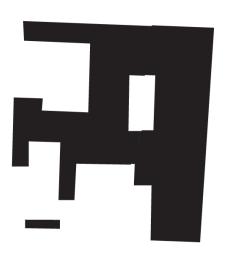
THE ALDERS



LONDON PLAN ENERGY STATEMENT

November 2020

CBG CONSULTANTS

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THE ALDERS LONDON PLAN ENERGY STATEMENT

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	Updated data to GLA				
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All information provided here is based on plans and information available at the time of writing. Prior to implementation of the options discussed, further detailed study, design, and costing, based on ground surveys, structural analysis, over shading studies, etc., as relevant to each renewable/low carbon source, is necessary.

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1. EXECUTIVE SUMMARY

This energy statement has been prepared by CBG Consultants on behalf of Wandsworth Borough Council: Housing Strategy and Development ("Applicant") in support of its planning application for the redevelopment of land at The Alders in the London Borough of Wandsworth.

The proposal is demolition of existing single storey garages, residents refuse and ancillary storage sheds and redevelopment of the site for affordable residential units within part 3, 4 and 6 storey building together with ancillary residents storage, car parking, bicycle storage, refuse storage, landscaping and communal amenity space. There are no conditioned non-domestic areas. The total internal floor area of the dwellings is 2,307m². The accommodation types and floor areas are listed below:

Dwelling Type	Number of units	Unit Floor Area (m²)
3B5P	4	101
2B3P (W/C)	3	71
1B2P	11	50
2B4P	16	71

Table 1: Schedule of accommodation.

1.1 London Plan - Reduction in Carbon Emissions

The GLA's pre-application report (6 August 2020) states 'applicants should follow the GLA Energy Assessment Guidance 2018', but that applicants should be familiar with the draft 2020 version of this guidance. We have also been advised that schemes determined after 7th July 2020 will be required to contribute the current Carbon Offset Fund Price of £95 per tonne. We have therefore used the new draft GLA carbon emission reporting spreadsheet (v1.2_2020).

As a wholly domestic development, the requirements of the zero-carbon target are:

- Energy demand reduction measures need to contribute to more than 10% of the reduction.
- A minimum 35% reduction (over the baseline) is required from improvement measures on site.
- The remainder can be compensated with carbon offset payments.

Carbon savings have been demonstrated using the London Plan "Be Lean, Be Clean, Be Green" hierarchy:

- Be Lean: High specification of building fabric and energy efficient services to minimise energy demand, including Mechanical Ventilation with Heat Recovery (MVHR).
- Be Clean: The site is not currently suitable for a local CHP system or connection to a district network. Therefore, no carbon savings are possible using this measure (although connect to a network in the future will be possible).
- Be Green: The heating and hot water for all dwellings will be provided by Air Source Heat Pumps (ASHPs) with additional carbon offset from photovoltaics.



The chart below shows the savings achieved at each stage of the process.

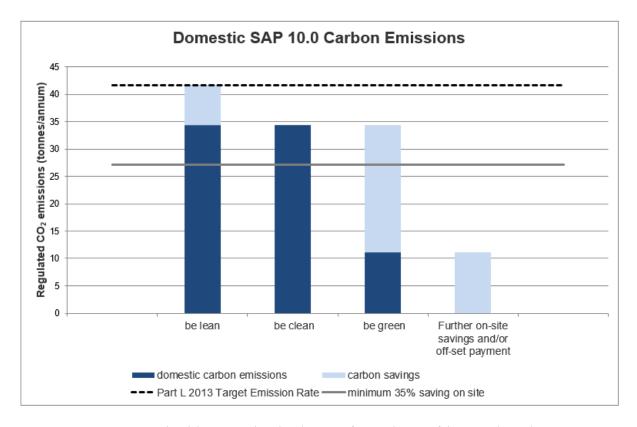


Figure 1: Regulated domestic carbon dioxide savings from each stage of the energy hierarchy.

