> ) =		0.53	(91)

Mean	internal	tamnar	ature (fo	r the wh	ole dwe	lling) – fl	ΙΔ <b>ν</b> Τ1	⊥ (1 _ fl	Δ) ~ T2					
(92)m=	18.97	19.3	19.77	20.24	20.49	20.6	20.62	20.62	20.55	20.17	19.5	18.91		(92)
	adjustm						m Table	4e. whe						, ,
(93)m=	18.97	19.3	19.77	20.24	20.49	20.6	20.62	20.62	20.55	20.17	19.5	18.91		(93)
8. Spa	ace heati	ng requ	uirement							L	L			
	i to the m			•		ed at ste	ep 11 of	Table 9	b, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation factor			•	,				'	<u> </u>				
(94)m=	0.91	0.86	0.79	0.66	0.51	0.36	0.26	0.29	0.49	0.73	0.87	0.92		(94)
Usefu	ıl gains, h	nmGm ,	W = (94	1)m x (8	4)m									
(95)m=	356.41	396.05	423.06	413.33	350.38	247.38	168.63	175.66	257.54	325.69	337.39	341.9		(95)
Month	nly avera	ge 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)
	loss rate			<u>.</u>			<del>-`                                    </del>	<del>-``</del>	<del>` ´ ´ </del>	<del></del>	<del></del>			
(97)m=		629.51	578.65	487.85	377.3	253.92	170.25	178.1	274.35	410.78	535.12	637.89		(97)
-	e heating								<u> </u>	<del></del>	r			
(98)m=	213.21	156.89	115.76	53.65	20.03	0	0	0	0	63.31	142.37	220.21	005.44	7(00)
								1018	ıl per year	(kwn/year	r) = Sum(9	8)15,912 =	985.44	(98)
·	e heating	•										L	19.53	(99)
	ergy requ				Ĭ									
	art is use on of spac										unity sch	neme.	0	(301)
Fractio	n of spac	ce heat	from co	mmunity	system	1 – (30	1) =					Ī	1	(302)
	nmunity sch									up to four	other heat	sources; th	ne latter	
	on of heat		-		aste neat n	ioni powei	i stations.	осс Арреі	nuix O.			[	0.6	(303a)
Fractio	n of com	munity	heat fro	m heat s	source 2							[	0.4	(303b)
Fractio	n of total	space	heat fro	m Comn	nunity C	HP				(3	02) x (303	a) =	0.6	(304a)
Fractio	n of total	space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.4	(304b)
Factor	for contro	ol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution loss	factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating											_	kWh/yea	<u>r_</u>
Annua	l space h	eating	requirem	nent									985.44	
Space	heat from	n Comr	nunity C	HP					(98) x (30	04a) x (30	5) x (306)	= [	620.82	(307a)
Space	heat fron	n heat s	source 2						(98) x (30	04b) x (30	5) x (306)	= [	413.88	(307b)
Efficier	ncy of sec	condary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating r	equirer	ment fro	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
	heating	ootina =	oguiror:	ont								Г	1005.15	$\neg$
	I water he	•	•									Ĺ	1825.45	
	/ from co heat from								(64) x (30	03a) x (30	5) x (306)	= [	1150.03	(310a)

			_
Water heat from heat source 2	$(64) \times (303b) \times (305) \times (306) =$	766.69	(310b)
Electricity used for heat distribution	$0.01 \times [(307a)(307e) + (310a)(310e)] =$	29.51	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system	$= (107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (7 mechanical ventilation - balanced, extract or po		97.86	(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) =	97.86	(331)
Energy for lighting (calculated in Appendix L)		233.65	(332)
Electricity generated by PVs (Appendix M) (neg	pative quantity)	-456.3	(333)
Electricity generated by wind turbine (Appendix	M) (negative quantity)	0	(334)
12b. CO2 Emissions – Community heating scho	eme		
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) (307a) × 100	÷ (362) = 1351.09 × 0.22	291.84	(363)
less credit emissions for electricity $-(307a) \times (367a)$	1) ÷ (362) = 401.68 × 0.52	-208.47	(364)
Water heated by CHP (310a) × 100	÷ (362) = 2502.79 × 0.22	540.6	(365)
less credit emissions for electricity $-(310a) \times (36a)$	1) ÷ (362) = 744.08 × 0.52	-386.18	(366)
Efficiency of heat source 2 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fue	91	(367b)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x 0.22	280.22	(368)
Electrical energy for heat distribution	[(313) x 0.52 =	15.32	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	533.33	(373)
CO2 associated with space heating (secondary	) (309) x 0 =	0	(374)
CO2 associated with water from immersion hea	tter or instantaneous heater (312) x 0.22 =	0	(375)
Total CO2 associated with space and water her	ating (373) + (374) + (375) =	533.33	(376)
CO2 associated with electricity for pumps and f	ans within dwelling (331)) x 0.52 =	50.79	(378)
CO2 associated with electricity for lighting	(332))) x 0.52 =	121.26	(379)
Energy saving/generation technologies (333) to Item 1	0 (334) as applicable 0.52 x 0.01 =	-236.82	(380)
Total CO2, kg/year sum of (	376)(382) =	468.57	(383)
Dwelling CO2 Emission Rate (383) ÷	(4) =	9.29	(384)
El rating (section 14)		93.42	(385)

			User D	etails:						
Assessor Name: Software Name:	Matthew Stain Stroma FSAP			Stroma Softwa					023501 n: 1.0.4.16	
		Р	roperty .	Address	06-18-6	69419 21	F-6			
Address :	2F-6, Bertram S	Street, Londo	n							
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	3)
Ground floor			7	3.35	(1a) x	2	2.4	(2a) =	176.04	(38
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	1) 7	3.35	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	176.04	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys		+ 0	<b>]</b> + [	0	] = [	0	X	40 =	0	(6a
Number of open flues	0	+ 0	╡ᆠ┝	0	] <sub>=</sub> [	0	X	20 =	0	(6b
Number of intermittent fa					J			10 =	<u> </u>	╡`
					Ļ	0			0	(7a
Number of passive vents	5					0	X	10 =	0	(7t
Number of flueless gas f	ires					0	X	40 =	0	(70
								A ir ah	angaa nar ha	
		(O-) - (Ob.) - (7	z - \ . ( <del>   </del>   \ . (	<b>7</b> -\	_				anges per ho	_
nfiltration due to chimne	•				ontinus fr	0		÷ (5) =	0	(8)
If a pressurisation test has leading to the Number of storeys in t		iteriaea, procee	a to (17), (	otnerwise (	ontinue ir	om (9) to (	(16)		0	(9)
Additional infiltration	ric awciirig (ris)						[(9)	-1]x0.1 =	0	-(1)
Structural infiltration: 0	.25 for steel or tim	ber frame or	0.35 for	r masonr	v constr	uction	[(0)	. j	0	=\(\)
if both types of wall are p					•				<u> </u>	`
deducting areas of openi	= :									_
If suspended wooden	•	,	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en									0	(13
Percentage of window Window infiltration	s and doors draug	int stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14
Infiltration rate				(8) + (10)	. ,	_	± (15) =		0	= (15
Air permeability value,	aEO expressed in	oubic motro	s par ha					oroo	0	= (16
f based on air permeabi			•	•	•	elle ol e	invelope	alea	3	= (17
Air permeability value applie	-					is beina u	sed		0.15	(18
Number of sides shelter				, poi	wanty				3	(19
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.78	(20
nfiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.12	(21
nfiltration rate modified	for monthly wind s	peed								
Jan Feb	Mar Apr N	/lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								•	
(22)m= 5.1 5		.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
						•	•	•	1	
Wind Factor (22a)m = (2	2)m ÷ 4									

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ition rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calcul <del>ate effec</del> If mechanica		•	rate for t	пе арріі	саріе са	ise						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	very: effici	iency in %	allowing f	or in-use f	actor (fror	n Table 4h	) =				79.9	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recov	ery (MV	HR) (24a	a)m = (2)	2b)m + (2	23b) × [	1 – (23c)	÷ 100]	<b>-</b>
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	covery (I	MV) (24b	o)m = (22	2b)m + (2	23b)	-	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v									0.5]			'	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change i	rate - en	iter (24a	) or (24k	o) or (24	c) or (24	ld) in bo	x (25)				-	
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25
3. Heat losses	and he	at loss p	paramete	er:									
LEMENT	Gros area	_	Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-l		X k /K
Doors					2.1	x	1.4	=	2.94				(2
Vindows					15.96	<sub>5</sub> x1	/[1/( 1.4 )+	0.04] =	21.16				(2
Valls Type1	33.84	4	18.00	6	15.78	3 X	0.15	=	2.37		14	220.92	2 (2
Valls Type2	13.5	1	0		13.5′	1 x	0.14	=	1.9		14	189.14	4 (2
Valls Type3	13.82	2	0		13.82	<u>x</u>	0.15	=	2.07		14	193.48	8 (2
otal area of el	ements,	, m²			61.17	7							(3
arty wall					21.19	) x	0	=	0		20	423.8	(3
arty floor					73.35	5					40	2934	(3
Party ceiling					73.35	5				Ī	30	2200.5	5 (3
nternal wall **					105.6	3				Ī	9	950.4	(3
for windows and a						lated using	g formula 1	/[(1/U-valu	ıе)+0.04] а	s given in	paragraph	1 3.2	_
abric heat los	s, W/K =	= S (A x	U)				(26)(30	) + (32) =				30.44	(3
leat capacity (	2m = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	7112.24	(3
hermal mass	paramet	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			96.96	(3
or design assessi an be used instea				construct	ion are no	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	•	,		• .	•	K						6.02	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)			(22) -	(26)		ĺ		<b></b> ,_
otal fabric hea	ม เบรร							(33) +	(36) =			36.46	(3
entilation hea	t loop on	ا معامده	manthi	,				(20)	= 0.33 × (	25)m + (F)	`		

(00)	l	·											(00)	
(38)m= 14.45	14.28	14.11	13.27	13.1	12.25	12.25	12.09	12.59	13.1	13.44	13.77		(38)	
Heat transfer (		<del></del>	10.70	10.50	10.70	10.70	10.55	· · ·	= (37) + (	<del></del>				
(39)m= 50.91	50.74	50.57	49.73	49.56	48.72	48.72	48.55	49.05	49.56	49.9	50.23	49.69	(39)	
Heat loss para	ameter (I	HLP), W	/m²K	•	i	•			= (39)m ÷	Sum(39)₁ · (4)	12 / 1 Z=	49.69	(39)	
(40)m= 0.69	0.69	0.69	0.68	0.68	0.66	0.66	0.66	0.67	0.68	0.68	0.68		<b>–</b> 1	
Number of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.68	(40)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)	
	-		-	-	-	-		-	-	-				
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:		
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)														
	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.52		(42)	
Annual averag	ge hot wa										).41		(43)	
Reduce the annua							to achieve	a water us	se target o	f				
						<u> </u>	Ι Δ	Con	Oat	Nov	Daa			
Jan Hot water usage i	Feb in litres per	Mar r day for ea	Apr ach month	May $Vd, m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec			
(44)m= 98.35	94.77	91.2	87.62	84.05	80.47	80.47	84.05	87.62	91.2	94.77	98.35			
(11)111= 00.00	1 0	1 01.2	07.02	01.00	00.11	00.11	0 1.00	l		m(44) <sub>112</sub> =		1072.92	(44)	
Energy content of	f 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)		<b>_</b>	
(45)m= 145.85	127.56	131.63	114.76	110.12	95.02	88.05	101.04	102.25	119.16	130.07	141.25			
If instantaneous w	vator hoati	na at noint	of use (no	n hot water	r storaga)	enter () in	hoves (16		Γotal = Su	m(45) <sub>112</sub> =	=	1406.77	(45)	
			,	ı		ı		, ,	47.07	10.54			(46)	
(46)m= 21.88 Water storage	19.13 loss:	19.75	17.21	16.52	14.25	13.21	15.16	15.34	17.87	19.51	21.19		(46)	
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)	
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)			<u></u>				
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)				
Water storage a) If manufact		aclarad l	nee fact	nr ie kna	wn (k\//k	J(day).							(48)	
Temperature f				JI 13 KI10	WII (ICVVI	ı, day).					0		(49)	
Energy lost fro				ear			(48) x (49)	) =			10		(50)	
b) If manufact		_	-		or is not		(10)11(10)				10		(00)	
Hot water stor	_			le 2 (kW	h/litre/da	ay)				0.	.02		(51)	
If community he Volume factor	•		on 4.3										(50)	
Temperature f			2b							-	.6		(52) (53)	
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		.03		(54)	
Enter (50) or		_	,y				( · · / / (O · )	, ( <del>=</del> ) A (	- <del>-</del> /		.03		(55)	
Water 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 cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendix	ĸН		
(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 (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 201.13 177.49 186.91 168.25 165.39 148.52 143.33 156.32 155.74 174.44	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	anon to water neating)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 201.13 177.49 186.91 168.25 165.39 148.52 143.33 156.32 155.74 174.44	183.57 196.53
Output from water heat	<del></del>
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>
(65)m= 92.72 82.36 87.99 80.95 80.84 74.39 73.5 77.82 76.79 83.84	86.04 91.19 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23 116.23	116.23 116.23 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 18.29 16.24 13.21 10 7.48 6.31 6.82 8.86 11.9 15.11	17.63 18.8 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 204.99 207.11 201.75 190.34 175.94 162.4 153.35 151.23 156.59 168	182.4 195.94 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62 34.62	34.62 34.62 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99 -92.99	-92.99 -92.99 (71)
Water heating gains (Table 5)	
(72)m= 124.62 122.55 118.27 112.43 108.65 103.32 98.79 104.59 106.66 112.69	119.51 122.56 (72)
	, ,
	<u> </u>
	377.41 395.17 (73)
<ol><li>Solar gains:</li><li>Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the application.</li></ol>	able erientation
	FF Gains
<u>0</u>	Table 6c (W)
w	
3.50 G.77 A 13.50 A 13.54 A 0.50 A	0.7 = 84.85 (80)
West 0.9x 0.77 × 15.96 × 38.42 × 0.56 ×	0.7 = 165.98 (80)

	_									_									_
West	0.9x	0.77		X	15.9	96	X	6	3.27	X		0.56	)		0.7		=	273.35	(80)
West	0.9x	0.77		X	15.9	96	X	9	2.28	X		0.56	)	· [	0.7		=	398.66	(80)
West	0.9x	0.77		X	15.9	96	X	1	13.09	X		0.56	)	· [	0.7		=	488.58	(80)
West	0.9x	0.77		x	15.9	96	X	1	15.77	x		0.56	)	· [	0.7		=	500.15	(80)
West	0.9x	0.77		x	15.9	96	X	1	10.22	x		0.56	)		0.7		=	476.16	(80)
West	0.9x	0.77		x	15.9	96	X	9	4.68	X		0.56	)		0.7		=	409.01	(80)
West	0.9x	0.77		x	15.9	96	X	7	3.59	x		0.56	)		0.7		=	317.92	(80)
West	0.9x	0.77		х	15.9	96	X	4	5.59	x		0.56	)		0.7		=	196.95	(80)
West	0.9x	0.77		X	15.9	96	X	2	4.49	x		0.56	)		0.7		=	105.8	(80)
West	0.9x	0.77		X	15.9	96	X	1	6.15	х		0.56	<u> </u>	· [	0.7		=	69.78	(80)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																			
(83)m= 84.85 165.98 273.35 398.66 488.58 500.15 476.16 409.01 317.92 196.95 105.8 69.78 (83)													(83)						
Total g	ains – i	nternal a	nd sol	ar	(84)m =	(73)m	+ (	83)m	, watts				•		•			-	
(84)m=	490.61	569.76	664.4	<u> </u>	769.31	838.51	8	30.04	792.99	731	.57	650.93	550	.62	483.21	464.	.95		(84)
7 Me	an inter	nal temp	eratur	e (	heating	seaso	n)												
		during h						area f	from Tal	ole 9	Th	1 (°C)						21	(85)
•		tor for g	_	•			_			010 0	,	. ( 0)						21	
	Jan	Feb	Mai	$\neg$	Apr	May	Ť	Jun	Jul	Α	ug	Sep		ct	Nov	D	ec	]	
(86)m=	0.94	0.9	0.82	+	0.68	0.52	+-	0.37	0.27	0.3	Ť	0.5	<del>                                     </del>		0.9	0.9			(86)
(86)m= 0.94 0.9 0.82 0.68 0.52 0.37 0.27 0.3 0.5 0.76 0.9 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)																			
ī			1	$\overline{}$			$\overline{}$		i e	T T				74	T 00 00	1 40		1	(07)
(87)m=	19.84	20.1	20.44		20.77	20.93		20.98	21	20.	99	20.95	20.	/1	20.23	19.	8		(87)
r		during h	r	$\overline{}$	eriods in	rest o	f dw	/elling	from Ta	able 9	9, Tł	n2 (°C)			1			Ī	
(88)m=	20.35	20.35	20.35	$\perp$	20.36	20.36	2	20.37	20.37	20.	37	20.37	20.	36	20.36	20.3	35		(88)
Utilisa	ation fac	tor for g	ains fo	r re	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.93	0.89	0.8		0.66	0.49		0.33	0.23	0.2	26	0.46	0.7	73	0.89	0.9	4		(89)
Mean	interna	l temper	ature i	n tl	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c	)		-			
(90)m=	18.78	19.14	19.63	_	20.07	20.28	Ť	20.36	20.37	20.		20.32	20.		19.35	18.7	72		(90)
L			!		!				<u>I</u>			f	LA =	Livir	ig area ÷ (4	4) =		0.39	(91)
N4				c	حاد د محالا د		- II!	\ دا	. A <b>T</b> 4	. /4	£I	۸) <b>T</b> O							_
Г		l temper	19.95	$\overline{}$	20.35	20.53	_	g) = 11 20.6	20.62	<del>r`</del>			20	20	10.60	10.	1.5	1	(92)
(92)m=	19.2	l .	<u> </u>	_					!	20.		20.57	20.		19.69	19.	15		(32)
(93)m=	19.2	nent to t	19.95	_	20.35	20.53	_	20.6	20.62	20.		20.57	20.		19.69	19.	1.5	1	(93)
				_	20.33	20.55	<u> </u>	20.6	20.02	20.	02	20.57	20.	20	19.69	19.	15		(33)
		iting requ			norotur	o obtoi	200	l ot ot	on 11 of	Tobl	ام ۸	o oo tho	4 T: .	~ <i>(</i>	76)m on	d ro	مماد	vuloto	
		mean int factor fo					nec	i ai sie	<del>з</del> р п ог	rabi	ie st	o, so ma	ll 11,1	11=(	76)III an	a re-	Calc	culate	
	Jan	Feb	Mai	$\neg$	Apr	May		Jun	Jul	Α	ug	Sep	Го	ct	Nov	D	ec		
ı Utilisa		tor for g	l	_											1			l	
(94)m=	0.91	0.87	0.79	Т	0.65	0.5	1	0.35	0.25	0.2	28	0.47	0.7	73	0.87	0.9	2		(94)
ւ Usefu	ıl gains,	hmGm	. W = (	94	 )m x (84	1)m	-		<u> </u>				!		!			l	
(95)m=	448.62	496.91	526.1	_	503.74	417.4	2	88.49	194.83	203	.36	305.48	401	.09	422.3	429.	.92		(95)
	nly aver	age exte	rnal te	mr	erature	from 7	abl	e 8	<u> </u>									ı	
(96)m=	4.3	4.9	6.5	Ť	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10	.6	7.1	4.2	2		(96)
L	I								1									1	

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93	3\m_ (96\m	1											
(97)m= 758.56 741.69 680.03 569.2 437.81 292.5 195.66 204.		479.97	628.4	750.83		(97)							
Space heating requirement for each month, kWh/month = 0.024 x [	[(97)m – (95	)m] x (4	I)m										
(98)m= 230.59 164.49 114.52 47.13 15.19 0 0 0	0	58.69	148.39	238.76		_							
	8) <sub>15,912</sub> =	1017.76	(98)										
Space heating requirement in kWh/m²/year	L	13.88	(99)										
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.													
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table	•		unity sch	neme.	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 CHP  0.6													
•	0.6	(303a)											
Fraction of community heat from heat source 2				Į	0.4	(303b)							
Fraction of total space heat from Community CHP		(3)	02) x (303	a) =	0.6	(304a)							
Fraction of total space heat from community heat source 2		(3)	02) x (303	b) =	0.4	(304b)							
Factor for control and charging method (Table 4c(3)) for community		1	(305)										
Distribution loss factor (Table 12c) for community heating system					1.05	(306)							
Space heating Annual space heating requirement				Γ	kWh/year	¬							
Space heat from Community CHP	(98) x (3(	04a) x (305	5) x (306) :	_ _ 「	641.19	 ☐(307a)							
Space heat from heat source 2	, , ,	04b) x (305	, , ,	Ļ	427.46	(307b)							
Efficiency of secondary/supplementary heating system in % (from Ta	, , ,	, ,	, , ,	¯ L	0	(308							
Space heating requirement from secondary/supplementary system		01) x 100 ÷	,	L T	0	(309)							
	(00) X (00)	31) X 100 .	(600) =	L	0								
Water heating Annual water heating requirement				ſ	2057.61	7							
If DHW from community scheme: Water heat from Community CHP	(64) x (30	03a) x (305	5) x (306) =	- -	1296.29	(310a)							
Water heat from heat source 2	(64) x (30	03b) x (305	5) x (306) =	<u> </u>	864.2	(310b)							
Electricity used for heat distribution	0.01 × [(307a)	(307e) +	(310a)(	310e)] =	32.29	(313)							
Cooling System Energy Efficiency Ratio				Ī	0	(314)							
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷	(314) =		Ī	0	(315)							
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsi	side			[	142.28	(330a)							
warm air heating system fans				Ī	0	(330b)							
pump for solar water heating				Ī	0	(330g)							
Total electricity for the above, kWh/year	=(330a) -	+ (330b) +	(330g) =	Ī	142.28	(331)							
Energy for lighting (calculated in Appendix L)				Ī	322.98	(332)							

Electricity generated by PVs (Appendix M) (negative quantity)	-456.3	(333)		
Electricity generated by wind turbine (Appendix M) (negative qu	0	(334)		
12b. CO2 Emissions – Community heating scheme				
Electrical efficiency of CHP unit			29.73	(361)
Heat efficiency of CHP unit			45.95	(362)
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	1395.41 ×	0.22	301.41	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	414.85 ×	0.52	-215.31	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2821.09 ×	0.22	609.36	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	838.71 ×	0.52	-435.29	(366)
Efficiency of heat source 2 (%) If there is CHP using	g two fuels repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 2 [(307b)+	(310b)] x 100 ÷ (367b) x	0.22	306.59	(368)
Electrical energy for heat distribution	[(313) x	0.52	16.76	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2) =	583.51	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		583.51	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	73.85	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	167.63	(379)
Energy saving/generation technologies (333) to (334) as application 1	able	0.52 x 0.01 =	-236.82	(380)
Total CO2, kg/year sum of (376)(382) =			588.17	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			8.02	(384)
El rating (section 14)			93.34	(385)

			Jser D	etails: _								
Assessor Name:	Matthew Stainrod			Stroma	Num	her.		STRO	O023501			
Software Name:	Stroma FSAP 201	2		Softwa					n: 1.0.4.16			
		Pro	perty A	Address:	06-18-6	69419 3I	F-7					
Address :	3F-7, Bertram Stree	t, London										
Overall dwelling dimer	nsions:		Aros	a(m²)		Δν Ηο	ight(m)		Volume(m³)			
Ground floor				<del>`                                    </del>	(1a) x		2.4	(2a) =	130.75	(3a)		
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e	)+(1n)	5	4.48	(4)			<b>.</b>				
Dwelling volume						)+(3c)+(3c	l)+(3e)+	.(3n) =	130.75	(5)		
2. Ventilation rate:												
		econdary leating		other		total			m³ per houi	•		
Number of chimneys	0 +	0	+	0	= [	0	X 4	40 =	0	(6a)		
Number of open flues	0 +	0	+	0	=	0	x	20 =	0	(6b)		
Number of intermittent fan	ıs					0	x -	10 =	0	(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 chimney  If a pressurisation test has be					ontinuo fr	0 om (0) to		÷ (5) =	0	(8)		
Number of storeys in the		на, ргосева и	.O ( <i>11),</i> C	ulei wise c	onunae m	om (9) to (	10)		0	(9)		
Additional infiltration							[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0.2					•	uction			0	(11)		
if both types of wall are pre deducting areas of opening		ponding to th	ne greate	er wall area	a (after							
If suspended wooden flo		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			. (45)		0	(15)		
Infiltration rate				(8) + (10) -					0	(16)		
Air permeability value, or If based on air permeabilit	•		•	•	•	etre of e	nvelope	area	3	(17)   (40)		
Air permeability value applies						is beina u:	sed		0.15	(18)		
Number of sides sheltered			· ·	,	,	J			3	(19)		
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			0.78	(20)		
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.12	(21)		
Infiltration rate modified fo	r monthly wind speed	l .							•			
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind spe	eed from Table 7								•			
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7				
Wind Factor (22a)m = (22	)m ÷ 4											
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18				

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	: (21a) x	(22a)m				_	
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effect If mechanica		•	rate for t	пе арріі	cable ca	ise						0.5	(23
If exhaust air h			endix N, (2	(3b) = (23a	a) × Fmv (	equation (	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	eiency in %	allowing t	for in-use f	actor (fror	n Table 4h	) =				79.9	<b>=</b> (2:
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2:	2b)m + (	23b) <b>×</b> [	1 – (23c)		
24a)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24
b) If balance	d mech	anical ve	entilation	without	heat red	covery (	MV) (24b	m = (22)	2b)m + (2	23b)		ı	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n		tract ven		•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n		on or wh en (24d)							0.5]			'	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	ld) in bo	x (25)					
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(2
3. Heat losse	s and he	eat loss	paramet	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-l		X k /K
oors					2.1	x	1.4	=	2.94				(2
/indows					12.1	5 x1	/[1/( 1.4 )+	0.04] =	16.11				(2
Valls Type1	31.3	32	14.2	5	17.07	7 x	0.15	=	2.56		14	238.98	3 (2
Valls Type2	25.0	)8	0		25.08	3 x	0.14	=	3.53		14	351.12	2 (2
Valls Type3	12.	6	0		12.6	x	0.13	=	1.67		14	176.4	. (2
otal area of e	lements	, m²			69								(3
arty wall					10.78	3 x	0	=	0		20	215.6	(3
arty floor					54.48	3					40	2179.2	2 (3
arty ceiling					54.48	3				Ī	30	1634.4	4 (3
nternal wall **					57.6					Ī	9	518.4	. (3
for windows and * include the area						lated usin	g formula 1	/[(1/U-valu	ue)+0.04] a	ns given in	paragraph	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30	) + (32) =				26.81	(3
eat capacity	Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	5314.1	(3
hermal mass	parame	ter (TMF	= Cm -	- TFA) ir	n kJ/m²K	<u>.</u>		= (34)	÷ (4) =			97.54	(3
or design assess an be used inste	ad of a de	tailed calc	ulation.			·	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	•	•			•	K						5.74	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.15 x (3	31)			(33) +	· (36) =			22.54	(3
		alculator	1 monthly	A.					$= 0.33 \times ($	25\m v (5)	١	32.54	(
entilation hea													

(00)	1 40 04	10.40	0.05	0.70	0.4		0.00	0.05	0.70		40.00		(20)
(38)m= 10.73	10.61	10.48	9.85	9.73	9.1	9.1	8.98	9.35	9.73	9.98	10.23		(38)
Heat transfer (39)m= 43.27	43.15	nt, W/K 43.02	42.4	42.27	41.64	41.64	41.52	(39)m 41.9	42.27	38)m 42.52	42.77		
(39)111= 43.27	43.13	43.02	42.4	42.21	41.04	41.04	41.32			Sum(39) <sub>1</sub> .		42.37	(39)
Heat loss para	ameter (I	HLP), W/	m²K				_		= (39)m ÷				` ′
(40)m= 0.79	0.79	0.79	0.78	0.78	0.76	0.76	0.76	0.77	0.78	0.78	0.79		_
Number of da	vs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.78	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	iting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occ	unancv	N											(40)
if TFA > 13.	.9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		82		(42)
if TFA £ 13. Annual average	,	otor ugo	ao io litro	o por de	w Vd ov	orogo –	(25 v NI)	. 26					(40)
Reduce the annu									e target o		.48		(43)
not more that 125	5 litres per	person per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	<del></del>						. /			Ι			
(44)m= 85.22	82.12	79.02	75.93	72.83	69.73	69.73	72.83	75.93	79.02	82.12	85.22	000.7	7(44)
Energy content o	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	929.7	(44)
(45)m= 126.38	110.54	114.06	99.44	95.42	82.34	76.3	87.55	88.6	103.25	112.71	122.39		
									Γotal = Su	m(45) <sub>112</sub> =	=	1218.98	(45)
If instantaneous v	i		,										
(46)m= 18.96 Water storage	16.58 e loss:	17.11	14.92	14.31	12.35	11.44	13.13	13.29	15.49	16.91	18.36		(46)
Storage volun		) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	heating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this in	ıcludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufac		eclared l	oss facto	or is kno	wn (kWh	ı/dav).					0		(48)
Temperature				), 10 mil	(	"aay,					0		(49)
Energy lost from				ear			(48) x (49)	=			10		(50)
b) If manufac			-										
Hot water stor If community I	•			e 2 (kWl	n/litre/da	ıy)				0.	02		(51)
Volume factor	•		JII 4.5							1.	03		(52)
Temperature	factor fro	m Table	2b							-	.6		(53)
Energy lost fro	om watei	rstorage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n	_			
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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 Appendi	κ 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 (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m =	- (46)m + (57)m + (59)m + (61)m
(62)m= 181.66 160.46 169.34 152.94 150.69 135.83 131.57 142.83 142.09 158.53	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution of the contr	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	dion to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	1 - 1 - 1
(64)m= 181.66 160.46 169.34 152.94 150.69 135.83 131.57 142.83 142.09 158.53	3 166.2 177.67
Output from water heat	<del></del>
Heat gains from water heating, kWh/month 0.25 $^{\circ}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)n	<del></del>
(65)m= 86.24 76.69 82.15 75.86 75.95 70.17 69.59 73.33 72.25 78.55	80.27 84.92 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11 91.11	91.11 91.11 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 14.16 12.58 10.23 7.74 5.79 4.89 5.28 6.86 9.21 11.7	13.65 14.55 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 158.84 160.49 156.34 147.5 136.33 125.84 118.83 117.19 121.34 130.18	3 141.34 151.84 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	· · · · · · · · · · · · · · · · · · ·
(69)m= 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11 32.11	32.11 32.11 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -72.88 -7	-72.88 -72.88 (71)
Water heating gains (Table 5)	1.2.65
	3 111.49 114.14 (72)
	` '
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (80)m + (80)m$	· · · · · · · · · · · · · · · · · · ·
(73)m= 339.26 337.53 327.31 310.93 294.53 278.52 267.98 272.95 281.24 297.79	316.82 330.86 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications of the solar flux from Table 6a and associated equations to convert to the applications of the solar flux from Table 6a and associated equations to convert to the applications of the solar flux from Table 6a and associated equations to convert to the applications of the solar flux from Table 6a and associated equations to convert to the applications of the solar flux flux flux flux flux flux flux flux	
Orientation: Access Factor Area Flux g_ Table 6d m <sup>2</sup> Table 6a Table 6b	FF Gains Table 6c (W)
w	
West 0.9x 0.77 × 12.15 × 19.64 × 0.56 ×	0.7 = 64.59 (80)
West 0.9x 0.77 x 12.15 x 38.42 x 0.56 x	0.7 = 126.36 (80)

	_									_									_
West	0.9x	0.77		X	12.	15	X	6	3.27	X		0.56	X		0.7		=	208.09	(80)
West	0.9x	0.77		X	12.	15	X	9	2.28	X		0.56	X		0.7		=	303.49	(80)
West	0.9x	0.77		X	12.	15	X	1	13.09	X		0.56	X		0.7		=	371.94	(80)
West	0.9x	0.77		X	12.	15	X	11	15.77	x		0.56	X		0.7		=	380.75	(80)
West	0.9x	0.77		X	12.	15	X	1	10.22	x		0.56	X		0.7		=	362.49	(80)
West	0.9x	0.77		x	12.	15	X	9	4.68	X		0.56	X		0.7		=	311.37	(80)
West	0.9x	0.77		x	12.	15	X	7	3.59	x		0.56	X		0.7		=	242.02	(80)
West	0.9x	0.77		X	12.	15	X	4	5.59	x		0.56	X		0.7		=	149.94	(80)
West	0.9x	0.77		X	12.	15	X	2	4.49	x		0.56	X		0.7		=	80.54	(80)
West	0.9x	0.77		x	12.	15	X	1	6.15	х		0.56	X		0.7		=	53.12	(80)
														_					
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																			
(83)m= 64.59 126.36 208.09 303.49 371.94 380.75 362.49 311.37 242.02 149.94 80.54 53.12 (83)													(83)						
Total g	ains – i	nternal a	nd so	ar	(84)m =	(73)m	+ (	83)m	, watts						•			•	
(84)m=	403.85	463.89	535.4	1	614.43	666.48	6	59.27	630.47	584	.32	523.26	447.	73	397.36	383.	98		(84)
7 Me	an inter	nal temp	peratur	e (	heating	seasor	า)												
		during h						area f	from Tal	ole 9	Th	1 (°C)						21	(85)
•		tor for g	_	•			_			010 0	,	. ( 0)						21	
	Jan	Feb	Ma	$\neg$	Apr	May	Ť	Jun	Jul	Α	ug	Sep	0	nt .	Nov	D	<u></u>		
(86)m=	0.93	0.89	0.82	$\dashv$	0.7	0.54	+	0.39	0.29	┢	<del>-  </del>	0.52	0.7		0.89	0.9			(86)
(86)m= 0.93   0.89   0.82   0.7   0.54   0.39   0.29   0.32   0.52   0.76   0.89   0.94   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)																			
ī			1	n II			_			T T			-00.4			10.		1	(07)
(87)m=	19.68	19.93	20.3		20.67	20.88		20.97	20.99	20.	99	20.93	20.6	)2	20.1	19.6	3		(87)
r	erature	during h	r	$\overline{}$	eriods ir	rest of	fdw	elling	from Ta	able 9	9, Tr	n2 (°C)						Ī	
(88)m=	20.26	20.26	20.26	5	20.27	20.27	2	20.28	20.28	20.	29	20.28	20.2	27	20.27	20.2	27		(88)
Utilisa	ation fac	tor for g	ains fo	r re	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.92	0.88	0.8		0.67	0.51		0.35	0.24	0.2	27	0.47	0.7	3	0.88	0.9	3		(89)
Mean	interna	l temper	ature i	n t	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)		-			•	
(90)m=	18.48	18.84	19.36	$\overline{}$	19.87	20.14	┰	20.26	20.28	20.		20.21	19.8		19.09	18.4	12		(90)
` ′ [		l	<u> </u>									f	LA = I	ivin	g area ÷ (4	1) =		0.45	(91)
																		0.10	」` ′
Г		l temper		Ì			_	<del></del>		<del>r`</del>					10.54	100		1	(02)
(92)m=	19.02	19.34	19.78	L	20.23	20.48		20.58	20.6	20	!	20.53	20.		19.54	18.9	97		(92)
		nent to t	i	_			1		1	1			i –		10.54	10/		1	(02)
(93)m=	19.02	19.34	19.78		20.23	20.48	2	20.58	20.6	20	.6	20.53	20.1	8	19.54	18.9	97		(93)
		ting requ							44 . 6	T	- 01			. (	70)			Lata	
		mean int factor fo			•		ned	at ste	ep 11 of	rabi	e 9t	o, so tha	t II,n	า=(	76)m an	d re-	calc	culate	
	Jan	Feb	Ma	$\neg$	Apr	May	T	Jun	Jul	Α	ug	Sep	0	nt .	Nov	D	ec		
l Utilisa		tor for g	l	_		iviay		oun	Oui		ug j	ОСР			1101			l	
(94)m=	0.9	0.86	0.79	T	0.67	0.52	T	0.37	0.26	0.2	29	0.49	0.7	3	0.86	0.9	1		(94)
		hmGm .	W = (	<u> </u>						<u> </u>	!				l	<u> </u>			
(95)m=	365.09	401.07	423.5	<del>`                                    </del>	409.75	345.57	2	43.05	165.22	172	.25	254.47	326.	43	343.37	350.	97		(95)
		age exte		_							!				<u> </u>	L		I	*
(96)m=	4.3	4.9	6.5	Ť	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10.	6	7.1	4.2	2		(96)
·	<u> </u>	I								<u> </u>	]		<u> </u>		I			I	

Heat loss rate for mean internal temperature. Lm. W =[/20)m × [/02	2)m (06)m	1												
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ m = $[637.07]$ 622.86 $[571.52]$ 480.47 $[370.99]$ 249 $[370.99]$ 166.62 $[370.99]$ 174.3		405.09	529.18	631.6		(97)								
Space heating requirement for each month, kWh/month = 0.024 x [(	(97)m – (95	)m] x (41	1)m											
(98)m= 202.35 149.05 110.07 50.92 18.91 0 0 0	0	58.52	133.78	208.79		_								
1	932.39	(98)												
Space heating requirement in kWh/m²/year	17.11	(99)												
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.														
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table	•		unity sch	neme.	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 CHP														
Fraction of heat from Community CHP	0.6	(303a)												
Fraction of community heat from heat source 2	0.4	(303b)												
Fraction of total space heat from Community CHP	0.6	(304a)												
Fraction of total space heat from community heat source 2	0.4	(304b)												
Factor for control and charging method (Table 4c(3)) for community h		1	(305)											
Distribution loss factor (Table 12c) for community heating system		1.05	(306)											
Space heating Annual space heating requirement				ſ	<b>kWh/yea</b> i 932.39	, 								
Space heat from Community CHP	(98) x (3	04a) x (305	5) x (306) =	_ = [	587.41	(307a)								
Space heat from heat source 2	, , ,	, ` 04b) x (305	, , ,	L	391.6	(307b)								
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or A	ppendix	E)	[	0	(308								
Space heating requirement from secondary/supplementary system	(98) x (3	01) x 100 ÷	- (308) =		0	(309)								
Water heating				-		_								
Annual water heating requirement					1869.82									
If DHW from community scheme: Water heat from Community CHP	(64) x (3	03a) x (305	5) x (306) =	= [	1177.99	(310a)								
Water heat from heat source 2	(64) x (3	03b) x (305	5) x (306) =	=	785.33	(310b)								
Electricity used for heat distribution	0.01 × [(307a)	(307e) +	(310a)(	310e)] =	29.42	(313)								
Cooling System Energy Efficiency Ratio				Ī	0	(314)								
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷	- (314) =		ĺ	0	(315)								
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsi	ide			[	105.68	(330a)								
warm air heating system fans				Ī	0	(330b)								
pump for solar water heating				Ī	0	(330g)								
Total electricity for the above, kWh/year	=(330a)	+ (330b) +	(330g) =	Ī	105.68	(331)								
Energy for lighting (calculated in Appendix L)				ĺ	250.09	(332)								

Electricity generated by PVs (Appendix M) (negative quantity)		-456.3	(333)	
Electricity generated by wind turbine (Appendix M) (negative qua	ntity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
Electrical efficiency of CHP unit			29.73	(361)
Heat efficiency of CHP unit			45.95	(362)
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	1278.36 ×	0.22	276.13	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	380.06 ×	0.52	-197.25	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2563.63 ×	0.22	553.74	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	762.17 ×	0.52	-395.57	(366)
Efficiency of heat source 2 (%) If there is CHP using to	wo fuels repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 2 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	279.36	(368)
Electrical energy for heat distribution [(3	313) x	0.52	15.27	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(37	2) =	531.69	(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) =		531.69	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	54.85	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	129.8	(379)
Energy saving/generation technologies (333) to (334) as applicable tem 1	le	0.52 x 0.01 =	-236.82	(380)
Total CO2, kg/year sum of (376)(382) =			479.51	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			8.8	(384)
El rating (section 14)			93.54	(385)

			llser I	Details:						
Accessor Names	Matthew St	toinrad	—— <del>0361</del> L		o Nives	hor.		CTD (	023501	
Assessor Name:	Stroma FS				a Num are Ve				on: 1.0.4.16	
Software Name:	Stioma ro	AP 2012	Duonout				F 0	versic	)II. 1.0. <del>4</del> .10	
A daluga e .	2E 9 Portro	m Stroot Lo	Property	Address	: 06-18-0	09419 3	F-8			
Address: 1. Overall dwelling dime	•	m Street, Loi	Idon							
1. Overall dwelling diffic	ensions.		Aro	a(m²)		۸۷ ۵۰	iaht/m\		Volume(m <sup>3</sup>	RN.
Ground floor				66.7	(1a) x		eight(m) 2.4	(2a) =	160.08	(3a)
	-) . (45) . (4 -) . (	'A -1\ . /A -\ .			<u> </u>		<u> </u>	(2a) -	160.06	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1a)+(1e)+	.(1h)	66.7	(4)					_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	160.08	(5)
2. Ventilation rate:										
	main heating	secon heatir		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	= [	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					0	x	10 =	0	(7a)
Number of passive vents	3					0	x	10 =	0	(7b)
•					L		$\dashv$ ,	40 =		Ⅎ .
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	we fluce and fa	anc – (6a)+(6h	)+(7a)+(7h)+	(7c) =	Г					_
If a pressurisation test has	•				continue fr	0 rom (9) to	(16)	÷ (5) =	0	(8)
Number of storeys in t			,,			0 (0) 10	(10)		0	(9)
Additional infiltration	3 (	,					[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0	).25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p			ng to the grea	ter wall are	a (after					
deducting areas of open If suspended wooden	• / .		r 0 1 (spal	ad) alsa	antar ()					7(12)
If no draught lobby, er		,	i U. i (Seai	eu), eise	CITICI U				0	(12)
Percentage of window	•		d						0	(14)
Window infiltration	3 and doors an	augiii sirippo	ď	0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(15)
Infiltration rate				_	+ (11) + (	_	+ (15) =		0	(16)
Air permeability value,	a50. expresse	d in cubic me	etres per h					e area	3	(17)
If based on air permeabi			•	•	•				0.15	(18)
Air permeability value appli	es if a pressurisatio	on test has been	done or a de	gree air pe	rmeability	is being u	sed			` ′
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified	for monthly win	d speed							1	
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 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 (00.)										
Wind Factor $(22a)m = (2a)m =$	:∠)m ÷ 4	1.00	F 0.05	T 0.00		T		_	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effect		-	rate for t	he appli	cable ca	se	•	•	•	•	•		
If mechanica			endix N (2	(23a) = (23a	a) × Fmv (e	equation (	N5)) othe	rwise (23h	n) = (23a)			0.5	(23a
If balanced with									) = (20u)			0.5	(23b
		-	-	_					2h\m + /:	22h) v [-	1 (22a)	79.9	(230
a) If balance (24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	<del>-</del> 100]	(24a
b) If balance				<u> </u>			<u> </u>	<u> </u>	l	l	0.20		(=
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h													`
	า < 0.5 ×								.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural	ventilatio	n or wh	ole hous	e positiv	ve input	ventilati	on from	loft					
if (22b)m	n = 1, the	n (24d)	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]	•			
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change r	ate - er	iter (24a	) or (24b	o) or (24	c) or (24	ld) in bo	x (25)		•	•		
(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losses	s and hea	at loss p	paramet	er:									
ELEMENT	Gross area (	3	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-ł		X k J/K
Doors					2.1	x	1.4	=	2.94	,			(26)
Windows Type	· 1				3.82	x1	/[1/( 1.4 )+	0.04] =	5.06				(27)
Windows Type	2				8.35	x1	/[1/( 1.4 )+	0.04] =	11.07				(27)
Windows Type	3				7.63	x1	/[1/( 1.4 )+	0.04] =	10.12	=			(27)
Walls Type1	52.8		21.9		30.9	x	0.15		4.64	<b>=</b>	14	432.6	6 (29)
Walls Type2	10.39		0		10.39	_	0.14	=	1.46	륵 ;	14	┥	6 (29)
Total area of e					63.19	=	<u> </u>						(31)
Party wall	,				20.53	_	0		0	<b>—</b> [	20	410.6	<b></b> ` ′
Party floor					66.7	=					40	2668	=
Party ceiling					66.7	=					30	2001	=
Internal wall **					96	=				L T	9	╡	= .
* for windows and	roof windo	WS. USA A	effective wi	ndow H-v		l lated using	g formula 1	1/[(1/U-valı	ıe)+0 041 a	L ns given in		864	(320
							, .c.maia i	.,, ., o vait		9 011 111	,sa. agraph	<u>-</u>	
** include the area							(26)(30	) + (32) =				35.29	(33)
	s, W/K =	S (A x	U)										
** include the area		•	U)					((28).	(30) + (32	2) + (32a).	(32e) =	6521.66	(34)
** include the area Fabric heat los	Cm = S(A	Axk)	ŕ	- TFA) ir	n kJ/m²K				(30) + (32 ) ÷ (4) =	2) + (32a).	(32e) =	6521.66 97.78	= '
** include the area Fabric heat los Heat capacity (	Cm = S(A paramete ments whe	Axk) er (TMF re the de	P = Cm -tails of the	,			recisely the	= (34)	÷ (4) =				(34)
** include the area Fabric heat los Heat capacity ( Thermal mass For design assess	Cm = S(A paramete ments whe ad of a deta	A x k ) er (TMF re the de	P = Cm - tails of the	construct	ion are no	t known pi	recisely the	= (34)	÷ (4) =				=
** include the area Fabric heat los Heat capacity ( Thermal mass For design assess can be used instead	Cm = S(A paramete ments whe ad of a deta es : S (L >	Axk) er (TMF re the de niled calcu xY) cal	P = Cm - tails of the ulation. culated	construct	ion are no pendix l	t known pi	recisely the	= (34)	÷ (4) =			97.78	(35)

Ventila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	13.9	13.73	13.56	12.72	12.55	11.71	11.71	11.54	12.04	12.55	12.89	13.22		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m=	55.06	54.89	54.73	53.88	53.71	52.87	52.87	52.7	53.21	53.71	54.05	54.39		
Heat lo	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	53.84	(39)
(40)m=	0.83	0.82	0.82	0.81	0.81	0.79	0.79	0.79	0.8	0.81	0.81	0.82		
Numbe	er of day	s in moi	nth (Tab	le 1a)			•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.81	(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	ter heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		16		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by	5% if the $a$	lwelling is	designed			se target o		.58		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	_		_	_		
(44)m=	94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14		
Energy c	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1026.98	(44)
(45)m=	139.61	122.1	126	109.85	105.4	90.95	84.28	96.71	97.87	114.06	124.5	135.2		
If instant	aneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1346.53	(45)
(46)m=	20.94	18.32	18.9	16.48	15.81	13.64	12.64	14.51	14.68	17.11	18.68	20.28		(46)
	storage		منالم مال مالات		-1 \	/\// IDC	_1	isladada a		1			` I	\
If comn	nunity h	eating a	includin and no ta hot wate	nk in dw	velling, e	nter 110	litres in	(47)				0		(47)
•			eclared l		or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage eclared o	-		or is not		(48) x (49)	) =		1	10		(50)
		_	factor free section		e 2 (kW	h/litre/da	ay)				0.	02		(51)
		from Ta									1.	03		(52)
•			m Table								0	.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
	` ' '	(54) in (5 loss cal	ວວ <i>ງ</i> culated f	or each	month			((56)m = (	55) × (41)	m	1.	03		(55)
(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)
,,	01		1 -2.01	1	I	1 -0.00	L	I'	1 -0.00	1 -2.01	L -0.00	1 -2.0		(-3)

If cylinder cont	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) - (	H11)] ÷ (5	u), eise (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.0	)1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	cuit loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circ	,	,			59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)	_		
(59)m= 23.2	26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss	calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water he	eating ca	alculated	I for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.	88 172.03	181.27	163.34	160.68	144.45	139.56	151.99	151.36	169.33	178	190.48		(62)
Solar DHW inp	out calculated	using App	endix G oı	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 194.	88 172.03	181.27	163.34	160.68	144.45	139.56	151.99	151.36	169.33	178	190.48		
							Outp	out from wa	ater heate	r (annual)₁	12	1997.37	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	]	
(65)m= 90.6	80.54	86.12	79.32	79.27	73.04	72.24	76.38	75.34	82.15	84.19	89.18		(65)
include (5	57)m in cal	culation (	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Interna	I gains (see	e Table 5	and 5a	):									
Metabolic g	ains (Table	e 5). Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 108.	17 108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 16.8	39 15	12.2	9.24	6.9	5.83	6.3	8.19	10.99	13.95	16.29	17.36		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		•	•	
(68)m= 189.	48 191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.6	181.12		(68)
Cooking ga	ins (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also se	ee Table	5	•	•	•	
(69)m= 33.8	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82		(69)
Pumps and	fans gains	(Table 5	īa)		•							•	
-	_		-ω,										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
(70)m= 0 Losses e.g.		0	0	<u> </u>		0	0	0	0	0	0		(70)
	evaporation	0	0	<u> </u>		-86.54	-86.54	-86.54	-86.54	0 -86.54	-86.54	 	(70) (71)
Losses e.g.	evaporation 54 -86.54	0 on (nega	0 tive valu	es) (Tab	le 5)					<u> </u>	<u> </u>		
Losses e.g. (71)m= -86.	evaporation 54 -86.54 ng gains (7	0 on (nega	0 tive valu	es) (Tab	le 5)					<u> </u>	<u> </u>		
Losses e.g. (71)m= -86 Water heati (72)m= 121	evaporation 54 -86.54 ng gains (7 83 119.85	on (negar -86.54 Table 5)	0 tive valu -86.54	es) (Tab -86.54	-86.54 101.44	-86.54 97.1	-86.54 102.66	-86.54	-86.54 110.41	-86.54 116.93	-86.54 119.86		(71)
Losses e.g. (71)m= -86. Water heati	evaporation 54 -86.54 ng gains (7 83 119.85 nal gains =	on (negar -86.54 Table 5)	0 tive valu -86.54	es) (Tab -86.54	-86.54 101.44	-86.54 97.1	-86.54 102.66	-86.54 104.63	-86.54 110.41	-86.54 116.93	-86.54 119.86		(71)
Losses e.g. (71)m= -86. Water heati (72)m= 121. Total interi	evaporation 54 -86.54  ng gains (7 83 119.85  nal gains = 65 381.75	0 on (nega: -86.54 Table 5) 115.75	0 tive valu -86.54	es) (Tab -86.54	le 5) -86.54 101.44 (66)	-86.54 97.1 m + (67)m	-86.54 102.66 1 + (68)m +	-86.54 104.63 + (69)m + (	-86.54 110.41 (70)m + (7	-86.54 116.93 1)m + (72)	-86.54		(71) (72)
Losses e.g. (71)m= -86.3  Water heati (72)m= 121.  Total interi (73)m= 383.  6. Solar ga	evaporation 54 -86.54  ng gains (7 83 119.85  nal gains = 65 381.75	0 n (nega) -86.54 [able 5] 115.75 369.89	0 tive valu -86.54 110.17	es) (Tab -86.54 106.54	-86.54 101.44 (66) 312.83	-86.54 97.1 m + (67)m 300.6	-86.54 102.66 1 + (68)m + 306.08	-86.54 104.63 + (69)m + (	-86.54 110.41 (70)m + (7 335.1	-86.54 116.93 1)m + (72) 357.27	-86.54 119.86 m 373.79		(71) (72)
Losses e.g. (71)m= -86.3  Water heati (72)m= 121.  Total interi (73)m= 383.  6. Solar ga	evaporation 54 -86.54  ng gains (7) 83 119.85  nal gains = 65 381.75  ains:  are calculated	0 on (negar -86.54 Fable 5) 115.75 369.89 using sola	0 tive valu -86.54 110.17	es) (Tab -86.54 106.54 331.52	101.44 (66) 312.83	-86.54  97.1 m + (67)m  300.6	-86.54 102.66 1 + (68)m + 306.08	-86.54 104.63 + (69)m + (	-86.54 110.41 (70)m + (7 335.1	-86.54 116.93 1)m + (72) 357.27	-86.54 119.86 m 373.79	Gains (W)	(71) (72)

Southeast 0.9x	0.77	X	7.63	x	36.79	X	0.56	x [	0.7	=	75.99	(77)
Southeast 0.9x	0.77	X	7.63	x	62.67	x	0.56	x [	0.7	=	129.44	(77)
Southeast 0.9x	0.77	X	7.63	x	85.75	X	0.56	x [	0.7	=	177.11	(77)
Southeast 0.9x	0.77	x	7.63	x	106.25	x	0.56	x [	0.7	=	219.44	(77)
Southeast 0.9x	0.77	X	7.63	x	119.01	X	0.56	x	0.7	=	245.8	(77)
Southeast 0.9x	0.77	x	7.63	x	118.15	X	0.56	x [	0.7	=	244.02	(77)
Southeast 0.9x	0.77	X	7.63	x	113.91	X	0.56	x [	0.7	=	235.26	(77)
Southeast 0.9x	0.77	x	7.63	x	104.39	X	0.56	x [	0.7	=	215.6	(77)
Southeast 0.9x	0.77	X	7.63	x	92.85	X	0.56	x [	0.7	=	191.77	(77)
Southeast 0.9x	0.77	x	7.63	x	69.27	X	0.56	x [	0.7	=	143.06	(77)
Southeast 0.9x	0.77	X	7.63	x	44.07	X	0.56	x	0.7	=	91.02	(77)
Southeast 0.9x	0.77	X	7.63	x	31.49	X	0.56	x [	0.7	=	65.03	(77)
South 0.9x	0.77	x	3.82	x	46.75	x	0.56	x	0.7		48.34	(78)
South 0.9x	0.77	x	3.82	x	76.57	x	0.56	×	0.7	_	79.17	(78)
South 0.9x	0.77	x	3.82	x	97.53	X	0.56	x	0.7	=	100.85	(78)
South 0.9x	0.77	x	3.82	x	110.23	x	0.56	x	0.7	=	113.98	(78)
South <sub>0.9x</sub>	0.77	x	3.82	x	114.87	x	0.56	×	0.7	=	118.78	(78)
South 0.9x	0.77	x	3.82	x	110.55	X	0.56	x	0.7	=	114.31	(78)
South 0.9x	0.77	x	3.82	x	108.01	x	0.56	x	0.7	=	111.69	(78)
South <sub>0.9x</sub>	0.77	x	3.82	x	104.89	x	0.56	×	0.7	=	108.46	(78)
South 0.9x	0.77	x	3.82	x	101.89	X	0.56	x	0.7	=	105.35	(78)
South 0.9x	0.77	X	3.82	x	82.59	X	0.56	x	0.7	=	85.4	(78)
South 0.9x	0.77	x	3.82	x	55.42	X	0.56	x [	0.7		57.3	(78)
South 0.9x	0.77	x	3.82	x	40.4	x	0.56	x [	0.7	=	41.77	(78)
West 0.9x	0.77	x	8.35	x	19.64	x	0.56	x [	0.7		44.39	(80)
West 0.9x	0.77	X	8.35	x	38.42	X	0.56	x [	0.7	=	86.84	(80)
West 0.9x	0.77	X	8.35	x	63.27	X	0.56	x [	0.7	=	143.01	(80)
West 0.9x	0.77	X	8.35	x	92.28	X	0.56	x [	0.7	=	208.57	(80)
West 0.9x	0.77	X	8.35	x	113.09	X	0.56	x	0.7	=	255.62	(80)
West 0.9x	0.77	X	8.35	x	115.77	X	0.56	x [	0.7	=	261.67	(80)
West 0.9x	0.77	X	8.35	x	110.22	X	0.56	x [	0.7	=	249.12	(80)
West 0.9x	0.77	X	8.35	x	94.68	X	0.56	x	0.7	=	213.99	(80)
West 0.9x	0.77	X	8.35	x	73.59	X	0.56	x [	0.7	=	166.33	(80)
West 0.9x	0.77	X	8.35	x	45.59	X	0.56	x [	0.7	=	103.04	(80)
West 0.9x	0.77	X	8.35	x	24.49	X	0.56	x [	0.7	=	55.35	(80)
West 0.9x	0.77	X	8.35	x	16.15	x	0.56	x [	0.7	=	36.51	(80)
Solar gains in	watte calcul	ated	for each mon	th		(83)m	ı = Sum(74)m	(82)m				
(83)m= 168.73		0.97	542 620.1		620 596.07	538		331.5	203.67	143.31		(83)
Total gains – ir	nternal and	solar	(84)m = $(73)$ n	n + (	33)m , watts							
(84)m= 552.37	677.2 790	0.86	892.8 951.7	1 9	32.83 896.67	844	.14 779.26	666.6	560.95	517.1		(84)
7. Mean inter	nal temperat	ture (	heating seaso	on)								
Temperature		•			area from Tab	ole 9,	, Th1 (°C)				21	(85)
Utilisation fac	•	•		_		·	. ,				L	
Stroma FSAP201	<del>`</del>			Ť		A	ug Sep	Oct	Nov	Dec	Page	5 of 8
									-			

			_	
(86)m= 0.91 0.85 0.76 0.63 0.49 0.35 0.26 0.28 0.45 0.69	0.86	0.92		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)			_	
(87)m= 19.72 20.06 20.42 20.73 20.9 20.98 20.99 20.99 20.95 20.7	20.17	19.66		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)			_	
(88)m= 20.23 20.23 20.24 20.25 20.25 20.26 20.26 20.26 20.26 20.26 20.26	5 20.24	20.24		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)			_	
(89)m= 0.9 0.84 0.74 0.61 0.46 0.32 0.21 0.24 0.41 0.66	0.85	0.92		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)				
(90)m= 18.53 19 19.5 19.93 20.14 20.24 20.26 20.26 20.2 19.9		18.44		(90)
fLA = Li	iving area ÷ (	4) =	0.45	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$			_	
(92)m= 19.07 19.48 19.91 20.29 20.49 20.57 20.59 20.59 20.54 20.20	6 19.63	18.99		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1		1	(22)
(93)m= 19.07 19.48 19.91 20.29 20.49 20.57 20.59 20.59 20.54 20.29	6 19.63	18.99		(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 an	d ro cold	sulato	
the utilisation factor for gains using Table 9a	=(70)111 a11	iu re-caic	Julate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oc	t Nov	Dec		
Utilisation factor for gains, hm:				
(94)m= 0.88 0.82 0.73 0.61 0.47 0.33 0.23 0.26 0.42 0.66	0.83	0.9		(94)
Useful gains, hmGm, W = (94)m x (84)m  (95)m=	15 465.65	164.46	1	(95)
(95)m= 488.18   556.14   579.83   542.31   446.34   309.75   209.56   218.79   329.19   441.1 Monthly average external temperature from Table 8	465.65	464.46		(93)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6	7.1	4.2	]	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]		<u> </u>	l	
(97)m= 813.3 800.32 734.08 613.88 472.03 315.76 210.96 220.77 342.68 519.0	01 677.18	804.57		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x	<del>`                                    </del>		1	
(98)m= 241.89 164.09 114.76 51.53 19.12 0 0 0 57.93		253.04		<b>-</b>
Total per year (kWh/y	ear) = Sum(9	98) <sub>15,912</sub> =	1054.66	(98)
Space heating requirement in kWh/m²/year			15.81	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating provided by a com Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	nmunity scl	heme.	0	(301)
, , , , , , , , , , , , , , , , , , , ,			0	╡`
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 fo includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	ur other heat	sources; t		7(2025)
Fraction of heat from Community CHP			0.6	(303a)
Fraction of community heat from heat source 2			0.4	(303b)
Fraction of total space heat from Community CHP	(302) x (303	8a) =	0.6	(304a)
Fraction of total space heat from community heat source 2	(302) x (303	8b) =	0.4	(304b)
Factor for control and charging method (Table 4c(3)) for community heating system			1	(305)