The efficient building fabric and ventilation system saves 7.4 tonnes over the baseline. This provides an 18% improvement which is greater than the 10% London Plan target for the Be Lean stage.

The use of the ASHPs and PV contribute a further saving of 23.2 tonnes, giving a total reduction of 73% over the baseline which significantly exceeds the 35% London Plan target for on-site savings.

This leaves a remaining 11.2 tonnes of annual carbon emissions where offset payments apply. At a cost of £95 per tonne for 30 years, the cash in-lieu contribution will be £31,868.

1.2 Wandsworth Borough Requirements

The relevant Local Plan policies are Core Strategy Policy IS2 and Development Management Plan Policy DMS3. However, as the borough's requirements regarding energy and carbon align with the London Plan, these are satisfied.

1.3 Building Regulations Requirements

For the proposed design, both the Dwelling Emission Rate and Fabric Energy Efficiency comply with the domestic Part L1A targets.



The calculated carbon emission rate for The Alders is lower than the Part L1A target:

Average Dwelling Emission Rate (DER) (kg.CO₂/m²): 10.80

Average Target Emission Rate (TER) (kg.CO₂/m²): 29.63

The scheme's Dwelling Fabric Energy Efficiency is also less than the target:

Average Dwelling Fabric Energy Efficiency (DFEE) (kWh/m²): 48.08

Average Target Fabric Energy Efficiency (TFEE) (kWh/m²): 59.40



2. INTRODUCTION

This energy statement has been prepared by CBG Consultants on behalf of Wandsworth Borough Council: Housing Strategy and Development ("Applicant") in support of its planning application for the redevelopment of land at The Alders in the London Borough of Wandsworth.

2.1 Description of the project

Demolition of existing single storey garages, residents refuse and ancillary storage sheds and redevelopment of the site for affordable residential units within part 3, 4 and 6 storey building together with ancillary residents storage, car parking, bicycle storage, refuse storage, landscaping and communal amenity space. There are no conditioned non-domestic areas. The glazing to floor area ratio for the development is 24.7%. The glazing to façade area ratio is 24.2%.

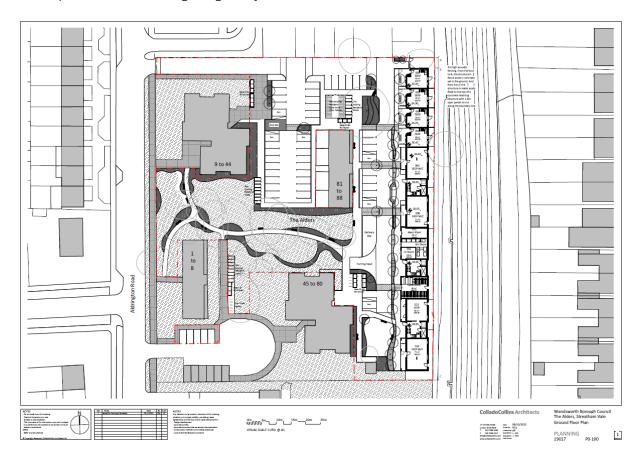


Figure 2: Proposed site plan.



The accommodation types and floor areas are listed below:

Dwelling Type	Number of units	Unit Floor Area (m²)
3B5P	4	101
2B3P (W/C)	3	71
1B2P	11	50
2B4P	16	71

Table 2: Schedule of accommodation.

2.2 Greater London Authority Carbon Emissions Targets

2.2.1 Carbon Reduction

The GLA's pre-application report (6 August 2020) states 'applicants should follow the GLA Energy Assessment Guidance 2018', but that applicants should be familiar with the draft 2020 version of this guidance. We have also been advised that schemes determined after 7th July 2020 will be required to contribute the current Carbon Offset Fund Price of £95 per tonne. We have therefore used the new draft GLA carbon emission reporting spreadsheet (v1.2_2020).

As a wholly domestic development, the requirements of the zero-carbon target are:

- Energy demand reduction measures need to contribute to more than 10% of the reduction.
- A minimum 35% reduction (over the baseline) is required from improvement measures on site.
- The remainder can be compensated with carbon offset payments.