Distribution loss factor (Table 12c) for community heat	ting system	1.05	306)
Space heating		kWh/year	
Annual space heating requirement		1054.66	
Space heat from Community CHP	(98) x (304a) x (305) x (306) =	664.43	307a)
Space heat from heat source 2	(98) x (304b) x (305) x (306) =	442.96	307b)
Efficiency of secondary/supplementary heating system	n in % (from Table 4a or Appendix E)	0 (3	308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x 100 ÷ (308) =	0 (3	309)
Water heating Annual water heating requirement		1997.37	
If DHW from community scheme: Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1258.34	310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	838.89	310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	32.05	313)
Cooling System Energy Efficiency Ratio		0 (3	314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = (107) ÷ (314) =	0 (3	315)
Electricity for pumps and fans within dwelling (Table 41 mechanical ventilation - balanced, extract or positive in		129.38	330a)
warm air heating system fans		0 (3	330b)
pump for solar water heating		0 (3	330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	129.38	331)
Energy for lighting (calculated in Appendix L)		298.32 (3	332)
Electricity generated by PVs (Appendix M) (negative q	quantity)	-456.3	333)
Electricity generated by wind turbine (Appendix M) (ne	egative quantity)	0 (3	334)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	361)
Heat efficiency of CHP unit		45.95	362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	1445.99 X 0.22	312.33	363)
less credit emissions for electricity $-(307a) \times (361) \div (362)$	2) = 429.89 X 0.52	-223.12	364)
Water heated by CHP (310a) × 100 ÷ (362) =	2738.5 X 0.22	591.52	365)
less credit emissions for electricity $-(310a) \times (361) \div (362)$	2) = 814.16 X 0.52	-422.55	366)
Efficiency of heat source 2 (%)	is CHP using two fuels repeat (363) to (366) for the second fue	91 (3	367b)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x 0.22	304.26	368)
Electrical energy for heat distribution	[(313) x 0.52	16.63	372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	579.08	373)
CO2 associated with space heating (secondary)	(309) x 0	0 (3	374)

CO2 associated with water from imme	rsion heater or instanta	aneous heater (312)	x 0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =	=		579.08	(376)
CO2 associated with electricity for pur	nps and fans within dw	velling (331)) x	0.52	=	67.15	(378)
CO2 associated with electricity for ligh	ting	(332))) x	0.52	=	154.83	(379)
Energy saving/generation technologie	s (333) to (334) as app	licable		_		_
Item 1		L	0.52 ×	0.01 =	-236.82	(380)
Total CO2, kg/year	sum of (376)(382) =				564.24	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				8.46	(384)
El rating (section 14)					93.23	(385)

			lloor D	) otoilo						
Assessor Name: Software Name:	Matthew Stainroo Stroma FSAP 20	12	User D	Strom Softwa	are Vei	rsion:			0023501 on: 1.0.4.16	
A diducaci	4F-10, Bertram Str			Address	06-18-6	69419 4	F-10			
Address: 1. Overall dwelling dim	·	eet, Lond	IOH							
1. Overall dwelling diff	1011310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.4	(2a) =	207.74	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	36.56	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	207.74	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	+ [	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī <b>-</b> [	0	x :	20 =	0	(6b)
Number of intermittent f	ans				, <u> </u>	0	x -	10 =	0	(7a)
Number of passive vent	ts					0	x	10 =	0	(7b)
Number of flueless gas					<u> </u>	0	x	40 =	0	(7c)
rumber er naerece gae									U U	(10)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	00-6						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre-				•	uction			0	(11)
	nings); if equal user 0.35	sportaing to	rile great	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unsea	ıled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2			(45)		0	(15)
Infiltration rate		L:t		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeab	e, q50, expressed in cultivity value, then $(18) = 10$		•	•	•	etre or e	envelope	area	3	(17)
·	lies if a pressurisation test ha					is beina u	sed		0.15	(18)
Number of sides shelter				, ,	,	3			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spee	d							•	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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 <i>∸ 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	1	
(-20/11)	25   1.1   1.00	1 0.00	L 3.55	1 0.02		L	I ''' <sup>2</sup>	Lo	J	

	Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
If mechanical ventilation:	I	' '		· ·	-	I -	· ·	0.12	0.13	0.14	0.14	0.15	]	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =     Tys.			•	ial <del>e</del> ioi l	пе аррп	cable ca	3E						0.5	(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100]	If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
24a)m 0.26 0.26 0.26 0.24 0.24 0.22 0.22 0.22 0.23 0.24 0.24 0.25   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	If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				79.9	(23
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	a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(24
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)			
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24d)m	24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d)m = 0	,				•	•				.5 × (23b	o)			
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d/m=	24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  25)m= 0.26  0.26  0.26  0.24  0.24  0.22  0.22  0.22  0.23  0.24  0.24  0.25  3. Heat losses and heat loss parameter:  ELEMENT Gross Parameter:  ELEMENT Gross Parameter:  Windows Type 1  Windows Type 1  Windows Type 1  Windows Type 2  Walls Type1  52.25  25.67  26.58  x  0.15  =  3.99  14  372.12  Walls Type2  17.09  0  17.09  x  0.14  =  2.41  14  239.26  Roof  86.56  0  86.56  x  0.11  =  9.52  9  779.04  Fotal area of elements, m²  Party wall Party floor  88.56  40  346.24  The rindows and roof windows, use effective window U-value calculated using formula 1/f(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)  Heat capacity Cm = S(A x k)  (26)(30) + (32) =  50.1  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 x (31)  Total fabric heat loss  (33) + (36) =  62.47	,				•					0.5]				
3. Heat losses and heat loss parameter:  ELEMENT Gross Openings Met Area W/m2K (W/K) k-value kJ/m²-K k	24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
3. Heat losses and heat loss parameter:  ELEMENT Gross A, m² U-value (W/K) k-value (M/K) kJ/m²-K kJ/m²	Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
Net Area   U-value   A X U   K-value   KJ/m²-K   KJ/m²	(25)m= 0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25
area (m²) m² A ,m² W/m2K (W/K) kJ/m²-K	3. Heat losse	s and he	at loss p	paramet	er:									
Windows Type 1    15.22   x1/[1/(1.4) + 0.04] =   20.18	LEMENT		_	•	=						<b>〈</b> )			X k J/K
Windows Type 2  Walls Type1 52.25 25.67 26.58 × 0.15 = 3.99 14 372.12  Walls Type2 17.09 0 17.09 × 0.14 = 2.41 14 239.26  Roof 86.56 0 86.56 × 0.11 = 9.52 9 779.04  Total area of elements, m² 155.9  Party wall 32.95 × 0 = 0 20 659  Party floor 86.56 40 3462.4  Internal wall ** 163.2 9 1468.8  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) = 50.1  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 6980.62  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 80.64  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K (12.37)  Fortal fabric heat loss (33) + (36) = 62.47	Doors					2.1	x	1.4	=	2.94				(20
Walls Type1       52.25       25.67       26.58       x       0.15       =       3.99       14       372.12         Walls Type2       17.09       0       17.09       x       0.14       =       2.41       14       239.26         Roof       86.56       0       86.56       x       0.11       =       9.52       9       779.04         Fortal area of elements, m²       155.9       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       20       659         Party floor       86.56       x       0       =       0       2       0	Nindows Type	e 1				15.22	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	20.18				(27
Nalls Type2	Nindows Type	2				8.35	x1	/[1/( 1.4 )+	0.04] =	11.07				(27
Roof 86.56 0 86.56 $\times$ 0.11 = 9.52 9 779.04  Fotal area of elements, m² 155.9  Party wall 32.95 $\times$ 0 = 0 20 659  Party floor 86.56 40 3462.4  Internal wall ** 163.2 9 1468.8  If or windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  If or windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  Fabric heat loss, W/K = S (A $\times$ U) (26)(30) + (32) = 50.1  Heat capacity Cm = S(A $\times$ K) ((28)(30) + (32) + (32a)(32e) = 6980.62  Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 80.64  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the same be used instead of a detailed calculation.  Thermal bridges: S (L $\times$ Y) calculated using Appendix K  If details of thermal bridging are not known (36) = 0.15 $\times$ (31)  Fotal fabric heat loss (33) + (36) = 62.47	Walls Type1	52.2	5	25.6	7	26.58	3 x	0.15	<b>-</b>	3.99		14	372.1	2 (2
Fotal area of elements, $m^2$	Walls Type2	17.0	9	0		17.09	) x	0.14	<u> </u>	2.41		14	239.2	6 (2
Party wall  32.95 $\times$ 0 = 0 20 659  Party floor  86.56 40 3462.4  Internal wall **  163.2 9 1468.8  If 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  The particulation are not known precisely the indicative values of TMP in Table 1fternal bridges: S (L x Y) calculated using Appendix K  Intermal bridges: S (L x Y) calculated using Appendix K  Intermal bridging are not known (36) = 0.15 x (31)  Intertal fabric heat loss  (33) + (36) = 62.47	Roof	86.5	6	0		86.56	3 x	0.11	<u> </u>	9.52		9	779.0	4 (3
Party floor  Internal wall **  It 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  If 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  In the areas on both sides of internal walls and partitions  In the areas on both sides of interna	Total area of e	elements	, m²			155.9	)							(3
Internal wall **  Internal wal	Party wall					32.95	5 X	0	=	0		20	659	(3:
** 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) =  (28)(30) + (32) + (32a)(32e) =  (34) ÷ (4) =  (34) ÷ (4) =  (35) **  ** include the areas on both sides of internal walls and partitions  ** include the areas on both sides of internal walls and partitions  (26)(30) + (32) =  (32) **  (32) **  (32) **  (33) + (36) =  (34) ÷ (4) =  (35) **  (36) **  (37) **  (38) **  (38) + (36) =  (38	Party floor					86.56	3					40	3462.	4 (32
The remainder of the areas on both sides of internal walls and partitions abric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  ((26)(30) + (32) = 50.1  ((28)(30) + (32) + (32a)(32e) = 6980.62  The rmal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K  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.  The rmal bridges: S (L x Y) calculated using Appendix K  If details of the rmal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	nternal wall **	:				163.2	2				Ī	9	1468.	8 (3:
Heat capacity Cm = S(A x k) $((28)(30) + (32) + (32a)(32e) = 6980.62$ Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K $= (34) \div (4) = 80.64$ 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 x (31)  Total fabric heat loss $(33) + (36) = 62.47$							ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	1 3.2	
Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 80.64  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 x (31)  Total fabric heat loss (33) + (36) = 62.47	abric heat los	ss, W/K =	= S (A x	U)				(26)(30)	) + (32) =				50.1	(3:
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  I details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	6980.62	(34
Thermal bridges: S (L x Y) calculated using Appendix K  I details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  (33) + (36) = 62.47	hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			80.64	(3
f details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) = 62.47	J				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Fotal fabric heat loss $(33) + (36) = 62.47$	_	,	•		• .	•	<						12.37	(3
<u> </u>			are not kn	own (36) =	= 0.15 x (3	31)			(22) -	(26) -				
continuon near 1055 Calculated monthly (30/III = 0.33 x (25/III x (5)			aloulotos	1 manthl	.,						25\m v (F)	\ \	62.47	(3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		r 1		· ·		lı	led.	۸	· · ·	<u> </u>	<del></del>	_	]	

(38)m= 18.03	17.82	17.6	16.5	16.29	15.19	15.19	14.98	15.63	16.29	16.72	17.16		(38)
Heat transfer of			10.5	10.29	15.19	13.19	14.90		= (37) + (37)	<u> </u>	17.10		(00)
(39)m= 80.51	80.29	80.07	78.98	78.76	77.67	77.67	77.45	78.11	78.76	79.2	79.64		
Heat loss para	meter (l	-II D) \\\/	m2K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	78.92	(39)
(40)m= 0.93	0.93	0.93	0.91	0.91	0.9	0.9	0.89	0.9	0.91	0.91	0.92		
( )								,	Average =	Sum(40) <sub>1</sub>	<del></del>	0.91	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/atau   a a a											1-10/1- /		
4. Water heat	ing ene	rgy requ	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.58		(42)
if TFA £ 13.9 Annual average	,	ater usad	ne in litre	es ner da	ıv Vd av	erane –	(25 x N)	+ 36		05	5.37		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	welling is	designed t			se target o		0.37		(40)
not more that 125		· ·	, ,			<u> </u>	1			1			
Jan Hot water usage ii	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 1c v	Aug	Sep	Oct	Nov	Dec		
	101.09	97.28	93.46	89.65	85.83	85.83	89.65	93.46	97.28	101.09	104.91		
(44)m= 104.91	101.09	97.20	93.46	69.00	00.00	65.63	69.00	l		m(44) <sub>112</sub> =	<del></del>	1144.46	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		
(45)m= 155.58	136.07	140.41	122.41	117.46	101.36	93.92	107.78	109.06	127.1	138.74	150.67		
If instantaneous w	ator hoati	na at noint	of use (no	n hot water	· storage)	enter∩in	hoves (46		Γotal = Su	m(45) <sub>112</sub> =	=	1500.57	(45)
(46)m= 23.34	20.41	21.06	18.36	17.62	15.2	14.09	16.17	16.36	19.07	20.81	22.6		(46)
Water storage	_	21.00	10.30	17.02	13.2	14.09	10.17	10.30	19.07	20.01	22.0		(40)
Storage volum	e (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			, ,			`			
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								00		(51)
If community h	_			IC Z (KVV	ii/iiti <del>c</del> /ua	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	. , .	•	or oach	manth			//EG\~~ /	EE) (44):	~	1.	.03		(55)
Water storage					20.00		((56)m = (			20.00	20.04		(EC)
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 om Appendix	кH	(56)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	•	(57)
(57)m= 32.01	20.92	JZ.U1	30.96	32.01	30.96	32.01	32.01	30.96	32.01	30.96	32.01		(37)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 210.85 186 195.69 175.91 172.74 154.85 149.2 163.05 162.56 182.38	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	and to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	1
(64)m= 210.85 186 195.69 175.91 172.74 154.85 149.2 163.05 162.56 182.38	192.24 205.94
Output from water heat	<del></del>
· · · · · · · · · · · · · · · · · · ·	
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>
(65)m= 95.95 85.18 90.91 83.5 83.28 76.5 75.45 80.06 79.06 86.48	88.93 94.32 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78   128.78	128.78 128.78 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 20.74 18.42 14.98 11.34 8.48 7.16 7.73 10.05 13.49 17.13	19.99 21.31 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 232.6 235.02 228.94 215.99 199.64 184.28 174.02 171.6 177.68 190.63	206.98 222.34 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<del></del>
(69)m= 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88 35.88	35.88 35.88 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -103.03	3 -103.03 -103.03 (71)
	100.00
Water heating gains (Table 5)	123.51 126.77 (72)
(72)m= 128.97   126.76   122.19   115.97   111.93   106.24   101.41   107.6   109.8   116.24	
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (68)m$	
(73)m= 443.94 441.83 427.74 404.93 381.68 359.32 344.8 350.89 362.61 385.64	412.12 432.06 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux flux flux flux flux flux flux flux	
Orientation: Access Factor Area Flux g_ Table 6d m <sup>2</sup> Table 6a Table 6b	FF Gains Table 6c (W)
North 0.9x 0.77 × 8.35 × 10.63 × 0.558 ×	0.7 = 24.03 (74)
North 0.9x 0.77 x 8.35 x 20.32 x 0.558 x	0.7 = 45.93 (74)

North 0.9x 0.77		_									-			_					_
North	North	0.9x	0.77	<u> </u>		8.35		X	3	34.53	X		0.558	X	0.7		=	78.05	(74)
North	North	0.9x	0.77	)		8.35		X	5	5.46	X		0.558	X	0.7		=	125.36	(74)
North	North	0.9x	0.77	)		8.35		X	7	4.72	X		0.558	X	0.7		=	168.87	(74)
North	North	0.9x	0.77	)		8.35		X	7	9.99	X		0.558	X	0.7		=	180.79	(74)
North	North	0.9x	0.77	)		8.35		X	7	4.68	X		0.558	X	0.7		=	168.79	(74)
North	North	0.9x	0.77	)		8.35		X	5	9.25	X		0.558	X	0.7		=	133.91	(74)
North	North	0.9x	0.77	)		8.35		X	4	1.52	X		0.558	x	0.7		=	93.84	(74)
North	North	0.9x	0.77	)		8.35		X	2	4.19	x		0.558	x	0.7		=	54.67	(74)
Solid	North	0.9x	0.77	)		8.35		X	1	3.12	X		0.558	x	0.7		=	29.65	(74)
East	North	0.9x	0.77	)		8.35		X		3.86	x		0.558	×	0.7		=	20.04	(74)
East	East	0.9x	1	)		15.22		X	1	9.64	X		0.56	x	0.7		=	80.91	(76)
East	East	0.9x	1	)	(	15.22		X	3	8.42	X		0.56	x	0.7		=	158.29	(76)
East	East	0.9x	1	)		15.22		x	6	3.27	x		0.56	×	0.7		=	260.68	(76)
East	East	0.9x	1	)		15.22		x	9	2.28	x		0.56	×	0.7		=	380.18	(76)
East	East	0.9x	1	,		15.22		x	1	13.09	x		0.56	×	0.7		=	465.92	(76)
East	East	0.9x	1	<u> </u>		15.22		X	1	15.77	x		0.56	×	0.7		=	476.96	(76)
East 0.9x 1 x 15.22 x 73.59 x 0.56 x 0.7 = 303.18 (76)  East 0.9x 1 x 15.22 x 45.59 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 66.54 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(62)m  (83)m= 104.95 204.22 338.72 505.54 634.8 657.74 622.87 523.96 397.01 242.49 130.54 86.58 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	East	0.9x	1	,		15.22		X	1	10.22	x		0.56	×	0.7		=	454.08	(76)
East 0.9x 1 x 15.22 x 45.59 x 0.56 x 0.7 = 187.82 (76)  East 0.9x 1 x 15.22 x 24.49 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 100.89 (76)  East 0.9x 1 x 15.22 x 16.15 x 0.56 x 0.7 = 66.54 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m  (83)m= 104.95 204.22 338.72 505.54 634.8 657.74 622.87 523.96 397.01 242.49 130.54 86.58 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	East	0.9x	1	,		15.22		X	9	4.68	x		0.56	×	0.7		=	390.05	(76)
East	East	0.9x	1	)		15.22		X	7	3.59	x		0.56	×	0.7		=	303.18	(76)
East	East	0.9x	1	)		15.22		X	4	5.59	х		0.56	×	0.7		=	187.82	(76)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 104.95   204.22   338.72   505.54   634.8   657.74   622.87   523.96   397.01   242.49   130.54   86.58    Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 548.89   646.05   766.46   910.47   1016.48   1017.06   967.66   874.85   759.63   628.13   542.66   518.64    7. Mean internal temperature (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 = 0.94   0.91   0.85   0.74   0.6   0.45   0.34   0.38   0.59   0.81   0.91   0.95   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.88   19.2   19.7   20.28   20.88   20.89   20.96   20.95   20.77   20.21   19.44   18.83   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.14   20.14   20.15   20.16   20.16   20.17   20.17   20.17   20.17   20.16   20.15   20.15   (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.93   0.9   0.84   0.72   0.56   0.4   0.28   0.32   0.54   0.79   0.9   0.94   (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 17.29   17.74   18.45   19.26   19.8   20.07   20.14   20.13   19.93   19.18   18.11   17.21   (90)	East	0.9x	1	)		15.22		X	2	4.49	x		0.56	×	0.7		=	100.89	(76)
(83)m=	East	0.9x	1	)		15.22		X	1	6.15	х		0.56	×	0.7		=	66.54	(76)
(83)m=		_												_					_
Total gains — internal and solar (84)m = (73)m + (83)m , watts  (84)m = 548.89 646.05 766.46 910.47 1016.48 1017.06 967.66 874.85 759.63 628.13 542.66 518.64 (84)  7. Mean internal temperature (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 = 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.88 19.2 19.7 20.28 20.88 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Solar g	ains in	watts, ca	alculate	d for e	ach m	onth	1			(83)m	n = Si	um(74)m .	(82)m					
(84)m=       548.89       646.05       766.46       910.47       1016.48       1017.06       967.66       874.85       759.63       628.13       542.66       518.64       (84)         7. Mean internal temperature (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=         0.94       0.91       0.85       0.74       0.6       0.45       0.34       0.38       0.59       0.81       0.91       0.95       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       18.88       19.2       19.7       20.28       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.17       20.17       20.17	` '										523	.96	397.01	242.4	9 130.54	. 86	.58		(83)
7. Mean internal temperature (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= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Total g	ains – ii	nternal a	nd sola	ır (84)	m = (7	'3)m	+ (	83)m	, watts								•	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.94 0.91 0.85 0.74 0.6 0.45 0.34 0.38 0.59 0.81 0.91 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	(84)m=	548.89	646.05	766.46	910	47 10	16.48	10	17.06	967.66	874	.85	759.63	628.1	3 542.66	518	3.64		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	7. Me	an inter	nal temp	erature	(hea	ing se	asor	n)											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Temp	erature	during h	eating	period	s in th	e livi	ing	area	from Tal	ole 9	, Th	1 (°C)					21	(85)
(86)m=       0.94       0.91       0.85       0.74       0.6       0.45       0.34       0.38       0.59       0.81       0.91       0.95         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=         18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.17       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	Utilisa	ition fac	tor for g	ains for	living	area,	h1,n	า (ร	ee Ta	ble 9a)									_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.88 19.2 19.7 20.28 20.68 20.89 20.96 20.95 20.77 20.21 19.44 18.83 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.14 20.14 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)		Jan	Feb	Mar	A	or I	May		Jun	Jul	А	ug	Sep	Oc	t Nov		Эес		
(87)m=       18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.16       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	(86)m=	0.94	0.91	0.85	0.7	4 (	0.6		0.45	0.34	0.3	38	0.59	0.81	0.91	0.	95		(86)
(87)m=       18.88       19.2       19.7       20.28       20.68       20.89       20.96       20.95       20.77       20.21       19.44       18.83       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.14       20.14       20.15       20.16       20.16       20.17       20.17       20.17       20.17       20.16       20.15       20.15       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.93       0.9       0.84       0.72       0.56       0.4       0.28       0.32       0.54       0.79       0.9       0.94       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.29       17.74       18.45       19.26       19.8       20.07       20.14       20.13       19.93       19.18       18.11       17.21       (90)	Mean	interna	l temper	ature in	living	area -	T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	e 9c)						
(88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	(87)m=	18.88	19.2	19.7	20.	.8 20	0.68	2	20.89	20.96	20.	95	20.77	20.2	19.44	18	.83		(87)
(88)m= 20.14 20.14 20.15 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.15 20.15 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	Temp	erature	durina h	eating	nerio	s in re	est of	. dw	ellina	from Ta	able 9	——. 9 Th	n2 (°C)		•	- <b>!</b>			
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.93 0.9 0.84 0.72 0.56 0.4 0.28 0.32 0.54 0.79 0.9 0.94 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	· .							_		i	1		<u> </u>	20.10	6 20.15	20	.15		(88)
(89)m=     0.93     0.9     0.84     0.72     0.56     0.4     0.28     0.32     0.54     0.79     0.9     0.94       Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)           (90)m=         17.29         17.74         18.45         19.26         19.8         20.07         20.14         20.13         19.93         19.18         18.11         17.21         (90)			tor for a	oina far	root	f dural	lina	<u>ь</u>	m (00	L Toblo	0e/	!			<b>!</b>	_!			
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)	1		Ť	1	1			1	•	i	T –	32	0.54	0.79	1 0 9	1 0	94		(89)
(90)m= 17.29 17.74 18.45 19.26 19.8 20.07 20.14 20.13 19.93 19.18 18.11 17.21 (90)					<u> </u>					<u> </u>					1 0.5		J-i		(==)
	I				1			Ť			·		i		1 40.44	1 4-	. 04	1	(00)
$ILA = Living area \div (4) = 0.28 \tag{91}$	(90) <b>m</b> =	17.29	17.74	18.45	19.	.ο   1	9.8	<u> </u>	20.07	∠0.14	20.	13					.∠1	0.00	_
													'	_/ \ — LI	ing ar <del>c</del> a ∓	(¬) -		0.28	(al)

Mean	internal temp	erature (fo	or the wh	ole dwe	llina) = f	LA × T1	+ (1 – fl	A) × T2					
(92)m=	17.73 18.14	<del></del>	19.55	20.04	20.3	20.37	20.36	20.17	19.47	18.48	17.66		(92)
Apply	adjustment to	the mea	n interna	l temper	ature fro	m Table	4e, whe	ere appr	opriate			l	
(93)m=	17.73 18.14	18.8	19.55	20.04	20.3	20.37	20.36	20.17	19.47	18.48	17.66		(93)
8. Spa	ace heating re	quiremen	t										
	to the mean ilisation factor		•		ed at st	ep 11 of	Table 9	b, so tha	nt Ti,m=(	76)m an	d re-calc	ulate	
tile ut	Jan Fel	<del></del>	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion factor for						19						
(94)m=	0.91 0.87	0.81	0.7	0.56	0.41	0.29	0.34	0.54	0.76	0.88	0.92		(94)
Usefu	l gains, hmGr		4)m x (8	4)m	1		•	,	1	•			
(95)m=	498.31 563.3		633.32	564.9	414	284.33	294.23	411.81	479.05	475.16	475.68		(95)
I	nly average ex	1	<del>i                                     </del>	T T	r		l			<del></del>			(00)
(96)m=	4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	oss rate for m	1	840.83	657.14	442.6	292.9	306.62	473.72	698.45	901.19	1071.87		(97)
` '	e heating requ		Į		l	l	l	l	l	l	107 1.07		(-1)
(98)m=	433.69 336.0	1	149.41	68.63	0	0	0	0	163.24	306.74	443.57		
•	Į		1		I.		Tota	l per year	(kWh/yea	r) = Sum(9	98) <sub>15,912</sub> =	2173.98	(98)
Space	e heating requ	irement ir	n kWh/m²	²/year								25.12	(99)
9b. En	ergy requirem	ents – Co	mmunity	heating	scheme	)							
	art is used for									unity sch	heme.		_
Fractio	n of space he	at from se	econdary	/supplen	nentary	heating	(Table 1	1) '0' if n	one			0	(301)
Fractio	n of space he	at from co	mmunity	/ system	1 – (30	1) =						1	(302)
	munity scheme r	-							up to four	other heat	sources; ti	he latter	
	boilers, heat pun n of heat from	-		asie neai i	rom powe	i Stations.	see Appe	ridix C.				0.6	(303a)
Fractio	n of communi	ty heat fro	m heat s	source 2								0.4	(303b)
Fractio	n of total spac	e heat fro	m Comr	nunity C	HP				(3	602) x (303	8a) =	0.6	(304a)
Fractio	n of total space	e heat fro	m comm	nunity he	at sourc	e 2			(3	602) x (303	8b) =	0.4	(304b)
Factor	for control an	d charging	g method	l (Table	4c(3)) fo	or commi	unity hea	ating sys	tem			1	(305)
Distribu	ution loss fact	or (Table	12c) for (	commun	ity heati	ng syste	m					1.05	(306)
	heating	`	,		•	0 ,						kWh/yea	 r
•	space heatin	g requirer	nent									2173.98	
Space	heat from Co	nmunity (	CHP					(98) x (3	04a) x (30	5) x (306)	=	1369.61	(307a)
Space	heat from hea	it source 2	2					(98) x (3	04b) x (30	5) x (306)	=	913.07	(307b)
Efficier	ncy of second	ary/supple	ementary	heating	system	in % (fro	om Table	e 4a or A	ppendix	ΞE)		0	(308)
Space	heating requi	ement fro	m secon	idary/su	oplemen	itary sys	tem	(98) x (3	01) x 100 ·	÷ (308) =		0	(309)
·					-								
	<b>heating</b> water heating	g requiren	nent									2151.41	
	from commu	•								_,	· ·		<b>_</b> <b>_</b>
Water	heat from Cor	nmunity C	HP					(64) x (3	u3a) x (30	5) x (306)	=	1355.39	(310a)

Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	903.5	9 (310b)
Electricity used for heat distribution	0.0	1 × [(307a)(307e	e) + (310a)(310e)] =	45.42	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling syst	em, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling mechanical ventilation - balanced, extract or		e		167.9	(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) =	167.9	(331)
Energy for lighting (calculated in Appendix L)				366.2	2 (332)
Electricity generated by PVs (Appendix M) (n	egative quantity)			-456.	3 (333)
Electricity generated by wind turbine (Append	lix M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating so	heme				
Electrical efficiency of CHP unit				29.73	(361)
Heat efficiency of CHP unit				45.9	(362)
		nergy Vh/year	Emission factor kg CO2/kWh	r Emissior kg CO2/y	
Space heating from CHP) (307a) × 10	00 ÷ (362) =	2980.64 ×	0.22	643	.82 (363)
less credit emissions for electricity -(307a) ×	361) ÷ (362) =	886.15 ×	0.52	-459	.91 (364)
Water heated by CHP (310a) x 10	00 ÷ (362) =	2949.7 ×	0.22	637	.13 (365)
less credit emissions for electricity -(310a) ×	361) ÷ (362) =	876.95 ×	0.52	-455	.13 (366)
Efficiency of heat source 2 (%)	If there is CHP using two fue	els repeat (363) to	(366) for the second fu	iel 9	(367b)
CO2 associated with heat source 2	[(307b)+(310b)] x	(100 ÷ (367b) x	0.22	= 431	.21 (368)
Electrical energy for heat distribution	[(313) x		0.52	= 23.	57 (372)
Total CO2 associated with community system	ns (363)(3	366) + (368)(372	)	= 820	.69 (373)
CO2 associated with space heating (secondary	ry) (309) x		0	= 0	(374)
CO2 associated with water from immersion h	eater or instantaneous he	eater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water I	eating (373) + (	374) + (375) =		820	.69 (376)
CO2 associated with electricity for pumps an	d fans within dwelling (33	31)) x	0.52	= 87.	14 (378)
CO2 associated with electricity for lighting	(332))) x		0.52	= 190	.07 (379)
Energy saving/generation technologies (333) Item 1	to (334) as applicable		0.52 x 0.01 =	-236	.82 (380)
Total CO2, kg/year sum	of (376)(382) =			861	.08 (383)
	÷ (4) =			9.9	5 (384)
El rating (section 14)				91.:	23 (385)

			User	Details:						
Assessor Name:	Matthew St	tainrad	OSCI I	Strom	o Nives	hor:		STD (	0023501	
Software Name:	Stroma FS			Softwa					on: 1.0.4.16	
Software Name:	Stroma FS	AP 2012	Duonout				ГО	versio	)II. 1.0. <del>4</del> .10	
Address .	4E 0 Portro	m Street, Lo	Property	Address	: 06-18-0	09419 4	F-9			
Address: 1. Overall dwelling dime		m Street, Loi	laon							
1. Overall dwelling diffie	ensions.		۸۳۵	o(m²)		۸۷ ۵۰	iaht/m\		Volume(m <sup>3</sup>	31
Ground floor				ea(m²) 86.56	(1a) x		eight(m) 2.4	(2a) =	207.74	) (3a)
	a) . (4b) . (4a) . (	4 -1) . (4 -) .					2.4	(24) =	207.74	(34)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1u)+(1e)+	.(111)	86.56	(4)			<i>i</i>		_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	207.74	(5)
2. Ventilation rate:										
	main heating	secon heatir		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	=	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<del></del>	0		0	X	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vents	<b>S</b>				F	0	X	10 =	0	(7b)
Number of flueless gas fi					Ļ		<u> </u>	40 =		= ' '
Trumber of flueless gas in	li es				L	0	^		0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a)+(6b	))+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	•				continue fr		(16)	÷ (5) =	U	(6)
Number of storeys in t			( ),			(-)	( -/		0	(9)
Additional infiltration	<b>.</b> .	,					[(9	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame	or 0.35 fc	r mason	ry consti	ruction			0	(11)
if both types of wall are p			ng to the grea	ter wall are	a (after					_
deducting areas of openial If suspended wooden to	• / .		ır N 1 (spal	ad) alsa	enter ()					7(12)
If no draught lobby, en		•	11 U. 1 (Seal	eu), eise	CITICI U				0	(12)
Percentage of window	•		d						0	= ' '
Window infiltration	s and doors die	augiit strippe	u	0.25 - [0.2	) x (14) ÷ 1	1001 =			0	(14)
Infiltration rate				(8) + (10)	` '	_	+ (15) =		0	(16)
Air permeability value,	a50 expresse	d in cubic me	etres ner h					e area	3	(17)
If based on air permeabil			-		•	0110 01 0	on voiop	o aroa	0.15	(18)
Air permeability value applie	,					is being u	ısed		0.15	(10)
Number of sides sheltere						•			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified f	for monthly win	d speed							_	
Jan Feb	Mar Apr	May Ju	ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
		•							-	
Wind Factor $(22a)m = (2$	2)m ÷ 4							_	-	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate (allow	ing for she	elter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16 0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effec	_	rate for th	e appli	cable ca	se	!	!	!	!	1	J	_
If mechanica		andiv N. (22)	h) - (22a	) v Emy (c	aguation (I	VEVV otho	muioo (22h	v) = (33a)			0.5	(23a)
	at pump using App							)) = (23a)			0.5	(23b)
	heat recovery: effi	-	_					Ol- \ /	005) [	4 (00-)	79.9	(23c)
· -	d mechanical v 0.26 0.26	<del> </del>	0.24	0.22	0.22	HR) (248	a)m = (2) 0.23	2b)m + ( 0.24	23b) × [ 0.24	1 – (23c) 0.25	i ÷ 100] I	(24a)
(24a)m= 0.26		0.24					<u> </u>	ļ		0.25		(24a)
(24b)m= 0	d mechanical v	entilation v	o I	neat rec		0 (240 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	26)m + (. T 0	230)	0	1	(24b)
( ',	ouse extract ve	<u> </u>										(210)
,	$< 0.5 \times (23b)$ ,		•	•				.5 x (23h	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural v	entilation or wl	hole house	positiv	e input	ventilati	on from	loft	<u> </u>		Į	ı	
,	= 1, then (24d		•	•				0.5]			_	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change rate - e	nter (24a)	or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.26	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. Heat losses	and heat loss	parameter	r:									
ELEMENT	Gross area (m²)	Opening m <sup>2</sup>	S	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		X k /K
Doors	( )			2.1	x	1.4		2.94				(26)
Windows Type	1			15.22		/[1/( 1.4 )+	- 0.04] =	20.18	Ħ			(27)
Windows Type	2			8.35		/[1/( 1.4 )+	- 0.04] =	11.07	=			(27)
Walls Type1	51.14	25.67	$\neg$	25.47	7 X	0.15	=	3.82		14	356.58	(29)
Walls Type2	8.21	0	=	8.21	x	0.14	=	1.16	Ħ i	14	114.94	(29)
Walls Type3	9.98	0		9.98	x	0.13	<del>-</del>	1.32		14	139.72	(29)
Roof	86.56	0		86.56	3 x	0.11	=	9.52	i i	9	779.04	(30)
Total area of el	ements, m <sup>2</sup>			155.8	9							(31)
Party wall				32.95	5 X	0	=	0		20	659	(32)
Party floor				86.56	5					40	3462.4	(32a)
Internal wall **				163.2	2					9	1468.8	(32c)
* for windows and i					lated using	g formula 1	1/[(1/U-valu	ue)+0.04] á	as given in	paragraph	1 3.2	_
Fabric heat loss	s, W/K = S (A >	(U)				(26)(30	) + (32) =				50.01	(33)
Heat capacity C	Cm = S(A x k)						((28).	(30) + (32	2) + (32a)	(32e) =	6980.48	(34)
Thermal mass	naramatar /TM	D 0	TEA) in	l 1/m2l/			- (34)	) ÷ (4) =			80.64	(35)
man mass	parameter (Tivi	$P = Cm \div$	11 7) 111	I KJ/III~K			- (34)	( -)			00.04	(/
For design assessi	ments where the d	etails of the c	,			recisely the	` '		TMP in T	able 1f	00.04	(==)
For design assessi	ments where the d ad of a detailed cal	etails of the c	constructi	ion are no	t known pi	recisely the	` '		TMP in T	able 1f	12.37	(36)
For design assessi can be used instea	ments where the dangled of a detailed calces: S:S(LxY) call bridging are not k	etails of the c culation. Ilculated us	constructi	on are not	t known pi	recisely the	` '		TMP in T	able 1f		

Ventila	tion hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.03	17.82	17.6	16.5	16.29	15.19	15.19	14.98	15.63	16.29	16.72	17.16		(38)
Heat tr	ansfer c	oefficier	nt, W/K	•	•	•	•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	80.41	80.19	79.97	78.88	78.66	77.57	77.57	77.35	78.01	78.66	79.1	79.54		
Heat Ic	ss para	meter (H	HLP), W	m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> · (4)	12 /12=	78.83	(39)
(40)m=	0.93	0.93	0.92	0.91	0.91	0.9	0.9	0.89	0.9	0.91	0.91	0.92		
Numbe	er of day	s in moi	nth (Tab	le 1a)		•	•	•	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.91	(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	iter heat	ing enei	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	pancy, l	N								2	.58		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.				` '
								(25 x N)				5.37		(43)
		-	not water person pei	• .		-	-	to achieve	a water us	se target o	Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	Oct	INOV	Dec		
(44)m=	104.91	101.09	97.28	93.46	89.65	85.83	85.83	89.65	93.46	97.28	101.09	104.91		
( - 1,111									<u> </u>		m(44) <sub>112</sub> =	l	1144.46	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	155.58	136.07	140.41	122.41	117.46	101.36	93.92	107.78	109.06	127.1	138.74	150.67		
lf instant	taneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1500.57	(45)
1			· ·	·				· · ·	. , ,	40.07	00.04	00.0		(46)
(46)m= Water	23.34 storage	20.41 loss:	21.06	18.36	17.62	15.2	14.09	16.17	16.36	19.07	20.81	22.6		(46)
	_		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)					l	
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage			(		- (1.14/1	. / .1 \						l	
•			eclared I		or is kno	wn (kvvr	n/day):					0		(48)
			m Table					(10)				0		(49)
			storage eclared o			or is not		(48) x (49)	) =		1	10		(50)
			factor fr								0.	.02		(51)
			ee secti											
	e factor										1.	.03		(52)
			m Table									.6		(53)
•			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
	(50) or (	, ,	•					(/EC) :	==\		1.	.03		(55)
vvater:			culated 1					((56)m = (	55) × (41)ı	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)

•	ains 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= 32.0	1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	uit loss (ar	nnual) fro	m Table	 e 3						!	0		(58)
Primary circ	•	,			59)m = (	(58) ÷ 36	65 × (41)	m				'	
(modified	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= 23.2	6 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss	calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water he	eating ca	alculated	I for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 210.	85 186	195.69	175.91	172.74	154.85	149.2	163.05	162.56	182.38	192.24	205.94		(62)
Solar DHW inp	ut calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 210.	85 186	195.69	175.91	172.74	154.85	149.2	163.05	162.56	182.38	192.24	205.94		
	•						Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2151.41	(64)
Heat gains	from 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= 95.9	5 85.18	90.91	83.5	83.28	76.5	75.45	80.06	79.06	86.48	88.93	94.32		(65)
include (5	57)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic g				,									
Ja		1											
	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 128.		Mar 128.78	Apr 128.78	May 128.78	Jun 128.78	Jul 128.78	Aug 128.78	Sep 128.78	Oct 128.78	Nov 128.78	Dec 128.78		(66)
<u> </u>	78 128.78	128.78	128.78	128.78	128.78	128.78	128.78	128.78	<b>-</b>	-			(66)
(66)m= 128.	78 128.78 ns (calcula	128.78	128.78	128.78	128.78	128.78	128.78	128.78	<b>-</b>	-			(66) (67)
(66)m= 128. Lighting gai	78 128.78 ns (calcula 74 18.42	128.78 ted in Ap 14.98	128.78 opendix 11.34	128.78 L, equat 8.48	128.78 ion L9 oi 7.16	128.78 r L9a), a 7.73	128.78 Iso see	128.78 Table 5	128.78	128.78	128.78		
(66)m= 128. Lighting gai (67)m= 20.7	78 128.78 ns (calcula 4 18.42 gains (calc	128.78 ted in Ap 14.98	128.78 opendix 11.34	128.78 L, equat 8.48	128.78 ion L9 oi 7.16	128.78 r L9a), a 7.73	128.78 Iso see	128.78 Table 5	128.78	128.78	128.78		
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232	ns (calcula 4 18.42 gains (calc 6 235.02	128.78 ted in Ap 14.98 culated in 228.94	128.78 opendix 11.34 n Append 215.99	128.78 L, equat 8.48 dix L, eq 199.64	128.78 ion L9 or 7.16 uation L	128.78 r L9a), a 7.73 13 or L1 174.02	128.78 Iso see 10.05 3a), also	128.78 Table 5 13.49 see Tal 177.68	128.78 17.13 ble 5 190.63	128.78	128.78 21.31		(67)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances	ns (calcula 4 18.42 gains (calc 6 235.02 ins (calcula	128.78 ted in Ap 14.98 culated in 228.94	128.78 opendix 11.34 n Append 215.99	128.78 L, equat 8.48 dix L, eq 199.64	128.78 ion L9 or 7.16 uation L	128.78 r L9a), a 7.73 13 or L1 174.02	128.78 Iso see 10.05 3a), also	128.78 Table 5 13.49 see Tal 177.68	128.78 17.13 ble 5 190.63	128.78	128.78 21.31		(67)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8	128.78 ns (calcula 14 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88	128.78  tted in Ap 14.98 culated in 228.94 ated in Ap 35.88	128.78  ppendix  11.34  Append  215.99  ppendix  35.88	128.78 L, equat 8.48 dix L, eq 199.64 L, equat	128.78 ion L9 of 7.16 uation L 184.28 ion L15	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a)	128.78 lso see 10.05 3a), also 171.6	128.78 Table 5 13.49 see Tal 177.68 ee Table	128.78 17.13 ble 5 190.63 5	128.78 19.99 206.98	128.78 21.31 222.34		(67) (68)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and	128.78 ns (calcula 14 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88	128.78  tted in Ap 14.98 culated in 228.94 ated in Ap 35.88	128.78  ppendix  11.34  Append  215.99  ppendix  35.88	128.78 L, equat 8.48 dix L, eq 199.64 L, equat	128.78 ion L9 of 7.16 uation L 184.28 ion L15	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a)	128.78 lso see 10.05 3a), also 171.6	128.78 Table 5 13.49 see Tal 177.68 ee Table	128.78 17.13 ble 5 190.63 5	128.78 19.99 206.98	128.78 21.31 222.34		(67) (68)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0	ns (calcula 4 18.42 gains (calcula 6 235.02 ins (calcula 8 35.88 fans gains	128.78  ted in Ap 14.98 culated in 228.94 ated in Ap 35.88 c (Table 5	128.78  ppendix 11.34  Append 215.99  ppendix 35.88  5a)  0	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78 17.13 ble 5 190.63 5 35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatio	ted in Ap 14.98 culated in 228.94 ated in Ap 35.88 c (Table 5	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5)	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78 17.13 ble 5 190.63 5 35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103.	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatic 03 -103.03	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  c (Table 5 0  on (negation)	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88	128.78  17.13 ble 5  190.63  5  35.88	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69) (70)
Lighting gai (67)m= 20.7  Appliances (68)m= 232  Cooking ga (69)m= 35.8  Pumps and (70)m= 0  Losses e.g. (71)m= -103.  Water heati	128.78 ns (calcula 18.42 gains (calcula 235.02 ins (calcula 35.88 fans gains 0 evaporatio 03 -103.03 ng gains (7	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  c (Table 5 0  on (negation)	128.78 ppendix 11.34 Appendix 215.99 ppendix 35.88 5a) 0 tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0	128.78  17.13 ble 5  190.63 5  35.88  0	128.78 19.99 206.98 35.88	21.31 222.34 35.88		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128.	78   128.78   128.78   128.78   18.42	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  on (negation of the content of the	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88 0 -103.03	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88 0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03	128.78 19.99 206.98 35.88 0 -103.03	128.78 21.31 222.34 35.88 0 -103.03		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr	128.78  ns (calcular 18.42  gains (calcular 235.02  ns (calcular 8 35.88  fans gains 0  evaporation 03 -103.03  ng gains (7 126.76  nal gains =	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  (Table 5 0 on (negation of the column	128.78 ppendix 11.34 Appendix 215.99 ppendix 35.88 5a) 0 tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 le 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0  -103.03  101.41 m + (67)m	128.78 lso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88  0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72)	128.78  21.31  222.34  35.88  0  -103.03		(67) (68) (69) (70) (71) (72)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr (73)m= 443.	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7  126.76  nal gains =	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  on (negation of the content of the	128.78 ppendix 11.34 Appendix 215.99 ppendix 35.88 5a) 0 tive valu -103.03	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88 0 -103.03	128.78 Iso see 10.05 3a), also 171.6 , also se 35.88 0 -103.03	128.78 Table 5 13.49 see Tal 177.68 ee Table 35.88 0 -103.03	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03	128.78 19.99 206.98 35.88 0 -103.03	128.78 21.31 222.34 35.88 0 -103.03		(67) (68) (69) (70)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 8 35.88  fans gains 0  evaporation 3 -103.03  ng gains (7  126.76  nal gains = 94 441.83  iins:	128.78  ted in Ap 14.98  culated in 228.94  ated in Ap 35.88  (Table 5 0 on (negated in 103.03)  Table 5) 122.19	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03  115.97	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03  111.93	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03  106.24 (66) 359.32	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0  -103.03  101.41 m + (67)m 344.8	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03  107.6 1+(68)m+ 350.89	128.78 Table 5 13.49 See Tal 177.68 See Table 35.88  0 -103.03  109.8 + (69)m	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7  385.64	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72) 412.12	128.78  21.31  222.34  35.88  0  -103.03  126.77		(67) (68) (69) (70) (71) (72)
(66)m= 128. Lighting gai (67)m= 20.7 Appliances (68)m= 232 Cooking ga (69)m= 35.8 Pumps and (70)m= 0 Losses e.g. (71)m= -103. Water heati (72)m= 128. Total interr (73)m= 443. 6. Solar ga	128.78  ns (calcula 18.42  gains (calcula 235.02  ins (calcula 35.88  fans gains 0  evaporatio 3 -103.03  ng gains (7  97   126.76  nal gains = 94   441.83  ins: re calculated	128.78  Ited in Ap 14.98  Rulated in 228.94  Ated in Ap 35.88  G(Table 5 0  In (negation of the context) 122.19  427.74  Using sola	128.78  ppendix 11.34  Appendix 215.99  ppendix 35.88  5a)  0  tive valu -103.03  115.97	128.78 L, equat 8.48 dix L, eq 199.64 L, equat 35.88  0 es) (Tab -103.03  111.93	128.78 ion L9 or 7.16 uation L 184.28 ion L15 35.88  0 lle 5) -103.03  106.24 (66) 359.32	128.78 r L9a), a 7.73 13 or L1 174.02 or L15a) 35.88  0 -103.03  101.41 m + (67)m 344.8	128.78 Iso see 10.05 3a), also 171.6 ), also se 35.88  0 -103.03  107.6 1+(68)m+ 350.89	128.78 Table 5 13.49 See Tal 177.68 See Table 35.88  0 -103.03  109.8 + (69)m	128.78  17.13 ble 5  190.63  5  35.88  0  -103.03  116.24  (70)m + (7  385.64	128.78  19.99  206.98  35.88  0  -103.03  123.51  1)m + (72) 412.12	128.78  21.31  222.34  35.88  0  -103.03  126.77	Gains	(67) (68) (69) (70) (71) (72)

North	0.9x	0.77		x	8.3	5	x	1	0.63	1 x		0.558	7 x	0.7			24.03	(74)
North	0.9x	0.77		x	8.3		X	$\vdash$	0.32	] x		0.558	X	0.7	= =		45.93	(74)
North	0.9x	0.77		x	8.3		x		4.53	] x	_	0.558	] x	0.7	= =		78.05	(74)
North	0.9x	0.77	$\equiv$	x	8.3		x		5.46	] ]	<b>—</b>	0.558	」 기 x	0.7	╡.	$\vdash$	125.36	(74)
North	0.9x	0.77		x	8.3		x	_	4.72	] ]	<b>-</b>	0.558	X	0.7	╡.		168.87	(74)
North	0.9x	0.77		x	8.3		x	<u> </u>	9.99	] ] x		0.558	X	0.7	= =		180.79	(74)
North	0.9x	0.77		x	8.3		х	_	4.68	)   x		0.558	X	0.7		. –	168.79	(74)
North	0.9x	0.77		x	8.3	5	х	5	9.25	X		0.558	X	0.7			133.91	(74)
North	0.9x	0.77		x	8.3	5	x	4	1.52	x		0.558	x	0.7	= =		93.84	(74)
North	0.9x	0.77		x	8.3	5	х	2	4.19	x		0.558	x	0.7			54.67	(74)
North	0.9x	0.77		x	8.3	5	х	1	3.12	x		0.558	x	0.7	_ =		29.65	(74)
North	0.9x	0.77		x	8.3	5	x	8	3.86	x		0.558	x	0.7			20.04	(74)
West	0.9x	0.77		x	15.2	22	x	1	9.64	x		0.56	x	0.7			80.91	(80)
West	0.9x	0.77		x	15.2	22	x	3	8.42	x		0.56	x	0.7			158.29	(80)
West	0.9x	0.77		x	15.2	22	x	6	3.27	X		0.56	х	0.7			260.68	(80)
West	0.9x	0.77		x	15.2	22	x	9	2.28	x		0.56	x	0.7			380.18	(80)
West	0.9x	0.77		x	15.2	22	x	1	13.09	x		0.56	x	0.7	-		465.92	(80)
West	0.9x	0.77		x	15.2	22	x	1	15.77	X		0.56	X	0.7	=		476.96	(80)
West	0.9x	0.77		x	15.2	22	x	1	10.22	X		0.56	X	0.7	-		454.08	(80)
West	0.9x	0.77		x	15.2	22	x	9	4.68	X		0.56	X	0.7	=		390.05	(80)
West	0.9x	0.77		x	15.2	22	x	7	3.59	X		0.56	X	0.7	=		303.18	(80)
West	0.9x	0.77		x	15.2	22	x	4	5.59	X		0.56	X	0.7	=		187.82	(80)
West	0.9x	0.77		x	15.2	22	x	2	4.49	X		0.56	X	0.7	=		100.89	(80)
West	0.9x	0.77		x	15.2	22	X	1	6.15	X	(	0.56	X	0.7	=		66.54	(80)
Ť		watts, ca					1	F7 74		ř	-	n(74)m		2 1 400 54	00.50	7		(02)
(83)m=   Total o		1 204.22 nternal a	338.		505.54 (84)m =	634.8 (73)m		57.74 83\m	622.87	523	.96	397.01	242.4	9 130.54	86.58			(83)
(84)m=	548.89	646.05	766.		910.47	, ,	<u> </u>	03)111	967.66	874	. 85	759.63	628.1	3 542.66	518.64	П		(84)
` ′ [								711100	007.00	<u> </u>	.00		020	7 0 .2.00	0.0.0			
		nal temp during h			Ĭ			oroo f	rom Tok	olo O	Th1	(°C)						7(05)
•		ctor for ga		٠.			·			JIE 9	, 1111	( C)					21	(85)
	Jan	Feb	M	-	Apr	May	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec			
(86)m=	0.94	0.91	0.8	$\rightarrow$	0.74	0.6	_	0.45	0.34	0.3	<del>-</del> -	0.59	0.81	0.91	0.95			(86)
L	intorno	ıl tempera	aturo	Lin li	ving or	22 T1 /	(follo	w cto	nc 3 to 7	I 7 in T		00)						
(87)m=	18.89	19.2	19.	$\overline{}$	20.28	20.68	<del>`</del>	20.9	20.96	20.		20.77	20.21	19.45	18.83			(87)
				!								<u> </u>			10100			, ,
(88)m=	20.14	during h	20.	<del></del> -	20.16	20.16	$\neg$	20.17	20.17	20.		20.17	20.16	20.16	20.15	7		(88)
							_!_				''	20.17	20.10	20.10	20.10			(55)
ı		ctor for ga		-			i, h2 T			T	, T	0.54	0.70		0.04	1		(89)
(89)m=	0.93	0.9	0.8		0.72	0.56		0.4	0.28	0.3		0.54	0.79	0.9	0.94			(03)
Mean	interna	ıl tempera	ature	in tl	he rest	of dwe	lling	T2 (fo	ollow ste	eps 3	3 to 7	in Table	9c)					

(90)m=   17.29   17.74   18.46   19.27   19.8   20.07   20.14   20.13   19.93   19.19   18.11   17.21	(90)
(90)m= 17.29 17.74 18.46 19.27 19.8 20.07 20.14 20.13 19.93 19.19 18.11 17.21 fLA = Living area ÷ (4) = 0.28	(90)
	(01)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 17.73   18.15   18.8   19.55   20.05   20.3   20.37   20.36   20.17   19.47   18.48   17.66	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(02)
(93)m= 17.73 18.15 18.8 19.55 20.05 20.3 20.37 20.36 20.17 19.47 18.48 17.66	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	
Utilisation factor for gains, hm:	
(94)m= 0.91 0.87 0.81 0.7 0.56 0.41 0.29 0.34 0.54 0.76 0.88 0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 498.3 563.28 618.28 633.13 564.59 413.68 284.08 293.98 411.58 478.95 475.13 475.67	(95)
Monthly average external temperature from Table 8	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	(96)
(97)m= $\begin{vmatrix} 1080.25 & 1062.47 & 983.92 & 840.02 & 656.47 & 442.13 & 292.59 & 306.3 & 473.24 & 697.8 & 900.37 & 1070.9 \end{vmatrix}$	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 432.98 335.46 272.03 148.97 68.36 0 0 0 162.83 306.17 442.85	
Total per year (kWh/year) = $Sum(98)_{15.912}$ = 2169.64	(98)
Space heating requirement in kWh/m²/year 25.07	(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	
Tradition of opade float from ecocinally/outplicitionally floating (rable 11) of inflorid	(301)
Fraction of space heat from community system 1 – (301) –	(301)
Fraction of space heat from community system 1 – (301) = 1	(301)
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.	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter	<b>=</b>  ` `
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.	(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 CHP  0.6	(302) (303a)
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 CHP  0.6  Fraction of community heat from heat source 2	(302) (303a) (303b)
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 CHP  0.6  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  (302) x (303a) = 0.6	(302) (303a) (303b) (304a)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  (302) x (303a) = 0.6  Fraction of total space heat from community heat source 2  (302) x (303b) = 0.4	(302) (303a) (303b) (304a) (304b)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  (302) $\times$ (303a) =  0.6  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fractor for control and charging method (Table 4c(3)) for community heating system	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Construction of community heat from heat source 2  Fraction of total space heat from Community CHP  Construction of total space heat from community CHP  Construction of total space heat from community heat source 2  Construction of total space heat from community heat	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  kWh/yea	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fractor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Authorized Appendix C.  0.6  0.6  0.6  1.05  8	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  (98) x (304a) x (305) x (306) = 1366.88	(302) (303a) (303b) (304a) (304b) (305) (306)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat from community heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fraction of total space heat from community heat from heat source 2  Fr	(302) (303a) (303b) (304a) (304b) (305) (306) (307a) (307b)
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 CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heat source 2  Fractor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  (98) × (304a) × (305) × (306) =  1366.88  Space heat from heat source 2  (98) × (304b) × (305) × (306) =  911.25  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	(302) (303a) (303b) (304a) (304b) (305) (306)  Ir (307a) (307b) (308

If DHW from community scheme:

Water heat from heat source 2		_		1
Electricity used for heat distribution	Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1355.39	(310a)
Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) =		(64) x (303b) x (305) x (306) =	903.59	(310b)
Space cooling (if there is a fixed cooling system, if not enter 0)	Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	45.37	(313)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  in 167.91 (330a) warm air heating system fans  0 (330b) pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = (377.91 (331) (	Cooling System Energy Efficiency Ratio		0	(314)
mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a)  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 167.91 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  12b. CO2 Emissions - Community heating scheme  Electrical efficiency of CHP unit  Energy kWh/year Emission factor kWh/year (307a) × 100 + (362) = 2974.7 × 0.22	Space cooling (if there is a fixed cooling system, if not	enter 0) = (107) ÷ (314) =	0	(315)
Total electricity for the above, kWh/year		•	167.91	(330a)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 167.91 (331)  Energy for lighting (calculated in Appendix L)	warm air heating system fans		0	(330b)
Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Electrical efficiency of CHP unit  Energy kWh/year  Energy (362)  455.93  (363)  (366)  Efficiency of heat source 2 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  91 (367b)  CO2 associated with heat source 2  [(307b)+(310b)] x 100 + (367b) x  0.22  Energy (357b)  CO2 associated with community systems  (363)(366) + (368)(372)  Energy (363)  (368)  Energy (363)  (368)  Energy (363)  (366)  Energy (363)  (36	pump for solar water heating		0	(330g)
Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Electrical efficiency of CHP unit  Energy KWh/year Emission factor kg CO2/kWh kg CO2/kyear  Space heating from CHP)  (307a) × 100 ÷ (362) = 2974.7 × 0.22 Emissions for electricity – (307a) × (361) + (362) = 884.38 × 0.52 —458.99 (364)  Water heated by CHP  (310a) × 100 ÷ (362) = 2949.7 × 0.22 Emissions for electricity – (310a) × (361) ÷ (362) = 876.95 × 0.52 —458.99 (364)  Efficiency of heat source 2 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel generated with heat source 2 (307b) + (310b)] × 100 ÷ (367b) × 0.22 = 430.78 (368)  Electrical energy for heat distribution  (313) × 0.52 = 23.55 (372)  Total CO2 associated with community systems  (363)(366) + (368)(372) = 819.87 (373)  CO2 associated with space heating (secondary)  (309) × 0 = 0 (374)  CO2 associated with space and water heating  (373) + (374) + (375) = 819.87 (376)	Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	167.91	(331)
Space heating from CHP  (307a) x 100 ÷ (362) =   2974.7   x   0.22   637.13   (365)	Energy for lighting (calculated in Appendix L)		366.22	(332)
Lectrical efficiency of CHP unit   29.73   (361)	Electricity generated by PVs (Appendix M) (negative quality	uantity)	-456.3	(333)
Electrical efficiency of CHP unit	Electricity generated by wind turbine (Appendix M) (ne	gative quantity)	0	(334)
Energy kWh/year kg CO2/kWh kg CO2/year Space heating from CHP) (307a) × 100 ÷ (362) = 2974.7 × 0.22 642.54 (363) less credit emissions for electricity -(307a) × (361) ÷ (362) = 884.38 × 0.52 -458.99 (364) Water heated by CHP (310a) × 100 ÷ (362) = 2949.7 × 0.22 637.13 (365) less credit emissions for electricity -(310a) × (361) ÷ (362) = 876.95 × 0.52 -455.13 (366) Efficiency of heat source 2 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 91 (367b) CO2 associated with heat source 2 ((307b) + (310b)] × 100 ÷ (367b) × 0.52 = 23.55 (372) Total CO2 associated with space heating (secondary) (309) × 0 = 0 (374) CO2 associated with water from immersion heater or instantaneous heater (312) × 0.22 = 0 (375) Total CO2 associated with space and water heating (373) + (374) + (375) = 87.14 (378) CO2 associated with electricity for pumps and fans within dwelling (331)) × 0.52 = 87.14 (378)	12b. CO2 Emissions – Community heating scheme			-
Energy kWh/year   Emission factor kg CO2/kWh kg CO2/year	Electrical efficiency of CHP unit		29.73	(361)
kWh/year         kg CO2/kWh         kg CO2/year           Space heating from CHP)         (307a) × 100 ÷ (362) =         2974.7         ×         0.22         642.54         (363)           less credit emissions for electricity         -(307a) × (361) ÷ (362) =         884.38         ×         0.52         -458.99         (364)           Water heated by CHP         (310a) × 100 ÷ (362) =         2949.7         ×         0.22         637.13         (365)           less credit emissions for electricity         -(310a) × (361) ÷ (362) =         876.95         ×         0.52         -455.13         (366)           Efficiency of heat source 2 (%)         If there is CHP using two fuels repeat (363) to (366) for the second fuel         91         (367b)           CO2 associated with heat source 2         ((307b)+(310b)] × 100 ÷ (367b) ×         0.22         =         430.78         (368)           Electrical energy for heat distribution         (313) ×         0.52         =         23.55         (372)           Total CO2 associated with community systems         (363)(366) + (368)(372)         =         819.87         (373)           CO2 associated with water from immersion heater or instantaneous heater         (312) ×         0.22         =         0         (374)           CO2 associated with space and wat	Heat efficiency of CHP unit		45.95	(362)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$ Water heated by CHP $(310a) \times 100 \div (362) =$ Efficiency of heat source 2 (%)  Efficiency of heat source 2 [(307b)+(310b)] × 100 ÷ (367b) ×  Electrical energy for heat distribution  Electrical energy for heat distri		<b>3</b> ,		
Water heated by CHP $(310a) \times 100 \div (362) =$ $2949.7 \times 0.22$ $637.13$ $(365)$ less credit emissions for electricity $-(310a) \times (361) \div (362) =$ $876.95 \times 0.52$ $-455.13$ $(366)$ Efficiency of heat source 2 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel CO2 associated with heat source 2 $(307b) + (310b) \times 100 \div (367b) \times 0.22 =$ $430.78$ $(368) \times 100 \times$	Space heating from CHP) $(307a) \times 100 \div (362) =$	2974.7 × 0.22	642.54	(363)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$ Efficiency of heat source 2 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  CO2 associated with heat source 2  [(307b)+(310b)] $\times$ 100 $\div$ (367b) $\times$ Discrete (363) to (366) for the second fuel  [(313) $\times$ Discrete (363) $\times$ [(313) $\times$ Discrete (312) $\times$ Discrete (312) $\times$ Discrete (312) $\times$ [(313) $\times$ Discrete (313) $\times$ Discrete (314) $\times$ Discrete (315) $\times$ Discrete (	less credit emissions for electricity -(307a) × (361) ÷ (362	) = 884.38 × 0.52	-458.99	(364)
Efficiency of heat source 2 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  91 (367b)  CO2 associated with heat source 2  [(307b)+(310b)] $\times$ 100 $\div$ (367b) $\times$ 0.22  = 430.78 (368)  Electrical energy for heat distribution  [(313) $\times$ 0.52  = 23.55 (372)  Total CO2 associated with community systems  (363)(366) + (368)(372)  = 819.87 (373)  CO2 associated with space heating (secondary)  (309) $\times$ 0  = 0 (374)  CO2 associated with water from immersion heater or instantaneous heater (312) $\times$ 0.22  = 0 (375)  Total CO2 associated with space and water heating  (373) + (374) + (375) =  CO2 associated with electricity for pumps and fans within dwelling (331)) $\times$ 0.52  = 87.14 (378)	Water heated by CHP (310a) × 100 ÷ (362) =	2949.7 × 0.22	637.13	(365)
CO2 associated with heat source 2 $ [(307b)+(310b)] \times 100 \div (367b) \times 0.22 = 430.78 $ (368) $ [(313) \times 0.52 = 23.55 (372) $ Total CO2 associated with community systems $ (363)(366) + (368)(372) = 819.87 (373) $ CO2 associated with space heating (secondary) $ (309) \times 0 = 0  (374) $ CO2 associated with water from immersion heater or instantaneous heater $ (312) \times 0.22 = 0  (375) $ Total CO2 associated with space and water heating $ (373) + (374) + (375) = 0.52 = 819.87 (376) $ CO2 associated with electricity for pumps and fans within dwelling $ (331)) \times 0.52 = 87.14  (378) $	less credit emissions for electricity -(310a) × (361) ÷ (362	) = 876.95 × 0.52	-455.13	(366)
Electrical energy for heat distribution $ [(313) \times 0.52] = 23.55  (372) $ Total CO2 associated with community systems $ (363)(366) + (368)(372)  = 819.87  (373) $ CO2 associated with space heating (secondary) $ (309) \times 0  = 0   (374) $ CO2 associated with water from immersion heater or instantaneous heater $ (312) \times 0.22  = 0   (375) $ Total CO2 associated with space and water heating $ (373) + (374) + (375) = 0.52  = 87.14  (378) $ CO2 associated with electricity for pumps and fans within dwelling $ (331)) \times 0.52  = 87.14   (378) $	Efficiency of heat source 2 (%)	s CHP using two fuels repeat (363) to (366) for the second fuel	91	(367b)
Total CO2 associated with community systems $(363)(366) + (368)(372)$ = $819.87$ (373) CO2 associated with space heating (secondary) $(309) \times$ 0 = 0 (374) CO2 associated with water from immersion heater or instantaneous heater $(312) \times$ 0.22 = 0 (375) Total CO2 associated with space and water heating $(373) + (374) + (375) =$ $819.87$ (376) CO2 associated with electricity for pumps and fans within dwelling $(331)) \times$ 0.52 = $87.14$ (378)	CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x 0.22 =	430.78	(368)
CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.22$ Total CO2 associated with space and water heating  CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dwelling $(331) \times 0.52$ = 0 (374)  819.87 (376)  CO2 associated with electricity for pumps and fans within dwelling $(331) \times 0.52$ = 87.14 (378)	Electrical energy for heat distribution	[(313) x 0.52 =	23.55	(372)
CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.22 = 0$ (375)  Total CO2 associated with space and water heating $(373) + (374) + (375) = 0.52$ = 87.14 (378)	Total CO2 associated with community systems	(363)(366) + (368)(372)	819.87	(373)
Total CO2 associated with space and water heating (373) + (374) + (375) = 819.87 (376)  CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 87.14 (378)	CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with electricity for pumps and fans within dwelling (331)) x  0.52  = 87.14 (378)	CO2 associated with water from immersion heater or in	nstantaneous heater (312) x 0.22 =	0	(375)
	Total CO2 associated with space and water heating	(373) + (374) + (375) =	819.87	(376)
CO2 accordated with electricity for lighting	CO2 associated with electricity for pumps and fans with	hin dwelling (331)) x 0.52 =	87.14	(378)
COZ associated with electricity for lighting (332))) x   0.52   =   190.07   (379)	CO2 associated with electricity for lighting	(332))) x 0.52 =	190.07	(379)
Energy saving/generation technologies (333) to (334) as applicable  Item 1  O.52 × 0.01 = -236.82 (380)			-236.82	(380)
Total CO2, kg/year sum of (376)(382) = 860.26 (383)	Total CO2, kg/year sum of (376)(3	82) =	860.26	(383)
Dwelling CO2 Emission Rate $(383) \div (4) =$ 9.94 (384)	, 50			-
El rating (section 14)	El rating (section 14)		91.24	(385)

		l Iser I	Details:						
Assessor Name: Software Name:	Matthew Stainrod Stroma FSAP 2012	<u> </u>	Strom Softwa					0023501 on: 1.0.4.16	
Software Name.		Property	Address			F-1	VEISIC	лі. т.ט. <del>4</del> .то	
Address :	GF-1, Bertram Street, Lond		Addiess	00 10 0	33413 C	'			
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)	-	Volume(m <sup>3</sup>	<u> </u>
Ground floor			73.52	(1a) x		2.4	(2a) =	176.45	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	73.52	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	176.45	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b> + -	0	Ī <b>-</b> [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x '	10 =	0	(7a)
Number of passive vents	3			F	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
· ·				L					`
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+($				0		÷ (5) =	0	(8)
	peen carried out or is intended, proceed	ed to (17),	otherwise (	continue fr	rom (9) to	(16)			
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(Q).	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masoni	v constr	ruction	[(0)	1].0.1 =	0	(11)
if both types of wall are p	resent, use the value corresponding t			•					`
deducting areas of opening	<i>ngs); if equal user 0.35</i> floor, enter 0.2 (unsealed) or 0	1 (cool	od) olco	ontor O					<b>—</b> (40)
If no draught lobby, en	,	. i (Seal	eu), eise	enter o				0	(12)
•	s and doors draught stripped							0	(14)
Window infiltration	3		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7(10)
Shelter factor	<del>c</del> u		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.78	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m <i>÷ 1</i>								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
(-20)	1 0.30	1 0.00	1 3.02	<u> </u>	L	12		J	

Adjusted infiltra	ation rate	e (allowi	ng for st	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effec		_	rate for t	he appli	cable ca	se	•	•	•	•	•		
If mechanica If exhaust air he			andiv N. (S	3h) - (23	a) v Emy (	aguation (I	VE)) otho	nuico (22h	) - (232)			0.5	(23
If balanced with		0 11		, ,	,	. `	,, .	,	) = (23a)			0.5	(23
		-	-	_					Ol- \	00h) [4	(OO = )	79.9	(23
a) If balance	0.25	o.24	0.23	0.23	at recov	0.21	1R) (248 0.21	0.22	2b)m + ( 0.23	23b) × [* 0.23	0.24	÷ 100]	(24
b) If balance					L		<u> </u>	L		L	0.24		(_
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho					<u> </u>			<u> </u>					(-
if (22b)m				•	•				.5 × (23k	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v	ـــــــــــــــــــــــــــــــــــــ	on or wh	ole hous	e positi	ve input	ventilatio	on from I	loft	!	!	!		
if (22b)m									0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)					
25)m= 0.25	0.25	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(2
3. Heat losses	and he	eat loss r	paramet	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-ł		X k J/K
oors					2.1	x	1.4	=	2.94				(2
Vindows Type	1				3.8	x1	/[1/( 1.4 )+	0.04] =	5.04	=			(2
Vindows Type	2				15.96	3 x1	/[1/( 1.4 )+	0.04] =	21.16	=			(2
loor					73.52	2 X	0.11	i	8.08719	9 [	110	8087	.2 (2
Valls Type1	47.6	64	21.80	6	25.78	3 x	0.15	<b>=</b>	3.87	<b>=</b>	14	360.9	2 (2
Valls Type2	2.4	=	0		2.4	X	0.14	<b>=</b>	0.34	<b>=</b>	14	33.6	=
otal area of el					123.5	_	<u> </u>		0.0 .				\` (3
arty wall		,			37.13	=	0		0	<b>—</b> [	20	742.	`
arty ceiling					73.52	=			<u> </u>		30	2205	=
nternal wall **					110.4	_				L			=
for windows and it					alue calcui		ı formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	9 paragraph	993.	<u>o (</u> (
abric heat los				о ини раг			(26)(30)	) + (32) =				41.43	(3
eat capacity (		•	-,				•		(30) + (3	2) + (32a).	(32e) =	12423.52	(3
hermal mass	,	,	o = Cm -	- TFA) ir	n kJ/m²K				÷ (4) =	, ( - <i>f</i> -	` '	168.98	= (3
or design assessi an be used instea	ments wh	ere the de	tails of the	•			ecisely the	` '		TMP in Ta	able 1f	100.30	
hermal bridge				using Ar	pendix l	K						9.46	(3
details of thermai	l bridging	,		• •	•			(33) +	(36) =			50.89	(3
								\-~/ ·					110
entilation hea	t loss ca	alculated	l monthly	/						(25)m x (5)	) )	00.00	`

(00) = 44.40	1 44 04	T 4444	40.0	40.40	40.00	40.00	T 40.44	40.00	40.40	10.47	1004		(20)
(38)m= 14.48	14.31	14.14	13.3	13.13	12.28	12.28	12.11	12.62	13.13	13.47	13.81		(38)
Heat transfer (39)m= 65.37	65.2	nt, W/K 65.03	64.19	64.02	63.17	63.17	63	(39)m 63.51	64.02	38)m 64.36	64.7		
(39)111=   03.37	03.2	03.03	04.19	04.02	03.17	03.17	03			Sum(39) <sub>1</sub>	<del>                                     </del>	64.15	(39)
Heat loss par	ameter (I	HLP), W	/m²K			_	_		= (39)m ÷		127	00	<b></b> ` ′
(40)m= 0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.88	0.88		_
Number of da	ıvs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.87	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ	unanev	N											(42)
if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.33		(42)
if TFA £ 13 Annual avera	•	ater usac	no in litro	se nar da	v Vd av	orano –	(25 v NI)	<b>+</b> 36		0/	2.5		(42)
Reduce the annu	ial average	hot water	usage by	5% if the a	welling is	designed t			se target o		9.5		(43)
not more that 12:	5 litres per	person pei	r day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	<del>,</del>		ı			1	· <i>'</i>				T 1		
(44)m= 98.45	94.87	91.29	87.71	84.13	80.55	80.55	84.13	87.71	91.29	94.87	98.45	4074.04	7(44)
Energy content of	of hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1074.01	(44)
(45)m= 146	127.69	131.77	114.88	110.23	95.12	88.14	101.14	102.35	119.28	130.2	141.39		
									Γotal = Su	m(45) <sub>112</sub> =	=	1408.2	(45)
If instantaneous	_	ng at point		hot water	storage),	enter 0 in	boxes (46)	) to (61)					
(46)m= 21.9 Water storage	19.15	19.77	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21		(46)
Storage volur		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						` ,
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage		oolorod l	ana fant	ar ia kaa	/Id\A/k	2/dox/\							(40)
<ul><li>a) If manufact</li><li>Temperature</li></ul>				JI 15 KI10	WII (KVVI	i/uay).					0		(48)
Energy lost fr				ar			(48) x (49)	· –			0		(49) (50)
b) If manufac		_	-		or is not		(40) X (40)	_		'	10		(30)
Hot water sto	•			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community Volume factor	_		on 4.3										(50)
Temperature			2b							-	.6		(52) (53)
Energy lost fr				ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				( ) (- )	(- )	,		.03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = (	55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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 Appendix	¢Н	
(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 (annual) fr	om Table 3			(	)	(58)
Primary circuit loss calculated		$n = (58) \div 365 \times$	(41)m			
(modified by factor from Tal	ole H5 if there is solar	water heating a	nd a cylinder t	hermostat)		
(59)m= 23.26 21.01 23.26	22.51 23.26 22.	51 23.26 23	.26 22.51	23.26 22.51	23.26	(59)
Combi loss calculated for eac	h month (61)m = (60)	÷ 365 × (41)m				
(61)m= 0 0 0	0 0 0	<del>- i - ` i -</del>	0 0	0 0	0	(61)
Total heat required for water h	neating calculated for	each month (62)	)m = 0.85 × (45	5)m + (46)m +	 (57)m + (59)m + (61)n	n
(62)m= 201.28 177.62 187.04	<del></del>		<del>`                                    </del>	174.56 183.7	196.67	(62)
Solar DHW input calculated using Ap				ontribution to wate	r heating)	
(add additional lines if FGHRS						
(63)m= 0 0 0	0 0 0	<del>- i - i -</del>	0 0	0 0	0	(63)
Output from water heater	1 1					
(64)m= 201.28 177.62 187.04	168.37 165.5 148	.61 143.42 156	6.42 155.85 1	174.56 183.7	196.67	
	1 1 1			er heater (annual)		(64)
Heat gains from water heating	r k\//h/month 0 25 ′ [0	) 85 v (45)m ± (1				<b>_</b> '` ′
(65)m= 92.77 82.4 88.03	80.99 80.87 74.	1 1	1 1	83.88 86.09	91.23	(65)
` '	<u> </u>					(55)
include (57)m in calculation	. ,	ier is in the awe	lling or not wat	er is from comi	munity neating	
5. Internal gains (see Table	, in the second					
Metabolic gains (Table 5), Wa		<del></del>	1.1	_		
Jan Feb Mar	+		lug Sep	Oct Nov	Dec	(2.5)
(66)m= 116.42 116.42 116.42	116.42   116.42   116	.42 116.42 116	6.42   116.42   1	116.42   116.42	116.42	(66)
Lighting gains (calculated in A	ppendix L, equation L	.9 or L9a), also				
(67)m= 18.31 16.26 13.22	10.01 7.48 6.3	32 6.83 8.	87 11.91	15.12 17.65	18.82	(67)
Appliances gains (calculated i	n Appendix L, equation	on L13 or L13a),	also see Table	e 5		
(68)m= 205.37 207.5 202.13	190.7 176.27 162	2.7 153.64 15 <sup>4</sup>	1.51 156.88 1	168.31 182.74	196.31	(68)
Cooking gains (calculated in A	Appendix L, equation L	_15 or L15a), als	so see Table 5	;		
(69)m= 34.64 34.64 34.64	34.64 34.64 34.	64 34.64 34	.64 34.64	34.64 34.64	34.64	(69)
Pumps and fans gains (Table	5a)			-		
(70)m= 0 0 0	0 0 0	0	0 0	0 0	0	(70)
Losses e.g. evaporation (nega	ative values) (Table 5)		•			
(71)m= -93.14 -93.14 -93.14	-93.14 -93.14 -93		3.14 -93.14 -	-93.14 -93.14	-93.14	(71)
Water heating gains (Table 5)	I I			l		
(72)m= 124.69 122.62 118.33		.36 98.83 104	4.64 106.7 1	112.74 119.57	122.63	(72)
Total internal gains =	1 1 1 1 1	(66)m + (67)m + (6		!!		
(73)m= 406.29 404.31 391.61	371.13 350.38 330	<del>-   -   -   -   -   -   -   -   -   -  </del>	<del> </del>	354.11 377.89	395.68	(73)
6. Solar gains:	071.10 000.00 000	.01 017.22 022	2.50 000.42	504.11 077.00	000.00	(1-5)
Solar gains are calculated using sol	ar flux from Table 6a and a	ssociated equations	to convert to the	applicable orientati	on.	
Orientation: Access Factor	Area	Flux	g_	 FF	Gains	
Table 6d	m <sup>2</sup>	Table 6a	Table 6b	Table 6c	(W)	
North 0.9x 0.77	3.8 ×	10.63 ×	0.48	x 0.7	= 9.41	(74)
0.77	3.8 X	20.32 X	0.48	x 0.7	= 17.98	(74)
0.11	3.0 ^ _	20.02	0.40	0.7	17.90	

N I a wila						_	_		1			_	г				<b>-</b>	٦
North	0.9x	0.77		X	3.8	_  '	`	34.53	X		0.48	X	Ļ	0.7		=	30.55	<b>(74)</b>
North	0.9x	0.77		X	3.8		× L	55.46	X		0.48	X	Ļ	0.7		=	49.08	(74)
North	0.9x	0.77		x	3.8	<u> </u>	<u>د</u> لــ	74.72	X		0.48	X	Ļ	0.7		=	66.11	(74)
North	0.9x	0.77		X	3.8	<u> </u>	· L	79.99	X		0.48	X	Ļ	0.7		=	70.77	(74)
North	0.9x	0.77		x	3.8	<u> </u>	×	74.68	X		0.48	X	L	0.7		=	66.08	(74)
North	0.9x	0.77		х	3.8	] ;	x	59.25	X		0.48	X		0.7		=	52.42	(74)
North	0.9x	0.77		x	3.8	] ;	× _	41.52	X		0.48	X		0.7		=	36.73	(74)
North	0.9x	0.77		x	3.8	] ;	x	24.19	X		0.48	X		0.7		=	21.4	(74)
North	0.9x	0.77		x	3.8	] ;	x [	13.12	X		0.48	X		0.7		=	11.61	(74)
North	0.9x	0.77		x	3.8	] ;	x	8.86	X		0.48	X		0.7		=	7.84	(74)
East	0.9x	1		x	15.96	] ;	× [	19.64	X		0.48	X		0.7		=	72.99	(76)
East	0.9x	1		x	15.96	] ;	x [	38.42	X		0.48	X		0.7		=	142.78	(76)
East	0.9x	1		х	15.96	] ;	x 🗌	63.27	x		0.48	X		0.7		=	235.14	(76)
East	0.9x	1		x	15.96	Ī,	× $$	92.28	X		0.48	X	Ī	0.7		=	342.94	(76)
East	0.9x	1		x	15.96	Ī,	× 🗏	113.09	X		0.48	x	Ī	0.7		=	420.28	(76)
East	0.9x	1		х	15.96	Ī,	x 🗏	115.77	x		0.48	X	Ī	0.7		=	430.23	(76)
East	0.9x	1		x	15.96	Ī,	х <u> </u>	110.22	x		0.48	X	Ī	0.7		=	409.6	(76)
East	0.9x	1		x	15.96	Ī,	٠ <u> </u>	94.68	X		0.48	X	Ī	0.7		=	351.84	(76)
East	0.9x	1		x	15.96	<b>j</b> ,	, <u> </u>	73.59	j x		0.48	= x	Ī	0.7		=	273.48	(76)
East	0.9x	1		х	15.96	Ī,	, <u> </u>	45.59	X		0.48	X	Ī	0.7		=	169.42	(76)
East	0.9x	1		х	15.96	Ī,	, <u> </u>	24.49	X		0.48	X	Ī	0.7		=	91.01	(76)
East	0.9x	1		x	15.96	ij,	νĒ	16.15	X		0.48	X	Ť	0.7		=	60.02	<b>7</b> (76)
	L					_	_		_			_	_					_
Solar g	ains in	watts, ca	alculate	ed	for each mo	nth			(83)m	n = Sı	um(74)m .	(82)r	n					
(83)m=	82.4	160.76	265.69	7	392.01 486.	39	501.	01 475.67	404	.26	310.21	190.	82	102.61	67	.87		(83)
Total g	ains – iı	nternal a	nd sol	ar	(84)m = (73)	m +	(83	)m , watts									•	
(84)m=	488.69	565.07	657.3		763.14 836.	77	831.	32 792.9	727	'.21	643.63	544.	93	480.5	463	3.55		(84)
7. Me	an inter	nal temp	eratur	e (l	heating seas	on)												
					eriods in the		g ar	ea from Tal	ble 9	, Th	1 (°C)						21	(85)
Utilisa	tion fac	tor for g	ains fo	r liv	ving area, h1	,m	(see	Table 9a)										_
	Jan	Feb	Mar	$\neg$	Apr Ma	$\overline{}$	Ju		A	ug	Sep	Od	ct	Nov		Эес		
(86)m=	0.99	0.97	0.93	T	0.83 0.6	3	0.4	8 0.35	0.	4	0.64	0.8	9	0.97	0.	99		(86)
Mean	interna	l temner	ature ii	ı Li	ving area T1	(fo	llow	stens 3 to 3	7 in 7	' Γahle	- 9c)			-!				
(87)m=	19.88	20.08	20.39	T	20.73 20.9		20.9	i	2		20.95	20.6	57	20.21	19	.84		(87)
		<u> </u>	!		l l		امييا	lina franc Ta										
(88)m=	20.18	20.18	20.18	÷	eriods in rest		20.	<u> </u>	20		20.2	20.1	a	20.19	20	.18	]	(88)
		<u> </u>	<u> </u>			!			<u>!</u>		20.2	20.1	9	20.19		.10		(00)
Ī			ı	rre	est of dwellin	Ť		· 1	T -	. 1			_	1			1	(00)
(89)m=	0.98	0.97	0.92	$\perp$	0.8 0.6	2	0.4	2 0.29	0.3	33	0.58	0.8	7	0.97	0.	99		(89)
Mean		l temper	ature ii	n th	he rest of dw	ellir	ng T	2 (follow ste	eps 3	3 to 7	7 in Tabl	e 9c)		,			1	
(90)m=	18.68	18.97	19.41		19.88 20.1	1	20.1	19 20.2	20	.2	20.16	19.8		19.17		.63		(90)
											f	LA = L	.ivi	ng area ÷ (4	4) =		0.36	(91)

Mean ir	nternal tempe	rature (fo	or the wh	nole dwe	llina) = f	LA × T1	+ (1 – fL	.A) × T2					
	19.11 19.37	19.76	20.19	20.4	20.48	20.49	20.49	20.44	20.12	19.54	19.07		(92)
Apply a	djustment to	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.11 19.37	19.76	20.19	20.4	20.48	20.49	20.49	20.44	20.12	19.54	19.07		(93)
8. Spac	e heating req	uirement											
	o the mean in		•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	sation factor f  Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisati	on factor for g			I May	Juli	Jui	Aug	Оер	001	INOV	Dec		
	0.98 0.96	0.91	0.8	0.63	0.44	0.31	0.35	0.6	0.86	0.96	0.98		(94)
Useful (	gains, hmGm	, W = (9	4)m x (8	4)m		•							
(95)m= 4	77.41 541.42	598.73	609.7	525.19	366.34	244.81	256.15	384.15	470.74	460.79	454.76		(95)
Monthly	/ average 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)
	ss rate for me	1	<del></del>	<del></del>		<del>-``</del>	<del>-``</del>	<del>`</del>	<del></del>		i		(0=)
` '	943.27	862.61	724.47	557.25	371.27	245.55	257.48	402.74	609.34	800.81	961.73		(97)
· —	neating requir	196.33	82.63	23.85	/vn/mon	$\frac{th = 0.02}{0}$	24 x [(97	)m - (95 0	103.12	1)m 244.82	377.19		
(90)111=	270.04	190.55	02.03	23.03	0			l per year			Į	1663.08	(98)
0	(*		1.14/1.//	2/			1018	ıı pei yeai	(KVVII/yeai	) = Sum(9	70)15,912 =		╡
·	neating requir			•								22.62	(99)
	gy requireme		· ·	Ĭ									
	is used for solof space hear									unity sch	neme.	0	(301)
Fraction	of space hear	t from co	mmunity	/ system	1 – (30	1) =						1	(302)
The comm	unity scheme ma	ay obtain he	eat from se	everal soui	rces. The p	procedure	allows for	CHP and i	up to four (	other heat	sources; ti	he latter	
	oilers, heat pump			aste heat f	rom powe	r stations.	See Appe	ndix C.			,		_
Fraction	of heat from (	Commun	ity CHP									0.6	(303a)
Fraction	of community	heat fro	m heat s	source 2								0.4	(303b)
Fraction	of total space	heat fro	m Comr	nunity C	HP				(3	02) x (303	sa) =	0.6	(304a)
Fraction	of total space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	8b) =	0.4	(304b)
Factor fo	or control and	charging	method	l (Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distributi	ion loss factor	(Table 1	12c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space h	eating										•	kWh/year	-
Annual s	pace heating	requiren	nent									1663.08	
Space he	eat from Com	munity C	HP					(98) x (30	04a) x (30	5) x (306)	=	1047.74	(307a)
Space he	eat from heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	=	698.49	(307b)
Efficienc	y of secondar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space he	eating require	ment fro	m secor	ndary/sur	oplemen	itary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water he	-												_
	vater heating	•										2059.04	
	rom communicat from Com							(64) x (3)	03a) x (30	5) x (306) :	<u> </u>	1297.19	(310a)
vvator ne	at nom com	marinty O						(U T) A (U	JJU/ A (UU)	c, x (000)		1231.13	(J1Ja)

			7
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	864.8	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	39.08	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter	$0) = (107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fr	rom outside	142.61	(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) =	142.61	(331)
Energy for lighting (calculated in Appendix L)		323.34	(332)
Electricity generated by PVs (Appendix M) (negative quantity	y)	-456.3	(333)
Electricity generated by wind turbine (Appendix M) (negative	e quantity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2280.17 × 0.22	492.52	(363)
less credit emissions for electricity -(307a) × (361) ÷ (362) =	677.9 × 0.52	-351.83	(364)
Water heated by CHP (310a) × 100 ÷ (362) =	2823.06 × 0.22	609.78	(365)
less credit emissions for electricity $-(310a) \times (361) \div (362) =$	839.29 × 0.52	-435.59	(366)
Efficiency of heat source 2 (%)	using two fuels repeat (363) to (366) for the second fu	el 91	(367b)
CO2 associated with heat source 2 [(30)	7b)+(310b)] x 100 ÷ (367b) x 0.22	= 371.07	(368)
Electrical energy for heat distribution	[(313) x 0.52	= 20.28	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	= 706.23	(373)
CO2 associated with space heating (secondary)	(309) x 0	= 0	(374)
CO2 associated with water from immersion heater or instant	taneous heater (312) x 0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =	706.23	(376)
CO2 associated with electricity for pumps and fans within dv	velling (331)) x 0.52	= 74.02	(378)
CO2 associated with electricity for lighting	(332))) x 0.52	= 167.81	(379)
Energy saving/generation technologies (333) to (334) as appliem 1	olicable 0.52 x 0.01 =	-236.82	<b>]</b> (380)
Total CO2, kg/year sum of (376)(382) =		711.24	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		9.67	(384)
El rating (section 14)		91.96	(385)

		l Iser I	Details:						
Assessor Name:	Matthew Stainrod	– <u>036</u> FL	Strom					023501	
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.4.16	
Address :	GF-2, Bertram Street, Lond		Address	: 06-18-0	69419 G	iF-2			
1. Overall dwelling dime		OH							
		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	<sup>3</sup> )
Ground floor		9	90.93	(1a) x	2	2.4	(2a) =	218.23	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) = = = =	90.93	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	218.23	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	<u> </u>	0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x .	10 =	0	(7a)
Number of passive vents	3			F	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			_ [	0	X 4	40 =	0	(7c)
_				L					
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+($				0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otherwise (	continue fr	rom (9) to	(16)		0	(9)
Additional infiltration	ne aweiling (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction	,	•	0	(11)
	resent, use the value corresponding t	o the grea	ter wall are	a (after					_
deducting areas of openial lf suspended wooden	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	.1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(***	/,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
,	q50, expressed in cubic metro	-	•	•	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$ es if a pressurisation test has been do				io boing u	and		0.15	(18)
Number of sides sheltere		ne or a de	gree air pe	ппеаышу	is being u	seu		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(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		
	II		+		-		<u> </u>	ı	

Adjusted infiltrati		<del></del>		1	<del>i i</del>	<del>`                                    </del>	<del>`                                    </del>	1	1	1	1	
	0.16 0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calcul <del>ate effecti</del> If mechanical	_	rate for t	пе аррп	cable ca	13 <b>C</b>						0.5	(2
If exhaust air heat	pump using App	endix N, (2	(23a) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	o) = (23a)			0.5	<b>=</b> (2
If balanced with he	eat recovery: effi	ciency in %	allowing	for in-use f	actor (fror	n Table 4h	) =				79.9	<b>=</b> `(2
a) If balanced	mechanical v	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)		`
· —	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	]	(2
b) If balanced	mechanical v	entilation	without	heat red	covery (	л МV) (24k	m = (2)	2b)m + (	 23b)	1	J	
24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(2
c) If whole hou	use extract ver < 0.5 × (23b),		•	•				.5 × (23b	) )	•	ı	
24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural ve	entilation or wh = 1, then (24d							0.5]			1	
24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24
Effective air ch	nange rate - e	nter (24a	) or (24l	o) or (24	c) or (24	ld) in bo	x (25)	•			•	
25)m= 0.26	0.26 0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(2
3. Heat losses a	and heat loss	paramet	er:									
ELEMENT	Gross area (m²)	Openir m		Net Ar A ,r		U-val W/m2		A X U (W/l	K)	k-value kJ/m²-		X k I/K
Doors				2.1	X	1.4	=	2.94				(2
Vindows Type 1				12.15	5 x1	/[1/( 1.4 )+	0.04] =	16.11				(2
Vindows Type 2				7.63	x1	/[1/( 1.4 )+	0.04] =	10.12				(2
loor				90.93	3 x	0.11	=	10.0023	3	110	10002.	.3 (2
Valls Type1	77.99	21.8	8	56.1	1 x	0.15	=	8.42		14	785.54	4 (2
Valls Type2	3.6	0		3.6	x	0.14	=	0.51		14	50.4	(2
Valls Type3	4.8	0		4.8	x	0.15	=	0.72		14	67.2	(2
otal area of ele	ments, m <sup>2</sup>			177.3	2							 (3
Party wall				22.8	x	0	=	0		20	456	(3
Party ceiling				90.93	3					30	2727.9	9 (3:
nternal wall **				153.6	<u>=</u>					9	1382.4	4 (3
for windows and ro * include the areas					l lated usino	g formula 1	/[(1/U-valu	ue)+0.04] a	as given ir	n paragraph		
abric heat loss,	W/K = S (A x)	( U)				(26)(30	) + (32) =				48.81	(3
leat capacity Cr	$n = S(A \times k)$						((28).	(30) + (32	2) + (32a)	(32e) =	15471.74	(3
hermal mass pa	arameter (TM	P = Cm -	- TFA) iı	n kJ/m²K			= (34)	÷ (4) =			170.15	(3
For design assessme an be used instead	of a detailed cald	culation.				recisely the	e indicative	e values of	TMP in T	able 1f		_
			- ' A -	ايدالم محمد	1						1	(3
hermal bridges	: S (L x Y) ca	liculated	using Ap	ppenaix i	n.						12.2	(5

Γ	i	Feb	alculated Mar	· ·	<del></del>	lun	Jul	۸۰۰۰	Sep	`	25)m x (5) Nov	Dec		
0)	Jan			Apr	May	Jun	1	Aug		Oct		-		(3
8)m=	18.94	18.72	18.49	17.34	17.11	15.96	15.96	15.73	16.42	17.11	17.57	18.03		(3
Г		oefficier		Γ	Γ	I	Ι	ı		= (37) + (3				
9)m=	79.96	79.73	79.5	78.35	78.12	76.97	76.97	76.74	77.43	78.12	78.58	79.04		<b>—</b> ,,
eat lo	ss para	meter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> (4)	12 /12=	78.29	(3
0)m=	0.88	0.88	0.87	0.86	0.86	0.85	0.85	0.84	0.85	0.86	0.86	0.87		
umbe	r of day	rs in mor	nth (Tab	le 1a)				•	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.86	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
				-	-	_	-	-			-			
. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ar:	
ssum	ed occu	pancy, I	N									.64		(4
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	013 x (	ΓFA -13.		.04		(
	A £ 13.9	•						(O.E. N.I)	00					
						ay Vd,av Iwelling is				se target o		5.86		(
		_		• •		not and co	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t wate						ctor from 7								
4)m=	106.54	102.67	98.8	94.92	91.05	87.17	87.17	91.05	94.92	98.8	102.67	106.54		
L								<u> </u>	-	Γotal = Su	<u>l</u> m(44) <sub>112</sub> =	=	1162.3	(
ergy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	158	138.19	142.6	124.32	119.29	102.94	95.39	109.46	110.76	129.09	140.91	153.02		
_										Γotal = Su	m(45) <sub>112</sub> =	=	1523.96	(
nstanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)		•			
6)m=	23.7	20.73	21.39	18.65	17.89	15.44	14.31	16.42	16.61	19.36	21.14	22.95		(
	storage		includin	a any c	olar or M	/WHRS	ctorogo	within co	mo voc	col				,
_		` ,		•		nter 110	•		une ves	3 <b>C</b> I		0		(
	•	•			•	nstantar		` '	ers) ente	er 'O' in <i>(</i>	47)			
	storage			(					,		,			
) If ma	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(
empe	rature fa	actor fro	m Table	2b								0		(
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(
) If ma	anufact	urer's de	eclared o	cylinder l	oss fact	or is not								•
					e 2 (kW	h/litre/da	ıy)				0.	.02		(
	-	eating s from Tal	ee secti	on 4.3										,
			ole 2a m Table	2h								.03		(
•								(47) (51)	(50)	F0)		0.6		(:
		m water 54) in (5	storage	, KVVN/ye	ar			(47) x (51)	x (52) X (	o3) =	-	.03		(
. 11 <u>0</u> 1 (	. , .		•	for ooob				((56) <del>~</del> = (	FF) (44).	_	1.	.03		(
0t0= -														
ater s	32.01	28.92	32.01	30.98	32.01		32.01	32.01	55) × (41)ı 30.98	32.01		32.01		(

,	is dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	пт)] <del>-</del> (э	u), eise (s	<i>i</i> )iii = (30)	m where (	HTT) IS ITC	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	t loss (ar	nual) fro	m Table	 3				•	•		0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	55 × (41)	m				•	
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss 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 heat req	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 213.28	188.12	197.88	177.81	174.57	156.43	150.66	164.73	164.26	184.36	194.4	208.29		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 213.28	188.12	197.88	177.81	174.57	156.43	150.66	164.73	164.26	184.36	194.4	208.29		_
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2174.8	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 96.76	85.89	91.64	84.13	83.89	77.02	75.94	80.62	79.62	87.14	89.65	95.1		(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga	ains (see	e Table 5	and 5a	):									
Metabolic gair	ns (Table	e 5). Wat	ts										
Jan	Feb	Mar											
(00)		Iviai	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 131.91	131.91	131.91	Apr 131.91	May 131.91	Jun 131.91	Jul 131.91	Aug 131.91	Sep 131.91	Oct 131.91	Nov 131.91	Dec 131.91		(66)
Lighting gains	l	131.91	131.91	131.91	131.91	131.91	131.91	131.91		-			(66)
` ′	l	131.91	131.91	131.91	131.91	131.91	131.91	131.91		-			(66) (67)
Lighting gains	(calcula	131.91 ted in Ap 15.52	131.91 ppendix 11.75	131.91 _, equati 8.78	131.91 on L9 or 7.41	131.91 r L9a), a 8.01	131.91 Iso see	131.91 Table 5	131.91 17.75	131.91	131.91		` '
Lighting gains (67)m= 21.48	(calcula	131.91 ted in Ap 15.52	131.91 ppendix 11.75	131.91 _, equati 8.78	131.91 on L9 or 7.41	131.91 r L9a), a 8.01	131.91 Iso see	131.91 Table 5	131.91 17.75	131.91	131.91		` '
Lighting gains (67)m= 21.48 Appliances ga	(calcula 19.08 iins (calc	131.91 ted in Ap 15.52 culated in 236.98	131.91 opendix 11.75 Append 223.58	131.91 L, equati 8.78 dix L, equali	131.91 on L9 or 7.41 uation L	131.91 r L9a), a 8.01 13 or L1 180.13	131.91 Iso see 10.41 3a), also	131.91 Table 5 13.98 see Ta	131.91 17.75 ble 5 197.33	20.71	131.91 22.08		(67)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78	(calcula 19.08 iins (calc	131.91 ted in Ap 15.52 culated in 236.98	131.91 opendix 11.75 Append 223.58	131.91 L, equati 8.78 dix L, equali	131.91 on L9 or 7.41 uation L	131.91 r L9a), a 8.01 13 or L1 180.13	131.91 Iso see 10.41 3a), also	131.91 Table 5 13.98 see Ta	131.91 17.75 ble 5 197.33	20.71	131.91 22.08		(67)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains	(calcula 19.08 ins (calcula 243.28 (calcula 36.19	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19	131.91 opendix 11.75 Append 223.58 opendix 36.19	131.91 L, equati 8.78 dix L, equ 206.66 L, equat	131.91 on L9 or 7.41 uation L 190.75 ion L15	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a)	131.91 lso see 10.41 3a), also 177.63	131.91 Table 5 13.98 see Ta 183.93 ee Table	131.91 17.75 ble 5 197.33	20.71 214.25	22.08 230.15		(67) (68)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19	(calcula 19.08 ins (calcula 243.28 (calcula 36.19	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19	131.91 opendix 11.75 Append 223.58 opendix 36.19	131.91 L, equati 8.78 dix L, equ 206.66 L, equat	131.91 on L9 or 7.41 uation L 190.75 ion L15	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a)	131.91 lso see 10.41 3a), also 177.63	131.91 Table 5 13.98 see Ta 183.93 ee Table	131.91 17.75 ble 5 197.33	20.71 214.25	22.08 230.15		(67) (68)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa	(calcula 19.08 tins (calcula 243.28 (calcula 36.19 ns gains	131.91 ted in Ap 15.52 ulated in 236.98 ated in Ap 36.19 (Table 5	131.91 ppendix 11.75 Append 223.58 ppendix 36.19 5a)	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negat	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equati 36.19  0  es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19 0 le 5)	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69) (70)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negat	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 5a) 0 tive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equati 36.19  0  es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19 0 le 5)	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19	131.91 17.75 ble 5 197.33 5 36.19	20.71 214.25 36.19	22.08 230.15 36.19		(67) (68) (69) (70)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating	(calcula 19.08 ins (calcula 243.28 36.19 ns gains 0 vaporatio -105.53 gains (T	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negation of the column of t	131.91 ppendix 11.75 Append 223.58 opendix 36.19 5a) 0 ciive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equat 36.19  0 es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19 0 -105.53	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19 0 -105.53	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19 0 -105.53	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53	131.91 20.71 214.25 36.19 0 -105.53	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05	(calcula 19.08 ins (calcula 243.28 36.19 ns gains 0 vaporatio -105.53 gains (T	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negation of the column of t	131.91 ppendix 11.75 Append 223.58 opendix 36.19 5a) 0 ciive valu	131.91  L, equati 8.78  dix L, equ 206.66  L, equat 36.19  0 es) (Tab	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19 0 -105.53	131.91 Iso see 10.41 3a), also 177.63 , also se 36.19 0 -105.53	131.91 Table 5 13.98 See Ta 183.93 See Table 36.19 0 -105.53	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53	131.91 20.71 214.25 36.19 0 -105.53	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05  Total internal	(calcula 19.08 ins (calcula 243.28 36.19 ns gains 0 /aporatio -105.53 gains (T 127.81 gains =	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negation of the column of t	131.91 opendix 11.75 Append 223.58 opendix 36.19 5a) 0 tive valu -105.53	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19  0 es) (Tab -105.53	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19  0  -105.53  102.07 m + (67)m	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19 0 -105.53 108.35 1+ (68)m -	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19 0 -105.53 110.59 + (69)m + (	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53  117.13  (70)m + (7	131.91 20.71 214.25 36.19 0 -105.53 124.51 1)m + (72)	131.91 22.08 230.15 36.19 0 -105.53		(67) (68) (69) (70) (71) (72)
Lighting gains (67)m= 21.48  Appliances ga (68)m= 240.78  Cooking gains (69)m= 36.19  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -105.53  Water heating (72)m= 130.05  Total internal (73)m= 454.88	(calcula 19.08 ins (calcula 243.28 (calcula 36.19 ns gains 0 vaporatio -105.53 gains (Table 127.81 gains = 452.74 s:	131.91 ted in Ap 15.52 culated in 236.98 ated in Ap 36.19 (Table 5 0 on (negate) -105.53 Table 5) 123.17 : 438.24	131.91 ppendix 11.75 Appendix 223.58 ppendix 36.19 6a) 0 tive valu -105.53 116.85	131.91 L, equati 8.78 dix L, equ 206.66 L, equat 36.19  0 es) (Tab -105.53  112.75	131.91 on L9 or 7.41 uation L 190.75 ion L15 36.19  0 le 5) -105.53  106.97 (66) 367.72	131.91 r L9a), a 8.01 13 or L1 180.13 or L15a) 36.19  0  -105.53  102.07 m + (67)m 352.78	131.91 Iso see 10.41 3a), also 177.63 1, also se 36.19 0 -105.53 108.35 1 + (68)m - 358.97	131.91 Table 5 13.98 see Ta 183.93 ee Table 36.19 0 -105.53 110.59 + (69)m + (	131.91  17.75 ble 5  197.33  5  36.19  0  -105.53  117.13  (70)m + (7  394.78	131.91 20.71 214.25 36.19 0 -105.53 124.51 1)m + (72) 422.05	131.91 22.08 230.15 36.19 0 -105.53 127.82		(67) (68) (69) (70) (71) (72)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_									_			_				
Southea	1St 0.9x	0.77		X	7.6	3	X	3	6.79	X	0.44		X	0.7	=	59.92	(77)
Southea	st 0.9x	0.77		X	7.6	3	x	6	2.67	X	0.44		X	0.7		102.07	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	8	5.75	X	0.44		X	0.7	=	139.65	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	10	06.25	X	0.44		x	0.7	=	173.04	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	1	19.01	X	0.44		x	0.7		193.82	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	11	18.15	X	0.44		X	0.7		192.42	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	11	13.91	X	0.44		x	0.7		185.51	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	10	04.39	X	0.44		x	0.7		170.01	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	9	2.85	X	0.44		X	0.7	=	151.22	(77)
Southea	st 0.9x	0.77		x	7.6	3	x	6	9.27	X	0.44		x	0.7	=	112.81	(77)
Southea	st <sub>0.9x</sub>	0.77		x	7.6	3	x	4	4.07	X	0.44		X	0.7	=	71.77	(77)
Southea	st 0.9x	0.77		x	7.6	3	X	3	1.49	X	0.44		X	0.7	=	51.28	(77)
South	0.9x	0.77		x	12.1	15	x	4	6.75	X	0.44		x	0.7	=	121.24	(78)
South	0.9x	0.77		x	12.1	15	x	7	6.57	X	0.44		X	0.7	=	198.57	(78)
South	0.9x	0.77		x	12.1	15	x	9	7.53	X	0.44		x	0.7	=	252.94	(78)
South	0.9x	0.77		x	12.1	15	x	11	10.23	X	0.44		x	0.7	=	285.88	(78)
South	0.9x	0.77		x	12.1	15	x	11	14.87	X	0.44		X	0.7	=	297.9	(78)
South	0.9x	0.77		x	12.1	15	X	11	10.55	X	0.44		X	0.7	=	286.69	(78)
South	0.9x	0.77		x	12.1	15	x	10	08.01	X	0.44		x	0.7		280.11	(78)
South	0.9x	0.77		x	12.1	15	X	10	04.89	X	0.44		x	0.7		272.03	(78)
South	0.9x	0.77		x	12.1	15	X	10	01.89	X	0.44		x	0.7		264.22	(78)
South	0.9x	0.77		x	12.1	15	x	8	2.59	X	0.44		x	0.7		214.17	(78)
South	0.9x	0.77		x	12.1	15	X	5	5.42	X	0.44		x	0.7		143.72	(78)
South	0.9x	0.77		x	12.1	15	X		10.4	X	0.44		X	0.7	=	104.77	(78)
Solar g	ains in	watts, ca	lcula	ted	for each	n mon	:h			(83)m	n = Sum(74	)m(8	82)m			_	
(83)m=	181.17	300.64	392.	59	458.91	491.72	2 4	79.11	465.62	442	.04 415.	44 3	326.98	215.49	156.05	5	(83)
Total ga	ains – i	nternal a	nd so	olar	(84)m =	(73)n	า + (	83)m	, watts								
(84)m=	636.05	753.38	830.	83	873.66	882.48	3 8	46.82	818.4	801	.01 786.	51 7	'21.76	637.53	598.68	3	(84)
7. Mea	an inter	nal temp	eratu	ıre (	heating	seaso	n)										
Tempe	erature	during h	eatin	g pe	eriods in	the li	ving	area f	from Tal	ble 9	, Th1 (°C	)				21	(85)
Utilisa	tion fac	tor for ga	ains f	or li	ving are	a, h1,	m (s	ee Ta	ble 9a)								
ſ	Jan	Feb	Ma	ar	Apr	May	/	Jun	Jul	А	ug Se	эр	Oct	Nov	Dec	:	
(86)m=	0.98	0.96	0.9	3	0.86	0.74		0.56	0.41	0.4	4 0.6	4	0.87	0.96	0.99	7	(86)
Mean	interna	l tempera	ature	in li	ving are	ea T1	follo	w ste	ns 3 to 7	7 in T	able 9c)	•		•		_	
(87)m=	19.95	20.17	20.4	$\overline{}$	20.7	20.88	<del>`</del>	20.98	21	20.	<del></del>	95 2	20.72	20.29	19.91	7	(87)
Temp	oraturo	during h	oatin	a ne	riode in	roct	of du	بماالم	from To	abla (	<b>_</b> 9, Th2 (°(					_	
(88)m=	20.19	20.19	20.1	<del></del>	20.2	20.2	$\neg$	20.21	20.21	20.	<del></del> _		20.2	20.2	20.19	7	(88)
L											1			- :-		_	. ,
Utilisa (89)m=	0.98	tor for ga	0.9	-	0.83	0.69	$\overline{}$	,m (se <sub>0.5</sub>	0.34	9a) 0.3	36 0.5	, T	0.84	0.96	0.98	7	(89)
L											!			0.90	0.96	_	(00)
Mean	interna	I tempera	ature	in th	ne rest (	of dwe	lling	T2 (fo	ollow ste	eps 3	to 7 in T	able	9c)				

(00)	0.47   40.00	40.00	40.70		(90)
(90)m= 18.78 19.1 19.47 19.85 20.08 20.19 20.21 20.21 20	0.17 19.89 fLA = Living	19.28 n area ÷ (4	18.73	0.34	(91)
		, ( .	<b>'</b>	0.54	(01)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times (92)m = 19.18                                  $	× 12 0.44   20.18	19.63	19.13		(92)
Apply adjustment to the mean internal temperature from Table 4e, where a		10.00	10.10		(02)
	0.44 20.18	19.63	19.13		(93)
8. Space heating requirement	,				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so	so that Ti,m=(7	76)m and	d re-calc	ulate	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug S	Sep Oct	Nov	Dec		
Utilisation factor for gains, hm:	oop   oot	1101	D00		
(94)m= 0.97 0.95 0.9 0.83 0.7 0.52 0.36 0.39 0.	0.6 0.84	0.95	0.98		(94)
Useful gains, hmGm , W = (94)m x (84)m					
	69.28 604.82	604.91	585.61		(95)
Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14	14.1 10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m–(90)]		7.1	4.2		(00)
	90.87 748.08	984.74	1180.29		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m -	– (95)m] x (41	)m			
(98)m= 425.07 301.21 227.59 114.28 43.66 0 0 0 0	0 106.59	273.47	442.44		_
Total per	r year (kWh/year)	) = Sum(98	3) <sub>15,912</sub> =	1934.31	(98)
Space heating requirement in kWh/m²/year				21.27	(99)
9b. Energy requirements – Community heating scheme					
This part is used for space heating, space cooling or water heating provided Fraction of space heat from secondary/supplementary heating (Table 11) '0		unity sch	eme.	0	(301)
		unity sch	eme.	0	(301)
Fraction of space heat from secondary/supplementary heating (Table 11) '0	0' if none			1	╡``
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C	0' if none P and up to four c			1 he latter	(302)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 6  Fraction of heat from Community CHP	0' if none P and up to four c			1	(302) (303a)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C	0' if none P and up to four c			1 he latter	(302) (303a) (303b)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C Fraction of heat from Community CHP	O' if none P and up to four c		sources; tl	1 ne latter 0.6	(302)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 0  Fraction of heat from Community CHP  Fraction of community heat from heat source 2	O' if none P and up to four of C.	other heat s	sources; ti	1 ne latter 0.6 0.4	(302) (303a) (303b)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 6  Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP	O' if none P and up to four of C. (30)	other heat s	sources; ti	1 ne latter 0.6 0.4 0.6	(302) (303a) (303b) (304a)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 6  Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2	O' if none P and up to four of C. (30)	other heat s	sources; ti	0.6 0.4 0.6 0.4	(302) (303a) (303b) (304a) (304b)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 6  Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating Distribution loss factor (Table 12c) for community heating system  Space heating	O' if none P and up to four of C. (30)	other heat s	sources; ti	1 0.6 0.4 0.6 0.4 1	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 6  Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating  Distribution loss factor (Table 12c) for community heating system	O' if none P and up to four of C. (30)	other heat s	sources; ti	1 0.6 0.4 0.6 0.4 1 1.05	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix of Fraction of heat from Community CHP  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement	O' if none P and up to four of C. (30)	other heat : 02) x (303a 02) x (303b	sources; th	1 ne latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix (Fraction of heat from Community CHP)  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  (98)	O' if none P and up to four of C. (30) (30)	02) x (303a 02) x (303b 02) x (306) =	sources; th	1 ne latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea 1934.31	(302) (303a) (303b) (304a) (304b) (305) (306)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix (Fraction of heat from Community CHP)  Fraction of community heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP	0' if none  P and up to four of C.  (30) (30) g system  (30) 8) x (304a) x (305) (30)	02) x (303a 02) x (303b 02) x (306) = 6) x (306) =	sources; th	1 ne latter  0.6 0.4 0.6 0.4 1 1.05 <b>kWh/yea</b> 1934.31 1218.61	(302) (303a) (303b) (304a) (304b) (305) (306) r
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 0  Fraction of heat from Community CHP  Fraction of total space heat from heat source 2  Fraction of total space heat from community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  Space heat from Community CHP  Space heat from Secondary/supplementary heating system in % (from Table 4a)	0' if none  P and up to four of C.  (30) (30) g system  (30) 8) x (304a) x (305) (30)	02) x (303a 02) x (303a 02) x (306) = 6) x (306) = E)	sources; th	1 ne latter  0.6 0.4 0.6 0.4 1 1.05 <b>kWh/yea</b> 1934.31 1218.61 812.41	(302) (303a) (303b) (304a) (304b) (305) (306)  r (307a) (307b)
Fraction of space heat from secondary/supplementary heating (Table 11) '0  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix 0  Fraction of heat from Community CHP  Fraction of total space heat from heat source 2  Fraction of total space heat from Community CHP  Fraction of total space heat from community heat source 2  Factor for control and charging method (Table 4c(3)) for community heating Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community CHP  Space heat from Community CHP  Space heat from Secondary/supplementary heating system in % (from Table 4a)	0' if none  P and up to four of C.  (30) (30) g system  (30) 8) x (304a) x (305) a or Appendix	02) x (303a 02) x (303a 02) x (306) = 6) x (306) = E)	sources; th	1 ne latter  0.6 0.4 0.6 0.4 1 1.05 kWh/yea 1934.31 1218.61 812.41 0	(302) (303a) (303b) (304a) (304b) (305) (306)  r (307a) (307b) (308

If DHW from community scheme:

	_		1
Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1370.12	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	913.41	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	43.15	(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): mechanical ventilation - balanced, extract or positive input.		176.39	(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) =	176.39	(331)
Energy for lighting (calculated in Appendix L)		379.38	(332)
Electricity generated by PVs (Appendix M) (negative qua	antity)	-456.3	(333)
Electricity generated by wind turbine (Appendix M) (neg	ative quantity)	0	(334)
12b. CO2 Emissions – Community heating scheme	_		-
Electrical efficiency of CHP unit		29.73	(361)
Heat efficiency of CHP unit		45.95	(362)
	Energy Emission factor Em kWh/year kg CO2/kWh kg	issions CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	2652.04 × 0.22	572.84	(363)
less credit emissions for electricity -(307a) × (361) ÷ (362)	788.45 × 0.52	-409.21	(364)
Water heated by CHP $(310a) \times 100 \div (362) =$	2981.77 × 0.22	644.06	(365)
less credit emissions for electricity  (361) ÷ (362)	886.48 × 0.52	-460.08	(366)
Efficiency of heat source 2 (%)	CHP using two fuels repeat (363) to (366) for the second fuel	91	(367b)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x 0.22 =	409.65	(368)
Electrical energy for heat distribution	[(313) x 0.52 =	22.39	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	779.65	(373)
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with water from immersion heater or ins	stantaneous heater (312) x 0.22 =	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =	779.65	(376)
CO2 associated with electricity for pumps and fans with	in dwelling (331)) x 0.52 =	91.54	(378)
CO2 associated with electricity for lighting	(332))) x 0.52 =	196.9	(379)
Energy saving/generation technologies (333) to (334) as Item 1	s applicable $0.52 \times 0.01 = \boxed{}$	-236.82	(380)
Total CO2, kg/year sum of (376)(382	2) =	831.28	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		9.14	(384)
El rating (section 14)		91.81	(385)
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			User D							
Assessor Name:	Matthew Stain			Stroma Number: Software Version:					023501	
Software Name:	Stroma FSAP	_•					4.4		n: 1.0.4.16	
Aulden	Llavias 44 Dark		· ·	Address	s: 06-18-6	69419 Ho	ouse-11			
Address: 1. Overall dwelling dimer	House-11, Bert	ram Street, Lo	ondon							
1. Overall dwelling diffier	1510115.		Δro	a(m²)		Av. Hei	aht(m)		Volume(m³)	
Ground floor				57.15	(1a) x	2		(2a) =	161.16	(3a)
First floor			6	31.15	(1b) x	2.	47	(2b) =	151.04	(3b)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	+(1e)+(1n)	) 1	28.3	(4)			_		_
Dwelling volume					(3a)+(3b	)+(3c)+(3d)	+(3e)+	(3n) =	312.2	(5)
2. Ventilation rate:										
	main heating	secondary heating	/	other		total			m³ per houi	٢
Number of chimneys		+ 0	] + [	0	=	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	+ [	0	=	0	X	20 =	0	(6b)
Number of intermittent far	is					4	X	10 =	40	(7a)
Number of passive vents						0	Х	10 =	0	(7b)
Number of flueless gas fir	es					0	х	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s. flues and fans	= (6a)+(6b)+(7a	a)+(7b)+(	7c) =	Г	40	$\neg$	÷ (5) =	0.13	(8)
If a pressurisation test has be	·				continue fr			. (-)	0.10	
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening			the great	ter wall are	ea (after					
If suspended wooden fl			1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ento	er 0.05, else ente	r O							0	(13)
Percentage of windows	and doors draug	ht stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)
Air permeability value, o	q50, expressed in	cubic metres	s per ho	our per s	square m	etre of e	nvelope	area	3	(17)
If based on air permeabilit	y value, then (18)	$= [(17) \div 20] + (8)$	), otherw	ise (18) =	(16)				0.28	(18)
Air permeability value applies		st has been done	e or a de	gree air pe	ermeability	is being us	ed	ı		_
	J					10)1			1	(19)
Number of sides sheltered	1			(20) 1	[O OZE v /					<b>-</b>
Number of sides sheltered Shelter factor					[0.075 x (1	19)] =			0.92	(20)
Number of sides sheltered Shelter factor Infiltration rate incorporati	ng shelter factor				(0.075 x (1 3) x (20) =	19)] =			0.92	(20)
Number of sides sheltered Shelter factor Infiltration rate incorporati	ng shelter factor			(21) = (18	3) x (20) =	···		1		=
Number of sides sheltered Shelter factor Infiltration rate incorporati	ng shelter factor	peed //ay Jun	Jul			Oct	Nov	Dec		=

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2 (22a)m= 1.27	22a)m = 1.25	(22)m ÷	1.1	1.08	0.95	0.95	0.92	1 1	1.08	1.12	1.18	]
, ,					!	!		<u> </u>	1		1	I
Adjusted infiltra	ation rat	e (allowi	ng for sh 0.28	nelter an	0.24	speed) = 0.24	(21a) x 0.24	(22a)m <sub>0.26</sub>	0.28	0.29	0.3	1
Calculate effec							0.24	0.20	0.20	0.29	0.5	J
If mechanica												0 (23a)
If exhaust air he									o) = (23a)			0 (23b)
If balanced with		-	•	_					<b>0</b> 1.) (		4 (00.)	0 (23c)
a) If balance	d mech	anical ve	ntilation 0	with he	at recove	ery (MVI	HR) (24a 	$\frac{a)m = (2)}{0}$	2b)m + (   0	23b) × [	1 – (23c)   0	) ÷ 100] ]
b) If balance									ļ			(244)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole h												· ''
,		(23b), t		•	•				.5 × (23b	o)		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24c)
d) If natural				•	•					-		
		en (24d)	<u> </u>		· `	<del></del>	<del>- `</del>	<del></del>	<del></del>	0.54	1 0.55	] (244)
(24d)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(24d)
Effective air (25)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(25)
` /					0.55	0.55	0.55	0.00	0.54	0.54	0.55	] (23)
2 2 2 2 2 2 2 2	مطالم مرمم											
3. Heat losse		•			NI a t A a		11 -1		A 3/ 11		1 -1	- A X/I
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²-	
	Gros	SS	Openin	gs								
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I			K kJ/K
<b>ELEMENT</b> Doors	Gros area	SS	Openin	gs	A ,r	m² x x1	W/m2	eK =     0.04] =	(W/l			K kJ/K (26)
ELEMENT  Doors  Windows Type	Gros area a 1	SS	Openin	gs	A ,r 2.1 2.88	m <sup>2</sup> x x <sup>1</sup> 1 x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+	eK =   0.04] =   0.04] =	2.94 3.82			K kJ/K (26) (27)
ELEMENT  Doors  Windows Type  Windows Type	Gros area e 1 e 2 e 1	SS	Openin	gs	A ,r 2.1 2.88 11.61	m <sup>2</sup> x x1 1 x1 x1	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	2.94 3.82 15.39			K kJ/K (26) (27) (27)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ	Gros area e 1 e 2 e 1	SS	Openin	gs	A ,r 2.1 2.88 11.61 4.05	m <sup>2</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) +	0.04] = 0.04] = 0.04] =	2.94 3.82 15.39 5.67	K)		K kJ/K (26) (27) (27) (27b)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ	Gros area e 1 e 2 e 1	ss (m²)	Openin	gs <sub>2</sub>	A ,r 2.1 2.88 11.61 4.05 5.4	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 2.94 3.82 15.39 5.67 7.56	K)	kJ/m²-	K kJ/K (26) (27) (27) (27b) (27b)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor	Gros area a 1 a 2 e 1 e 2	ss (m²)	Openin m	gs <sub>2</sub>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	2.94 3.82 15.39 5.67 7.56 8.7295	K)	kJ/m²-	K kJ/K (26) (27) (27) (27b) (27b) (28)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls	Gros area 2 1 2 2 e 1 e 2	64 31	Openin m	gs <sup>2</sup>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15	0.04] = 0.04]	2.94 3.82 15.39 5.67 7.56 8.7295	K)	110 150	K kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (28) (13207.5 (29)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls  Roof Type1	Gros area 1 2 2 e 1 e 2 104. 40.3 30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 ) + /[1/(1.4) +  0.13  0.15  0.11	0.04] = 0.04]	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43	K)	110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (30)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls  Roof Type1  Roof Type2	Gros area 1 2 2 e 1 e 2 104. 40.3 30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 ) + /[1/(1.4) +  0.13  0.15  0.11	0.04] = 0.04]	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43	K)	110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (30) (30)
ELEMENT  Doors  Windows Type  Windows Type  Rooflights Typ  Rooflights Typ  Floor  Walls  Roof Type1  Roof Type2  Total area of e	Gros area  1 1 2 2 e 1 e 2 104.  40.3  30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r 2.1 2.88 11.61 4.05 5.4 67.15 88.05 40.31 21.54	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (30) (31)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall	Gros area  1 1 2 2 e 1 e 2 104.  40.3  30.9	64 31	16.55 0	gs <sup>2</sup>	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (29) (362.79 (30) (31) (31) (2768.5 (32)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling	Gros area  1 2 1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1	64 B1 D9 S, m <sup>2</sup>	16.55 0 9.45	gs <sub>1</sub> 2	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4) + /[1/(1.4) +  0.13  0.15  0.11  0	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27b) (320) (31) (31) (32c) (32d) (550.35 (32e)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and	Gros area  1 1 2 2 e 1 e 2  104. 40.3 30.9	64 31 99 s, m <sup>2</sup>	Openin m  16.59  0  9.45	gs P	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15  alue calcul	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4) + /[1/(1.4) +  0.13  0.15  0.11  0	K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27b) (320) (31) (31) (32c) (32d) (550.35 (32e)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling	Gros area  1 1 2 2 e 1 e 2 104.  40.3  30.5  Ilements	64 B1 B9 G, m <sup>2</sup> ows, use e	16.50  9.45	gs P	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15  alue calcul	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11  0	2K	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (27c) (30c) (31) (31c) (31c) (31c) (32c) (32c) (32c) (32c) (33c) (32c) (33c) (32c) (33c) (33
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area	Gros area  1 1 2 2 2 e 1 4 2 3 0.5 3 1 3 0.5 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1	64 31 39 39 30, m <sup>2</sup> 30, m <sup>2</sup> 30, m <sup>2</sup>	16.50  9.45	gs P	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  216  61.15  61.15  alue calcul	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11  0.11	2K =   0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =   =   =   =   =   =	(W/l 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18 9	K kJ/K (26) (27) (27) (27b) (320) (31) (31) (32c) (32d) (550.35 (32e)
ELEMENT  Doors  Windows Type Windows Type Rooflights Typ Rooflights Typ Floor Walls Roof Type1 Roof Type2 Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area Fabric heat los	Gros area  1 1 2 2 e 1 e 2 1 104.  40.3 30.9 Ilements  1 roof winders on both iss, W/K:  Cm = S(	64 31 39 3, m <sup>2</sup> 3, m <sup>2</sup> 3, m <sup>2</sup>	16.50 9.45	gs p g g g g g g g g g g	A ,r  2.1  2.88  11.61  4.05  5.4  67.15  88.05  40.31  21.54  243.0  39.55  61.15  alue calcultitions	m <sup>2</sup>	W/m2  1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + /[1/(1.4) +  0.13  0.15  0.11  0.11	K	(W// 2.94 3.82 15.39 5.67 7.56 8.7295 13.21 4.43 2.37	K)	110 150 9 9 70 9 18 9	K kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b) (27c) (30) (31) (31) (31) (32c) (32c) (32c) (33.2)

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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 instea	ad of a do	tailad calc	ulation										
Thermal bridge				usina An	nendix I	K						19.78	(36)
if details of therma	,	•			•	•						19.70	(00)
Total fabric hea	0 0		( )	,	,			(33) +	(36) =			83.19	(37)
Ventilation hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)			_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 57.06	56.84	56.63	55.64	55.45	54.59	54.59	54.43	54.92	55.45	55.83	56.22		(38)
Heat transfer of	oefficier	nt, W/K					•	(39)m	= (37) + (	38)m		•	
(39)m= 140.25	140.03	139.82	138.83	138.65	137.78	137.78	137.62	138.12	138.65	139.02	139.41		
Heat loss para	meter (H	HLP), W/	m²K			-	-		Average = = (39)m ÷		12 /12=	138.83	(39)
(40)m= 1.09	1.09	1.09	1.08	1.08	1.07	1.07	1.07	1.08	1.08	1.08	1.09		
Number of day	s in moi	nth (Tah	le 1a)			•	•		Average =	Sum(40) <sub>1</sub>	12 /12=	1.08	(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)
L!					<u> </u>	!	!		!	!	ļ		
4. Water heat	ing ener	av requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13	.9)	89		(42)
Annual averag	•	ater usag	ae in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		10:	2.85		(43)
Reduce the annua	_				_	_	to achieve	a water us	se target o	f			
not more that 125						•					_	1	
Jan Hot water usage ir	Feb	Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	-						· ·	400.70	1,04,04	1,00,00	140.40	Ī	
(44)m= 113.13	109.02	104.91	100.79	96.68	92.56	92.56	96.68	100.79	104.91	109.02	113.13	4004.40	7(44)
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	m x nm x E	OTm / 3600		Total = Su oth (see Ta	( /		1234.18	(44)
(45)m= 167.77	146.74	151.42	132.01	126.67	109.3	101.29	116.23	117.61	137.07	149.62	162.48		
						!	!		Total = Su	m(45) <sub>112</sub> =	=	1618.2	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)				•	
(46)m= 25.17 Water storage	22.01	22.71	19.8	19	16.4	15.19	17.43	17.64	20.56	22.44	24.37		(46)
Storage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	,		•			_							, ,
Otherwise if no	_			_			. ,	ers) ente	er '0' in (	47)			
Water storage												•	
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee sectio		-								1	
Volume factor			2h								0		(52)
Temperature fa	actor iro	штаріе	ZU								0		(53)

Energy lost fro		•	, kWh/ye	ear			(47) x (51)	) x (52) x (5	53) =		0		(54)
Enter (50) or	. , ,	,						,			0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n			•	
(56)m= 0	0	0	0	0 (7.0)	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	/)m = (56)i	m where (	H11) is fro	m Append	IX H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Primary circuit				•	•	` '	, ,						
(modified by						i				<del></del>	i	1	,,
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m					_	
(61)m= 50.96	46.03	50.96	49.32	49.27	45.65	47.17	49.27	49.32	50.96	49.32	50.96		(61)
Total heat req	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= 218.73	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no solaı	contribut	ion to wate	er heating)	•	
(add additiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	<b>3</b> )				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 218.73	192.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2207.36	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n1 + 0 8 x	[(46)m	+ (57)m	+ (59)m	1	
							. (0.)	1] 1 0.0 /	( 0 ) 1 1 1	. (0,,,,,,	. (00)	J	
(65)m= 68.52	60.3	63.09	56.22	54.43	47.76	45.47	50.96	51.44	58.32	62.08	66.76	,	(65)
(65)m= 68.52 include (57)					47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57)	m in calc	culation o	of (65)m	only if c	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57) 5. Internal ga	m in cald ains (see	culation of Table 5	of (65)m and 5a	only if c	47.76	45.47	50.96	51.44	58.32	62.08	66.76		(65)
include (57)	m in cald ains (see	culation of Table 5	of (65)m and 5a)	only if c	47.76	45.47	50.96 dwelling	51.44	58.32	62.08	66.76		(65)
include (57)  5. Internal game	m in calc ains (see as (Table	culation of Table 5	of (65)m and 5a	only if c	47.76 ylinder i	45.47	50.96	51.44 or hot w	58.32 ater is fr	62.08 om com	66.76 munity h		(65) (66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52	m in cald ains (see as (Table Feb 144.52	e Table 5 e 5), Wat Mar	of (65)m and 5a ts Apr 144.52	only if c : May 144.52	47.76 ylinder is Jun 144.52	45.47 s in the o	50.96 dwelling Aug 144.52	51.44 or hot was Sep 144.52	58.32 ater is fr	62.08 om com	66.76 munity h		
include (57)  5. Internal games  Metabolic gain  Jan	m in cald ains (see as (Table Feb 144.52	e Table 5 e 5), Wat Mar	of (65)m and 5a ts Apr 144.52	only if c : May 144.52	47.76 ylinder is Jun 144.52	45.47 s in the o	50.96 dwelling Aug 144.52	51.44 or hot was Sep 144.52	58.32 ater is fr	62.08 om com	66.76 munity h		
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52	m in calconnum in	ETable 5 E Table 5 E 5), Wate Mar 144.52 ted in Ap	of (65)m 5 and 5a ts Apr 144.52 opendix 14.5	only if c  May  144.52  L, equati  10.84	47.76  ylinder is  Jun  144.52 ion L9 of  9.15	45.47 s in the o  Jul 144.52 r L9a), a 9.89	50.96 dwelling Aug 144.52 lso see 12.86	51.44 or hot was Sep 144.52 Table 5 17.25	58.32 ater is fr Oct 144.52 21.91	62.08 om com Nov 144.52	66.76 munity h		(66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games	m in calc	Evaluation of Table 5  Evaluation of Table 5  Evaluation of Table 5  Mar  144.52  Ited in Ap  19.16  ulated in	of (65)m and 5a ts Apr 144.52 opendix 14.5	only if c  May  144.52  L, equati  10.84  dix L, eq	Jun 144.52 ion L9 of 9.15 uation L	45.47 s in the o  Jul 144.52 r L9a), a 9.89 13 or L1	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also	51.44 or hot was Sep 144.52 Table 5 17.25 see Tal	58.32 ater is fr Oct 144.52 21.91	62.08 om com Nov 144.52	Dec 144.52		(66)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc	Evaluation of Table 5 E 5), Wate Mar 144.52 Ited in Ap 19.16 Evaluated in 291	of (65)m 5 and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12	Sep 144.52 Table 5 17.25 see Tal 225.85	58.32  ater is fr  Oct 144.52  21.91  ole 5 242.31	62.08 om com Nov 144.52	66.76 munity h		(66) (67)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains	m in calc ains (see as (Table Feb 144.52 (calcula: 23.56 ins (calcula: 298.73 (calcula:	Table 5 5), Wate Mar 144.52 ted in Ap 19.16 ulated in Ap 291	of (65)m and 5a ts Apr 144.52 ppendix 14.5 Append 274.54 ppendix	only if constructions only if constructions only if constructions on the construction of the construction on the construction of the construction on the construction on the construction of the construction on the construction of the construction on the construction on the construction on the construction on the construction of the construction on the construction of the construction on the construction of the construction	Jun 144.52 ion L9 o 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a)	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se	Sep 144.52 Table 5 17.25 see Table 225.85	58.32  ater is fr  Oct  144.52  21.91  ole 5  242.31  5	62.08 om com Nov 144.52 25.57	Dec 144.52 27.26 282.61		(66) (67) (68)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45	Table 5 2 5), Wate Mar 144.52 ted in Ap 19.16 ulated in 291 ated in Ap 37.45	of (65)m s and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23	Jul 144.52 r L9a), a 9.89 13 or L1 221.19	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12	Sep 144.52 Table 5 17.25 see Tal 225.85	58.32  ater is fr  Oct 144.52  21.91  ole 5 242.31	62.08 om com Nov 144.52	Dec 144.52		(66) (67)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fain	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains	ted in Apulated in	of (65)m 5 and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	Aug 144.52 Iso see 12.86 3a), also 218.12 , also se 37.45	Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32  ater is fr  Oct 144.52  21.91  ble 5 242.31  5 37.45	62.08 om com Nov 144.52 25.57 263.09	Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3	ted in Aputed in	of (65)m ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 5a) 3	only if construction only if c	Jun 144.52 ion L9 o 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a)	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se	Sep 144.52 Table 5 17.25 see Table 225.85	58.32  ater is fr  Oct  144.52  21.91  ole 5  242.31  5	62.08 om com Nov 144.52 25.57	Dec 144.52 27.26 282.61		(66) (67) (68)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even	m in calc ains (see s (Table Feb 144.52 (calcular 23.56 ins (calcular 37.45 ns gains 3	ted in Apulated in	of (65)m ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 a tive valu	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5)	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se 37.45	Sep 144.52 Table 5 17.25 see Tall 225.85 ee Table 37.45	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45	62.08  om com  Nov  144.52  25.57  263.09  37.45	66.76 munity h  Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calcula 37.45 as gains 3 raporatio -115.62	ted in Ap 19.16 ulated in 291 ted in Ap 37.45 (Table 5	of (65)m s and 5a ts Apr 144.52 opendix 14.5 Appendix 274.54 opendix 37.45 Sa) 3 tive value	only if construction only if c	Jun 144.52 ion L9 o 9.15 uation L 234.23 ion L15 37.45	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	Aug 144.52 Iso see 12.86 3a), also 218.12 , also se 37.45	Sep 144.52 Table 5 17.25 o see Tal 225.85 ee Table 37.45	58.32  ater is fr  Oct 144.52  21.91  ble 5 242.31  5 37.45	62.08 om com Nov 144.52 25.57 263.09	66.76 munity h  Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3 raporatio -115.62 gains (T	ted in Apulated in	of (65)m ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 5a) 3 tive valu -115.62	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 , also se 37.45	Sep 144.52 Table 5 17.25 see Table 225.85 ee Table 37.45	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45	62.08 om com Nov 144.52 25.57 263.09 37.45	Dec 144.52 27.26 282.61 37.45		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1	m in calce is (Table Feb 144.52) (calcular 23.56) ins (calcular 37.45) ins gains 3 (caporatio -115.62) gains (Table 89.73)	ted in Ap 19.16 ulated in Ap 37.45 (Table 5 3 on (negat -115.62 Table 5) 84.79	of (65)m ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 a tive valu	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 a, also se 37.45  3  -115.62	Sep 144.52 Table 5 17.25 see Tal 225.85 ee Table 37.45 3 -115.62	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45 3 -115.62	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62		(66) (67) (68) (69) (70)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1  Total internal	m in calc ains (see s (Table Feb 144.52 (calcula 23.56 ins (calc 298.73 (calcula 37.45 ns gains 3 vaporatio -115.62 gains (T 89.73 gains =	ted in Ap 19.16 ulated in 291 ated in Ap 37.45 (Table 5 3 on (negate -115.62) able 5) 84.79	of (65)m ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 a live valu -115.62	only if construction only if c	Jun 144.52 fon L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45 3 -115.62 m + (67)m	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 a, also se 37.45  3  -115.62  68.5 a + (68)m +	Sep 144.52 Table 5 17.25 see Table 225.85 ee Table 37.45  3  -115.62  71.44 + (69)m + (	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45  3  -115.62  78.38 70)m + (7	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62  86.22  1)m + (72)	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62 89.74		(66) (67) (68) (69) (70) (71)
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 144.52  Lighting gains  (67)m= 26.52  Appliances games  (68)m= 295.66  Cooking gains  (69)m= 37.45  Pumps and fames  (70)m= 3  Losses e.g. even  (71)m= -115.62  Water heating  (72)m= 92.1	m in calc ains (see as (Table Feb 144.52 (calcula 23.56 ins (calcula 37.45 as gains 3 raporatio -115.62 gains (T 89.73 gains =	ted in Ap 19.16 ulated in Ap 37.45 (Table 5 3 on (negat -115.62 Table 5) 84.79	of (65)m ts Apr 144.52 ppendix 14.5 Appendix 274.54 ppendix 37.45 5a) 3 tive valu -115.62	only if construction only if c	Jun 144.52 ion L9 of 9.15 uation L 234.23 ion L15 37.45  3 le 5) -115.62	Jul 144.52 r L9a), a 9.89 13 or L1 221.19 or L15a) 37.45	50.96 dwelling  Aug 144.52 lso see 12.86 3a), also 218.12 a, also se 37.45  3  -115.62	Sep 144.52 Table 5 17.25 see Tal 225.85 ee Table 37.45 3 -115.62	58.32 ater is fr  Oct 144.52  21.91 ble 5 242.31 5 37.45 3 -115.62	62.08  om com  Nov  144.52  25.57  263.09  37.45  3  -115.62	66.76 munity h  Dec 144.52 27.26 282.61 37.45 3 -115.62		(66) (67) (68) (69) (70)

Stroma FSAP 2012 Version: 1.0.4.16 (SAP 9.92) - http://www.stroma.com

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

Orientation: Access Fac Table 6d	tor Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East 0.9x 1	x 2.88	x	19.64	x	0.76	x	0.7	=	20.85	(76)
East 0.9x 1	x 2.88	x	38.42	x	0.76	х	0.7	=	40.79	(76)
East 0.9x 1	x 2.88	X	63.27	х	0.76	х	0.7	<b>=</b>	67.18	(76)
East 0.9x 1	x 2.88	x	92.28	x	0.76	x	0.7	] =	97.98	(76)
East 0.9x 1	x 2.88	X	113.09	х	0.76	х	0.7	=	120.08	(76)
East 0.9x 1	x 2.88	X	115.77	x	0.76	х	0.7	=	122.92	(76)
East 0.9x 1	x 2.88	X	110.22	x	0.76	х	0.7	=	117.03	(76)
East 0.9x 1	x 2.88	X	94.68	x	0.76	x	0.7	=	100.53	(76)
East 0.9x 1	x 2.88	X	73.59	x	0.76	х	0.7	=	78.14	(76)
East 0.9x 1	x 2.88	X	45.59	x	0.76	x	0.7	=	48.41	(76)
East 0.9x 1	x 2.88	x	24.49	x	0.76	x	0.7	=	26	(76)
East 0.9x 1	x 2.88	x	16.15	x	0.76	x	0.7	=	17.15	(76)
West 0.9x 0.77	x 11.61	X	19.64	x	0.76	x	0.7	=	84.07	(80)
West 0.9x 0.77	X 11.61	x	38.42	x	0.76	x	0.7	=	164.45	(80)
West 0.9x 0.77	x 11.61	X	63.27	x	0.76	x	0.7	=	270.83	(80)
West 0.9x 0.77	x 11.61	X	92.28	x	0.76	x	0.7	=	394.99	(80)
West 0.9x 0.77	X 11.61	x	113.09	x	0.76	x	0.7	=	484.07	(80)
West 0.9x 0.77	x 11.61	X	115.77	x	0.76	x	0.7	=	495.54	(80)
West 0.9x 0.77	x 11.61	X	110.22	x	0.76	x	0.7	=	471.77	(80)
West 0.9x 0.77	× 11.61	X	94.68	x	0.76	х	0.7	=	405.24	(80)
West 0.9x 0.77	x 11.61	X	73.59	x	0.76	х	0.7	=	314.99	(80)
West 0.9x 0.77	x 11.61	X	45.59	x	0.76	x	0.7	=	195.14	(80)
West 0.9x 0.77	X 11.61	x	24.49	x	0.76	x	0.7	=	104.82	(80)
West 0.9x 0.77	x 11.61	x	16.15	x	0.76	x	0.7	=	69.13	(80)
Rooflights 0.9x 1	× 4.05	X	26.61	X	0.76	X	0.7	=	51.6	(82)
Rooflights 0.9x 1	× 5.4	X	26.61	X	0.76	X	0.7	=	68.79	(82)
Rooflights <sub>0.9x</sub> 1	x 4.05	X	53.79	x	0.76	x	0.7	=	104.31	(82)
Rooflights 0.9x 1	× 5.4	X	53.79	X	0.76	X	0.7	=	139.08	(82)
Rooflights 0.9x 1	× 4.05	X	92.95	X	0.76	X	0.7	=	180.24	(82)
Rooflights 0.9x 1	× 5.4	X	92.95	X	0.76	X	0.7	=	240.31	(82)
Rooflights 0.9x 1	× 4.05	X	142.44	X	0.76	X	0.7	=	276.21	(82)
Rooflights 0.9x 1	× 5.4	X	142.44	X	0.76	X	0.7	=	368.28	(82)
Rooflights 0.9x 1	x 4.05	x	180.71	x	0.76	x	0.7	=	350.43	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	180.71	x	0.76	x	0.7	=	467.24	(82)
Rooflights <sub>0.9x</sub> 1	x 4.05	X	187.72	x	0.76	х	0.7	=	364.02	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	187.72	x	0.76	х	0.7	=	485.36	(82)
Rooflights 0.9x 1	x 4.05	X	177.6	x	0.76	х	0.7	] =	344.39	(82)
Rooflights <sub>0.9x</sub> 1	x 5.4	X	177.6	x	0.76	x	0.7	=	459.18	(82)
Rooflights 0.9x 1	x 4.05	x	148.43	x	0.76	x	0.7	=	287.83	(82)

Rooflight	ts <sub>0.9x</sub>	1	Х	5.	4	x [	14	48.43	X		0.76	x	0.7	=	383.77	(82)
Rooflight	ts <sub>0.9x</sub>	1	Х	4.0	)5	<b>x</b> [	1′	10.34	x		0.76	x [	0.7	=	213.96	(82)
Rooflight	ts <sub>0.9x</sub>	1	X	5.	4	x	1′	10.34	x		0.76	x	0.7	=	285.28	(82)
Rooflight	ts <sub>0.9x</sub>	1	X	4.0	)5	x	6	4.97	x		0.76	x	0.7	=	125.99	(82)
Rooflight	ts <sub>0.9x</sub>	1	X	5.	4	<b>x</b> [	6	4.97	x		0.76	x [	0.7	=	167.99	(82)
Rooflight	ts <sub>0.9x</sub>	1	Х	4.0	)5	x	3	3.49	X		0.76	x	0.7	=	64.94	(82)
Rooflight	ts <sub>0.9x</sub>	1	х	5.	4	x	3	3.49	x		0.76	x	0.7	=	86.58	(82)
Rooflight	ts <sub>0.9x</sub>	1	х	4.0	)5	x	2	1.68	x		0.76	x	0.7		42.04	(82)
Rooflight	ts <sub>0.9x</sub>	1	х	5.	4	x	2	1.68	x		0.76	x	0.7	_ =	56.06	(82)
Solar ga	ains in v	vatts, ca	alculated	d for eac	h month				(83)m	n = Sı	um(74)m .	(82)m				
(83)m=	225.31	448.64	758.56	1137.47	1421.82	14	67.84	1392.37	1177	7.37	892.36	537.52	282.35	184.38		(83)
Total ga	ains – ir	nternal a	nd sola	r (84)m =	= (73)m ·	+ (8	33)m	, watts		•			•	•	_	
(84)m=	708.95	930	1222.87	1573.95	1828.94	18	46.91	1753.92	154	6.2	1276.26	949.48	726.58	653.35		(84)
7. Mea	ın interr	nal temr	perature	(heating	season	)										
				eriods in		<i>'</i>	area f	from Tab	ole 9	. Th	1 (°C)				21	(85)
-		_	٠.	living are		-				,	. ( •)					(3.37)
Γ	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	0.99	0.96	0.85	0.66	$\vdash$	).47	0.34	0.4	Ť	0.69	0.95	0.99	1	1	(86)
_	intornal	tompor	oturo in	living or	00 T1 /f/	حالم	w oto	no 2 to 7	 7 in T	Toble	. 00)		1		1	
_	19.64	19.89	20.29	living are	20.93	_	w Ste	21	2		20.94	20.55	19.99	19.59	1	(87)
` ′ _			<u>l</u>		<u> </u>	l			l	I		20.00	10.00	10.00	J	(0.)
· -				eriods ir	1	_	Ť			$\overline{}$	<u> </u>		1	·	1	(0.0)
(88)m=	20.01	20.01	20.01	20.02	20.02	20	0.02	20.02	20.	02	20.02	20.02	20.01	20.01		(88)
Utilisa <u>t</u>	ion fact	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)						_	
(89)m=	1	0.99	0.95	0.82	0.6	(	0.4	0.27	0.3	32	0.61	0.93	0.99	1		(89)
Mean i	internal	temper	ature in	the rest	of dwelli	na	T2 (fc	ollow ste	eps 3	3 to 7	' in Tabl	e 9c)			_	
	18.76	19.01	19.4	19.8	19.97	<u> </u>	0.02	20.02	20.	$\overline{}$	19.99	19.66	19.12	18.71	1	(90)
L			!			<u> </u>			!		f	LA = Livi	ng area ÷ (4	4) =	0.26	(91)
Mooni	intornal	tompor	oturo (fo	r tho wh	olo duro	llina	~\ _ fl	Λ Τ1	. /1	fl	۸) یا T2					
	18.98	19.23	19.63	or the wh	20.22	_	رو 0.26	20.27	20.		20.23	19.89	19.34	18.94	1	(92)
` ′				interna									10.04	10.54	J	(02)
· · · · ′ ⊢	18.83	19.08	19.48	19.88	20.07	_	0.11	20.12	20.	_	20.08	19.74	19.19	18.79	1	(93)
		ina real	uiremen			<u> </u>										
•		•			re obtair	ned	at ste	en 11 of	Tabl	le 9h	o, so tha	t Ti.m=	(76)m an	d re-cal	culate	
				using Ta		.00	ui oii	ор о.	. ab	.0 0.0	,, 00 1110	,	(1 0) a	a ro can	oulato	
	Jan	Feb	Mar	Apr	May	,	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisat	tion fact	tor for g	ains, hm	1:											- -	
(94)m=	1	0.98	0.94	0.81	0.6	0	).41	0.28	0.3	33	0.61	0.92	0.99	1		(94)
Useful	gains,	hmGm	W = (9)	4)m x (8	4)m								_		_	
(95)m=	705.47	915.15	1151.36	1275.34	1105.37	75	52.93	484.3	510	.14	784.54	872.75	718.26	651.1		(95)
Month	ly avera	age exte	rnal tem	perature	e from Ta	able	8 e							1	-	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
			r	al tempe	r				<del>-</del> `	<del>-</del> -	<u> </u>			1	7	
(97)m= 2	2038.12	1986.09	1814.52	1524.66	1159.98	75	59.87	485.14	512	.04	825.88	1266.75	1680.54	2033.72	]	(97)

Space heating	require	ement fo	r each m	nonth, k\	Nh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m= 991.49 7	19.67	493.39	179.51	40.63	0	0	0	0	293.14	692.84	1028.67		
							Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	4439.33	(98)
Space heating	require	ement in	kWh/m²	/year								34.6	(99)
9a. Energy requi	remen	ıts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heating		. •		, .							г		7,004
Fraction of space			-		mentary	•		(004)			Ļ	0	(201)
Fraction of space			•	• •			(202) = 1 -		(000)1		Ļ	1	(202)
Fraction of total			•				(204) = (204)	02) <b>x</b> [1 –	(203)] =		Ļ	<u> </u>	(204)
Efficiency of ma	•										Ĺ	91.8	(206)
Efficiency of se	conda	ry/supple	ementar	y heating	g system	า, %	•			•		0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating		<u>`</u>		· ·	I				000.44	000 04	1000 07		
	19.67	493.39	179.51	40.63	0	0	0	0	293.14	692.84	1028.67		
$(211)$ m = {[(98)m]									040.00	75470	4400 50		(211)
1080.05	783.96	537.46	195.54	44.26	0	0	0 Tota	0 I (kWh/yea	319.32	754.73	1120.56	4025.07	(211)
Space heating	fuel (e	ooondor	v) k///b/	month			Tota	i (KVVII/yCc	ar) =0arri(2	- ' '/15,1012		4835.87	(211)
Space heating $t = \{[(98)m \times (201)]\}$	•		• • •	monun									
(215)m = 0	0	0	0	0	0	0	0	0	0	0	0		
							Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<i>=</i>	0	(215)
Water heating											_		_
Output from water						l					l l		
	92.76	202.38	181.32	175.93	154.95	148.45	165.49	166.93	188.03	198.94	213.44		7(040)
Efficiency of wat		ter 88.89	86.88	04.4	00.5	00.5	00.5	00.5	07.00	00.55	00.00	82.5	(216)
` '	89.66			84.1	82.5	82.5	82.5	82.5	87.93	89.55	90.06		(217)
Fuel for water he $(219)m = (64)m$													
(219)m= 243.12 2	214.98	227.68	208.71	209.2	187.82	179.95	200.6	202.34	213.85	222.16	237.01		
							Tota	I = Sum(2	19a) <sub>112</sub> =			2547.4	(219)
Annual totals									k۱	Wh/year		kWh/yea	<u>r</u>
Space heating fu	iei use	ed, main	system	1							Ĺ	4835.87	╛
Water heating fu	el use	d									L	2547.4	
Electricity for pur	mps, fa	ans and	electric	keep-ho	t								
central heating	pump:										30		(230c)
Total electricity f	or the	above. k	«Wh/yea	r			sum	of (230a).	(230g) =			30	(231)
Total electricity is			,										
Electricity for ligh		,	,								ŗ	468.38	(232)

**Energy** kWh/year

Emission factor kg CO2/kWh Emissions kg CO2/year

Space heating (main system 1)	(211) x	0.216	=	1044.55	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	550.24	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1594.79	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	243.09	(268)
Total CO2, kg/year	sum	of (265)(271) =		1853.45	(272)
Dwelling CO2 Emission Rate	(272)	) ÷ (4) =		14.45	(273)
El rating (section 14)				86	(274)



# APPENDIX C1 COMMUNITY CENTRE - PART L RESULTS "LEAN"

# BRUKL Output Document



Compliance with England Building Regulations Part L 2013

#### **Project name**

# **Highgate Newtown Community Centre**

As designed

Date: Fri Nov 02 12:08:03 2018

#### Administrative information

Building Details

Address: 25 Bertram Street, Camden, London, N19 5DQ

**Certification tool** 

Calculation engine: TAS

Calculation engine version: "v9.4.3"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.3

BRUKL compliance check version: v5.4.b.0

**Owner Details** 

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

#### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.8
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.8
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	14
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

# Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.24	2.2	Damper 1.50 (internal)-frame
Floor	0.25	0.19	0.24	Exposed Floor
Roof	0.25	0.15	0.15	Roof
Windows***, roof windows, and rooflights	2.2	1.59	1.74	0F Hallf Rooflights
Personnel doors	2.2	1.63	1.63	Door
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
LL Limiting area waighted average LL values [\A	1//2021/\1			

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

 $U_{a\text{-Calc}}$  = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	3

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

#### 1-3

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	0.91	-	-	-	-			
Standard value	0.91*	N/A	N/A	N/A	N/A			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES								

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 2-1 (0F Gym)

	Heating efficiency	Cooling efficiency	Radiant efficiency	iant efficiency SFP [W/(I/s)]					
This system	0.91	3.6	-	1.6	0.7				
Standard value	0.91*	2.6	N/A	1.1^	0.5				
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									

<sup>\*</sup> Standard shown is for one single holler evetome <=2 MW output. For single holler evetome >2 MW or multi-holler evetome (overall) limit

#### 3-4 (0F Kitchen)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	0	-	-	1.6	0.7			
Standard value	N/A	N/A	N/A	1.1^	0.5			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES								
A Limiting SED may be extended by the amounts appointed in the Nan Demostic Building Services Compliance Cuide if the system includes								

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

#### 4-5 (0F Servery)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency					
This system	0.91	•	•	1.6	0.7					
Standard value	0.91*	N/A	N/A	1.1^	0.5					
Automatic moni	Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 5-6 (0F Laundrette)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	0	-	-	1.6	0.7				
Standard value	N/A	N/A	N/A	1.1^	0.5				
Automatic monitoring 8 targeting with alarms for out of range values for this HVAC system. VES									

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	0.91	-	-	-	-			
Standard value	0.91*	N/A	N/A	N/A	N/A			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES								

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 7-13 (3F RecBooth)

	Heating efficiency	Cooling efficiency	Radiant efficiency	HR efficiency					
This system	0.91	3.6	-	1.6	0.7				
Standard value	0.91*	2.6	N/A	1.1^	0.5				
Automatic monitoring 8 targeting with alarma for out of range values for this HVAC evetem VES									

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

#### 8- WC (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	0.91	-	-	-	-				
Standard value	0.91*	N/A	N/A	N/A	N/A				
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									

<sup>\*</sup> Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 1- New HWS Circuit

	Water heating efficiency Storage loss factor [kWh/litre per day							
This building	0.91	0						
Standard value 0.9* N/A								
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.								

#### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide								
Α	Local supply or extract ventilation units serving a single area								
В	Zonal supply system where the fan is remote from the zone								
С	Zonal extract system where the fan is remote from the zone								
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery								
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery								
F	Other local ventilation units								
G	Fan-assisted terminal VAV unit								
Н	Fan coil units								
ı	Zonal extract system where the fan is remote from the zone with grease filter								

Zone name		SFP [W/(I/s)]					IID officiency					
	ID of system type	Α	В	С	D	Е	F	G	Н	I	HR efficiency	
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F WC1		0.3	-	-	-	-	-	-	-	-	-	N/A
0F WC2		0.3	-	-	-	-	-	-	-	-	-	N/A
1F WC		0.3	-	-	-	-	-	-	-	-	-	N/A

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

Zone name		SFP [W/(I/s)]						LID officiones				
	ID of system type	Α	В	С	D	E	F	G	Н	I	HR efficiency	
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
2F WC		0.3	-	-	-	-	-	-	-	-	-	N/A
3F WC1		0.3	-	-	-	-	-	-	-	-	-	N/A
3F WC2		0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Lumino	ous effic			
Zone name	Luminaire	Luminaire Lamp Dis		General lighting [W]	
Standard value	60	60	22		
0F Gym	-	80	-	364	
0F Hall	-	80	-	1656	
0F CafeSeating	-	80	22	344	
0F Kitchen	-	80	-	224	
0F Servery	-	80	-	44	
0F SeatingArea	-	80	22	215	
0F ActivitySpace	80	-	-	521	
0F Laundrette	80	-	-	38	
1F Meeting	80	-	-	287	
1F Office (B.1.02)	80	-	-	227	
1F Circulation	-	80	-	76	
2F Activity Room	80	-	-	340	
2F ArtistResidence	-	80	-	50	
2F Circulation1	-	80	-	158	
2F Pottery	80	-	-	566	
2F Art	80	-	-	607	
3F Activity	80	-	-	508	
3F Circulation	-	80	-	201	
3F 1to1_1	80	-	-	115	
3F 1to1_2	80	-	-	119	
3F RecBooth	80	-	-	136	
0F Store1	80	-	-	7	
0F WC1	-	80	-	103	
0F WC2	-	80	-	99	
1F WC	-	80	-	67	
2F WC	-	80	-	68	
3F WC1	-	80	-	61	
3F WC2	-	80	-	45	
0F Stairs 1	-	80	-	38	
1F Stairs 1	-	80	-	83	
2F Stairs 1	-	80	-	160	
3F Stairs 1	-	80	-	157	
0F WC circulation	-	80	-	35	
1F Stairs 2	-	80	-	36	
2F Office (Police room)	80	-	-	245	
3F Store1	80	-	-	13	

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F Circulation2	-	80	-	35
0F Stairs 2	-	80	-	34
3F JuiceBar	-	80	-	109
OF Lift	-	80	-	18
0F CIrculation 3	-	80	-	17
0F Store2	80	-	-	46
0F Office (B.0.01)	80	-	-	92
1F Workshop	80	-	-	587
1F WorkshopStrg	80	-	-	59
1F SeatingArea	-	80	-	73
3F Store2	80	-	-	15
3F Office	80	-	-	275
3F SeatingArea	-	80	22	188

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0F Gym	NO (-55%)	NO
0F Hall	NO (-91%)	NO
0F CafeSeating	NO (-2%)	NO
0F Servery	NO (-79%)	NO
0F SeatingArea	NO (-94%)	NO
0F ActivitySpace	NO (-82%)	NO
1F Meeting	NO (-38%)	NO
1F Office (B.1.02)	NO (-59%)	NO
2F Activity Room	NO (-69%)	NO
2F Pottery	NO (-68%)	NO
2F Art	NO (-46%)	NO
3F Activity	NO (-53%)	NO
3F 1to1_1	NO (-57%)	NO
3F 1to1_2	NO (-47%)	NO
3F RecBooth	N/A	N/A
2F Office (Police room)	NO (-41%)	NO
3F JuiceBar	NO (-89%)	NO
0F Office (B.0.01)	NO (-92%)	NO
1F Workshop	NO (-37%)	NO
1F SeatingArea	NO (-88%)	NO
3F Office	NO (-56%)	NO
3F SeatingArea	NO (-31%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

### **EPBD** (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?				
Is evidence of such assessment available as a separate submission?	NO			
Are any such measures included in the proposed design?	YES			

# Technical Data Sheet (Actual vs. Notional Building)

#### **Building Global Parameters**

Actual	Notional
1612	1612
5988	5988
LON	LON
3	4
1493	1834
0.25	0.31
10.64	10.64
	1612 5988 LON 3 1493 0.25

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

#### **Building Use**

#### % Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

#### 100 D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

#### Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	12.8	15
Cooling	0.03	0.08
Auxiliary	1.04	0.92
Lighting	15.6	16.62
Hot water	12.14	12.36
Equipment*	14.18	14.18
TOTAL**	41.61	44.99

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

### Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	44.5	48.17
Primary energy* [kWh/m²]	81.59	86.13
Total emissions [kg/m²]	14	14.8

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

ŀ	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[\$1	] Central he	eating using	water: rad	iators, [HS]	LTHW boil	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	46	0	14	0	1	0.91	0	0.91	0
	Notional	50	0	16.7	0	0.7	0.83	0		
[S1	] Split or m	ulti-split sy	stem, [HS]	LTHW boile	r, [HFT] Na	tural Gas, [	CFT] Electr	icity		
	Actual	6.8	1.1	2.1	0.1	2.1	0.91	3.6	0.91	3.6
	Notional	11.4	2.8	3.9	0.2	1.2	0.82	3.6		
[S1	] Central he	eating using	y water: rad	iators, [HS]	LTHW boil	ler, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	0	0	0	0	9.1	0	0	0	0
	Notional	0	0	0	0	6.5	0	0		
[S1	] Central he	eating using	water: floo	or heating,	[HS] LTHW	boiler, [HF	T] Natural G	as, [CFT] E	lectricity	
	Actual	775.9	0	236.9	0	7.7	0.91	0	0.91	0
	Notional	682.7	0	231.5	0	16.4	0.82	0		
[S1	] Central he	eating using	water: floo	or heating,	[HS] LTHW	boiler, [HF	T] Natural G	as, [CFT] E	lectricity	
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0		
[S1	] Central he	eating using	water: rad	iators, [HS]	LTHW boil	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	98.2	0	30	0	1	0.91	0	0.91	0
	Notional	112.7	0	38.2	0	1	0.82	0		
[S1	] Split or m	ulti-split sy	stem, [HS]	LTHW boile	r, [HFT] Na	tural Gas, [	CFT] Electr	icity		
	Actual	29	47.8	8.8	3.7	5.6	0.91	3.6	0.91	3.6
	Notional	45.1	151.7	15.3	11.7	3.2	0.82	3.6		
[S]	] Central he	eating using	water: rad	iators, [HS]	LTHW boil	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	47.9	0	14.6	0	4.2	0.91	0	0.91	0
	Notional	56.5	0	19.2	0	5.2	0.82	0		

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

# **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

#### **Building fabric**

Element	<b>U</b> i-Typ	U <sub>i-Min</sub>	Surface where the minimum value occurs*		
Wall	0.23	0.22	External Wall		
Floor	0.2	0.19	Ground Floor		
Roof	0.15	0.15	Roof		
Windows, roof windows, and rooflights	1.5	1.56	1.5x1 Unopened (H elevation - 44% 5.84m2 openable)		
Personnel doors	1.5	1.63	Door		
Vehicle access & similar large doors	1.5	-	No vehicle doors in project		
High usage entrance doors	1.5	-	No high usage entrance doors in project		
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m²K)	j		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m²K)]		
* There might be more than one surface where the minimum U-value occurs.					

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3



# APPENDIX C2 COMMUNITY CENTRE - PART L RESULTS "CLEAN"

# **BRUKL Output Document**



Compliance with England Building Regulations Part L 2013

#### **Project name**

# **Highgate Newtown Community Centre**

As designed

Date: Fri Nov 02 13:29:41 2018

#### Administrative information

Building Details

Address: 25 Bertram Street, Camden, London, N19 5DQ

**Certification tool** 

Calculation engine: TAS

Calculation engine version: "v9.4.3"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.3

BRUKL compliance check version: v5.4.b.0

**Owner Details** 

Name:

Telephone number:

Address: , ,

**Certifier details** 

Name:

Telephone number:

Address: , ,

#### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.8
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.8
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	11.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

# Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.24	2.2	Damper 1.50 (internal)-frame
Floor	0.25	0.19	0.24	Exposed Floor
Roof	0.25	0.15	0.15	Roof
Windows***, roof windows, and rooflights	2.2	1.59	1.74	0F Hallf Rooflights
Personnel doors	2.2	1.63	1.63	Door
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
II limitima anno suoimbto descende II subsectiva	1// 21/\1			

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

 $U_{a\text{-Calc}}$  = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	3

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

#### 1-3

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.86	•	-	-	-	
Standard value	0.91*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 2-1 (0F Gym)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.86	3.6	-	1.6	0.7	
Standard value	0.91*	2.6	N/A	1.1^	0.5	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						

\* Standard shown in far gap single bailer evetame --2 MW output. For single bailer evetame > 2 MW or multi bailer evetame (everall) limit

#### 3-4 (0F Kitchen)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0	-	-	1.6	0.7	
Standard value	N/A	N/A	N/A	1.1^	0.5	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						
A Limiting SEP may be extended by the amounts execified in the Non-Domestic Building Services Compliance Guide if the system includes						

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

#### 4-5 (0F Servery)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.86	•	•	1.6	0.7	
Standard value	0.91*	N/A	N/A	1.1^	0.5	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 5-6 (0F Laundrette)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0	-	-	1.6	0.7	
Standard value	N/A	N/A	N/A	1.1^	0.5	
Automatic monitoring 8 targeting with alarms for out of range values for this HVAC system. VES						

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

<sup>\*</sup> Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.86	-	-	-	-	
Standard value	0.91*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 7-13 (3F RecBooth)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.86	3.6	-	1.6	0.7	
Standard value	0.91*	2.6	N/A	1.1^	0.5	

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

#### 8- WC (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.86	-	-	-	-	
Standard value	0.91*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						
* 01	tanana atau da batan arawatan a	- 0 MM/	la bailan avatama . O MMM a	a and the last transfer of		

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]			
This building	0.91	0			
Standard value	0.9*	N/A			
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.					

#### 1- CHP + back up boilers

	CHPQA quality index	CHP electrical efficiency
This building	152	0.36
Standard value	105	0.2

#### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name			SFP [W/(I/s)]			UD a	fficionav					
	ID of system type	Α	В	С	D	Е	F	G	Н	I	пке	fficiency
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F WC1		0.3	-	-	-	-	-	-	-	-	-	N/A

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

Zone name			SFP [W/(I/s)]			HR efficiency						
	ID of system type	Α	В	С	D	Е	F	G	Н	I	пке	inclency
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F WC2		0.3	-	-	-	-	-	-	-	-	-	N/A
1F WC		0.3	-	-	-	-	-	-	-	-	-	N/A
2F WC		0.3	-	-	-	-	-	-	-	-	-	N/A
3F WC1		0.3	-	-	-	-	-	-	-	-	-	N/A
3F WC2		0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Lumino	ous effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F Gym	-	80	-	364
0F Hall	-	80	-	1656
0F CafeSeating	-	80	22	344
0F Kitchen	-	80	-	224
0F Servery	-	80	-	44
0F SeatingArea	-	80	22	215
0F ActivitySpace	80	-	-	521
0F Laundrette	80	-	-	38
1F Meeting	80	-	-	287
1F Office (B.1.02)	80	-	-	227
1F Circulation	-	80	-	76
2F Activity Room	80	-	-	340
2F ArtistResidence	_	80	-	50
2F Circulation1	_	80	-	158
2F Pottery	80	-	-	566
2F Art	80	-	-	607
3F Activity	80	-	-	508
3F Circulation	-	80	-	201
3F 1to1_1	80	-	-	115
3F 1to1_2	80	-	-	119
3F RecBooth	80	-	-	136
0F Store1	80	-	-	7
0F WC1	-	80	-	103
0F WC2	-	80	-	99
1F WC	-	80	-	67
2F WC	-	80	-	68
3F WC1	-	80	-	61
3F WC2	-	80	-	45
0F Stairs 1	-	80	-	38
1F Stairs 1	-	80	-	83
2F Stairs 1	-	80	-	160
3F Stairs 1	-	80	-	157
0F WC circulation	-	80	-	35
1F Stairs 2	-	80	-	36

General lighting and display lighting	Lumino	ous effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
2F Office (Police room)	80	-	-	245
3F Store1	80	-	-	13
0F Circulation2	-	80	-	35
0F Stairs 2	-	80	-	34
3F JuiceBar	-	80	-	109
OF Lift	-	80	-	18
0F CIrculation 3	-	80	-	17
0F Store2	80	-	-	46
0F Office (B.0.01)	80	-	-	92
1F Workshop	80	-	-	587
1F WorkshopStrg	80	-	-	59
1F SeatingArea	-	80	-	73
3F Store2	80	-	-	15
3F Office	80	-	-	275
3F SeatingArea	-	80	22	188

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0F Gym	NO (-55%)	NO
0F Hall	NO (-91%)	NO
0F CafeSeating	NO (-2%)	NO
0F Servery	NO (-79%)	NO
0F SeatingArea	NO (-94%)	NO
0F ActivitySpace	NO (-82%)	NO
1F Meeting	NO (-38%)	NO
1F Office (B.1.02)	NO (-59%)	NO
2F Activity Room	NO (-69%)	NO
2F Pottery	NO (-68%)	NO
2F Art	NO (-46%)	NO
3F Activity	NO (-53%)	NO
3F 1to1_1	NO (-57%)	NO
3F 1to1_2	NO (-47%)	NO
3F RecBooth	N/A	N/A
2F Office (Police room)	NO (-41%)	NO
3F JuiceBar	NO (-89%)	NO
0F Office (B.0.01)	NO (-92%)	NO
1F Workshop	NO (-37%)	NO
1F SeatingArea	NO (-88%)	NO
3F Office	NO (-56%)	NO
3F SeatingArea	NO (-31%)	NO

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

#### **EPBD** (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

# Technical Data Sheet (Actual vs. Notional Building)

#### **Building Global Parameters**

	Actual	Notional
Area [m²]	1612	1612
External area [m²]	5988	5988
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	4
Average conductance [W/K]	1493	1834
Average U-value [W/m²K]	0.25	0.31
Alpha value* [%]	10.64	10.64

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

#### **Building Use**

#### % Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

#### 100 D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Crown and County Courts D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

### Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	13.48	15
Cooling	0.03	0.08
Auxiliary	1.04	0.92
Lighting	15.6	16.62
Hot water	19.79	12.36
Equipment*	14.18	14.18
TOTAL**	42.21	44.99

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

### Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	7.72	0
Solar thermal systems	0	0

### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	44.5	48.17
Primary energy* [kWh/m²]	68.03	86.13
Total emissions [kg/m²]	11.8	14.8

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

H	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	] Central he	eating using	water: rad	iators, [HS]	LTHW boil	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	46	0	14.8	0	1	0.86	0	0.86	0
	Notional	50	0	16.7	0	0.7	0.83	0		
[ST	[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	6.8	1.1	2.2	0.1	2.1	0.86	3.6	0.86	3.6
	Notional	11.4	2.8	3.9	0.2	1.2	0.82	3.6		
[ST	[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	0	0	0	0	9.1	0	0	0	0
	Notional	0	0	0	0	6.5	0	0		
[ST	] Central he	eating using	water: floo	or heating,	[HS] LTHW	boiler, [HF	T] Natural G	as, [CFT] E	lectricity	
	Actual	775.9	0	249.4	0	7.7	0.86	0	0.86	0
	Notional	682.7	0	231.5	0	16.4	0.82	0		
[ST	] Central he	eating using	water: floo	or heating,	[HS] LTHW	boiler, [HF	T] Natural G	as, [CFT] E	lectricity	
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0		
[ST	] Central he	eating using	water: rad	iators, [HS]	LTHW boil	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	98.2	0	31.6	0	1	0.86	0	0.86	0
	Notional	112.7	0	38.2	0	1	0.82	0		
[ST	] Split or m	ulti-split sy	stem, [HS]	LTHW boile	r, [HFT] Na	tural Gas, [	CFT] Electr	icity		
	Actual	29	47.8	9.3	3.7	5.6	0.86	3.6	0.86	3.6
	Notional	45.1	151.7	15.3	11.7	3.2	0.82	3.6		
[ST	] Central he	eating using	water: rad	iators, [HS]	LTHW boi	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	47.9	0	15.4	0	4.2	0.86	0	0.86	0
	Notional	56.5	0	19.2	0	5.2	0.82	0		

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

# **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

#### **Building fabric**

Element	<b>U</b> i-Typ	U <sub>i-Min</sub>	Surface where the minimum value occurs*			
Wall	0.23	0.22	External Wall			
Floor	0.2	0.19	Ground Floor			
Roof	0.15	0.15	Roof			
Windows, roof windows, and rooflights	1.5	1.56	1.5x1 Unopened (H elevation - 44% 5.84m2 openable)			
Personnel doors	1.5	1.63	Door			
Vehicle access & similar large doors	1.5	-	No vehicle doors in project			
High usage entrance doors	1.5	-	No high usage entrance doors in project			
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m²K)	j		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m²K)]			
* There might be more than one surface where the minimum U-value occurs.						

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3



# APPENDIX C3 COMMUNITY CENTRE - PART L RESULTS "GREEN"

# **BRUKL** Output Document



Compliance with England Building Regulations Part L 2013

#### Project name

# **Highgate Newtown Community Centre**

As designed

Date: Fri Nov 02 14:20:38 2018

#### Administrative information

**Building Details** 

Address: 25 Bertram Street, Camden, London, N19 5DQ

**Certification tool** 

Calculation engine: TAS

Calculation engine version: "v9.4.3"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.3

BRUKL compliance check version: v5.4.b.0

**Owner Details** 

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

#### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.8
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.8
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	10.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

#### Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.24	2.2	Damper 1.50 (internal)-frame
Floor	0.25	0.19	0.24	Exposed Floor
Roof	0.25	0.15	0.15	Roof
Windows***, roof windows, and rooflights	2.2	1.59	1.74	0F Hallf Rooflights
Personnel doors	2.2	1.63	1.63	Door
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
II Limiting area waighted average II values [M	1//2021/1			

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	3

There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

#### 1-3

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0.86	•	-	-	-		
Standard value	0.91*	N/A	N/A	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 2-1 (0F Gym)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0.86	3.6	-	1.6	0.7		
Standard value	0.91*	2.6	N/A	1.1^	0.5		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							

\* Standard shown in far gap single bailer evetame --2 MW output. For single bailer evetame > 2 MW or multi bailer evetame (everall) limit

#### 3-4 (0F Kitchen)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0	-	-	1.6	0.7		
Standard value	N/A	N/A	N/A	1.1^	0.5		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							
A Limiting SEP may be extended by the amounts execified in the Non-Domestic Building Services Compliance Guide if the system includes							

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

#### 4-5 (0F Servery)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0.86	•	•	1.6	0.7		
Standard value	0.91*	N/A	N/A	1.1^	0.5		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 5-6 (0F Laundrette)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	0	-	-	1.6	0.7				
Standard value	N/A	N/A	N/A	1.1^	0.5				
Automatic monitoring 8 targeting with alarms for out of range values for this HVAC system VES									

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

<sup>\*</sup> Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency					
This system	0.86	-	-	-	-					
Standard value	0.91*	N/A	N/A	N/A	N/A					
Automatic moni	Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 7-13 (3F RecBooth)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	0.86	3.6	-	1.6	0.7			
Standard value	0.91*	2.6	N/A	1.1^	0.5			

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

#### 8- WC (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	0.86	-	-	-	-				
Standard value	0.91*	N/A	N/A	N/A	N/A				
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									
* 01	* Chandral above in far and in lab hills a variety of ANN autout For single hells a variety of ANN autout hells and a variety of ANN autout hells a variety of ANN autout hells and a variety of ANN autout hell a variety of ANN autout								

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

#### 1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]					
This building	0.91	0					
Standard value	Standard value 0.9* N/A						
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.							

#### 1- CHP + back up boilers

	CHPQA quality index	CHP electrical efficiency
This building	152	0.36
Standard value	105	0.2

#### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name			SFP [W/(I/s)]				UD officionav					
	ID of system type	Α	В	С	D	Е	F	G	Н	I	HR efficiency	
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F WC1		0.3	-	-	-	-	-	-	-	-	-	N/A

<sup>\*</sup> Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

<sup>^</sup> Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

Zone name			SFP [W/(I/s)]					UD officiency				
	ID of system type	Α	В	С	D	Е	F	G	Н	I	HR efficiency	
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
0F WC2		0.3	-	-	-	-	-	-	-	-	-	N/A
1F WC		0.3	-	-	-	-	-	-	-	-	-	N/A
2F WC		0.3	-	-	-	-	-	-	-	-	-	N/A
3F WC1		0.3	-	-	-	-	-	-	-	-	-	N/A
3F WC2		0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Lumino	ous effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
0F Gym	-	80	-	364
0F Hall	-	80	-	1656
0F CafeSeating	-	80	22	344
0F Kitchen	-	80	-	224
0F Servery	-	80	-	44
0F SeatingArea	-	80	22	215
0F ActivitySpace	80	-	-	521
0F Laundrette	80	-	-	38
1F Meeting	80	-	-	287
1F Office (B.1.02)	80	-	-	227
1F Circulation	-	80	-	76
2F Activity Room	80	-	-	340
2F ArtistResidence	_	80	-	50
2F Circulation1	_	80	-	158
2F Pottery	80	-	-	566
2F Art	80	-	-	607
3F Activity	80	-	-	508
3F Circulation	-	80	-	201
3F 1to1_1	80	-	-	115
3F 1to1_2	80	-	-	119
3F RecBooth	80	-	-	136
0F Store1	80	-	-	7
0F WC1	-	80	-	103
0F WC2	-	80	-	99
1F WC	-	80	-	67
2F WC	-	80	-	68
3F WC1	-	80	-	61
3F WC2	-	80	-	45
0F Stairs 1	-	80	-	38
1F Stairs 1	-	80	-	83
2F Stairs 1	-	80	-	160
3F Stairs 1	-	80	-	157
0F WC circulation	-	80	-	35
1F Stairs 2	-	80	-	36

General lighting and display lighting	Lumino	ous effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
2F Office (Police room)	80	-	-	245
3F Store1	80	-	-	13
0F Circulation2	-	80	-	35
0F Stairs 2	-	80	-	34
3F JuiceBar	-	80	-	109
OF Lift	-	80	-	18
0F CIrculation 3	-	80	-	17
0F Store2	80	-	-	46
0F Office (B.0.01)	80	-	-	92
1F Workshop	80	-	-	587
1F WorkshopStrg	80	-	-	59
1F SeatingArea	-	80	-	73
3F Store2	80	-	-	15
3F Office	80	-	-	275
3F SeatingArea	-	80	22	188

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0F Gym	NO (-55%)	NO
0F Hall	NO (-91%)	NO
0F CafeSeating	NO (-2%)	NO
0F Servery	NO (-79%)	NO
0F SeatingArea	NO (-94%)	NO
0F ActivitySpace	NO (-82%)	NO
1F Meeting	NO (-38%)	NO
1F Office (B.1.02)	NO (-59%)	NO
2F Activity Room	NO (-69%)	NO
2F Pottery	NO (-68%)	NO
2F Art	NO (-46%)	NO
3F Activity	NO (-53%)	NO
3F 1to1_1	NO (-57%)	NO
3F 1to1_2	NO (-47%)	NO
3F RecBooth	N/A	N/A
2F Office (Police room)	NO (-41%)	NO
3F JuiceBar	NO (-89%)	NO
0F Office (B.0.01)	NO (-92%)	NO
1F Workshop	NO (-37%)	NO
1F SeatingArea	NO (-88%)	NO
3F Office	NO (-56%)	NO
3F SeatingArea	NO (-31%)	NO

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

#### **EPBD** (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?				
Is evidence of such assessment available as a separate submission?	NO			
Are any such measures included in the proposed design?				

### Technical Data Sheet (Actual vs. Notional Building)

#### **Building Global Parameters**

	Actual	Notional
Area [m²]	1612	1612
External area [m²]	5988	5988
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	4
Average conductance [W/K]	1493	1834
Average U-value [W/m²K]	0.25	0.31
Alpha value* [%]	10.64	10.64

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

### **Building Use**

#### % Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

#### 100 D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Crown and County Courts D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

#### Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	13.48	15
Cooling	0.03	0.08
Auxiliary	1.04	0.92
Lighting	15.6	16.62
Hot water	19.79	12.36
Equipment*	14.18	14.18
TOTAL**	42.21	44.99

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

### Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	3.19	0
Wind turbines	0	0
CHP generators	7.72	0
Solar thermal systems	0	0

### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	44.5	48.17
Primary energy* [kWh/m²]	68.03	86.13
Total emissions [kg/m²]	10.2	14.8

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	46	0	14.8	0	1	0.86	0	0.86	0
	Notional	50	0	16.7	0	0.7	0.83	0		
[ST	[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	6.8	1.1	2.2	0.1	2.1	0.86	3.6	0.86	3.6
	Notional	11.4	2.8	3.9	0.2	1.2	0.82	3.6		
[ST	] Central he	eating using	water: rad	iators, [HS]	LTHW boil	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	0	0	0	0	9.1	0	0	0	0
	Notional	0	0	0	0	6.5	0	0		
[ST	] Central he	eating using	water: floo	or heating,	[HS] LTHW	boiler, [HF	T] Natural G	as, [CFT] E	lectricity	
	Actual	775.9	0	249.4	0	7.7	0.86	0	0.86	0
	Notional	682.7	0	231.5	0	16.4	0.82	0		
[ST	] Central he	eating using	water: floo	or heating,	[HS] LTHW	boiler, [HF	T] Natural G	as, [CFT] E	lectricity	
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0		
[ST	[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	98.2	0	31.6	0	1	0.86	0	0.86	0
	Notional	112.7	0	38.2	0	1	0.82	0		
[ST	[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	29	47.8	9.3	3.7	5.6	0.86	3.6	0.86	3.6
	Notional	45.1	151.7	15.3	11.7	3.2	0.82	3.6		
[ST	] Central he	eating using	water: rad	iators, [HS]	LTHW boi	er, [HFT] N	atural Gas,	[CFT] Elect	ricity	
	Actual	47.9	0	15.4	0	4.2	0.86	0	0.86	0
	Notional	56.5	0	19.2	0	5.2	0.82	0		

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

# **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

#### **Building fabric**

Element	<b>U</b> i-Typ	U <sub>i-Min</sub>	Surface where the minimum value occurs*	
Wall	0.23	0.22	External Wall	
Floor	0.2	0.19	Ground Floor	
Roof	0.15	0.15	Roof	
Windows, roof windows, and rooflights	1.5	1.56	1.5x1 Unopened (H elevation - 44% 5.84m2 openable)	
Personnel doors	1.5	1.63	Door	
Vehicle access & similar large doors	1.5	-	No vehicle doors in project	
High usage entrance doors	1.5	-	No high usage entrance doors in project	
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m²K)	j		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)]	
* There might be more than one surface where the minimum U-value occurs.				

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3