It should be noted that these targets apply to regulated carbon only. Regulated carbon refers to the emissions associated with internal lighting, heating, hot water, air conditioning and mechanical ventilation. Other consumptions such as small power equipment (PCs, TVs, laptops etc.) are "unregulated". Despite unregulated carbon not having a specific target, it is a condition of the London Plan that it is stated.

Regulated energy calculations for the dwellings have been carried out using FSAP 2012 software which is accredited for use in Part L1A calculations. The unregulated energy has been calculated using BRE Domestic Energy Model (BREDEM 2012). These calculations can be found in Appendix 3.

2.2.2 Carbon Emissions Fuel Factors

As encouraged by the GLA, SAP 10.0 carbon factors have been used. These factors account for recent decarbonisation of the electricity grid, making it a more favourable fuel. It should be noted that calculations for building regulations are yet to implement these new factors causing a discrepancy in results for different approval bodies.



2.2.3 Energy Hierarchy

A further requirement is that energy strategy is developed in accordance with the London Plans' energy hierarchy:

- Be Lean: savings from energy demand reduction.
- Be Clean: savings from heat networks.
- Be Green: savings from renewable energy.

2.3 Wandsworth Borough Requirements

The relevant Local Plan policies are:

- Core Strategy Policy IS2: Sustainable design, low carbon development and renewable energy
- Development Management Plan Policy DMS3: Sustainable design and low-carbon energy

Both policies refer to London Plan Policy 5.2 and the energy hierarchy.

Last year Wandsworth Council declared a climate emergency and set targets of becoming a carbon neutral organisation by 2030 and a zero-carbon by 2050¹. The Wandsworth Environment and Sustainability Strategy 2019 –2030 states²:

"In line with the draft London Plan in meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should aim for 10 per cent, and non-residential should aim to achieve 15 per cent carbon reductions through energy efficiency measures.

Only where it can be clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided though a cash in lieu contribution to the Council's carbon offset fund or off-site provided that an alternative proposal is identified and delivery is certain."

Wandsworth Borough planning requirements follow the GLA guidance so compliance with the London Plan will also satisfy these.

¹ https://www.wandsworth.gov.uk/climatechange/

² https://www.wandsworth.gov.uk/media/6769/wandsworth_environment_and_sustainability_strategy_2019_30.pdf, page 4.



2.4 Building Regulations – Part L1A

Domestic areas come under Part L1A 2013 of the building regulations, this sets out five compliance criteria with the scope of this report covering the first one³:

"the calculated rate of CO_2 emissions from the dwelling (the dwelling CO_2 Emission Rate, DER) must not be greater than the Target CO_2 Emission Rate (TER)."

The DER and TER calculations require the regulated carbon emissions from the proposed dwelling to be less than the target. The target emission rate is based on a notional building, with the same basic geometry as the actual building, but with U-values, glazing and plant systems set by the approved methodology.

"Additionally [..] the Calculated Dwelling Fabric Energy Efficiency (DFEE) rate must not be greater than the Target Fabric Energy Efficiency rate."

The fabric energy efficiency applies a separate limit to the building fabric itself. The intention behind this is to place an increased importance on this area as building fabric is likely to outlast building services and renewable technologies.

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³ The Building Regulations 2010, L1A Conservation of Fuel and Power in New Dwellings 2013 edition with 2016 amendments, page 4.



3. LONDON PLAN

3.1 Baseline Case

The baseline CO₂ emissions are calculated from the 'notional' building using the Part L software tools. The 'notional' building consists of standard set of fabric and services parameters which deliver the Target Emissions Rate. This is then used as the Baseline emissions from which savings from Be Lean, Be Clean, and Be Green measures are calculated. As stated by the guidance document, heating has been provided by gas boilers and active cooling is provided by electrically powered equipment. Table 3 below shows the regulated and unregulated baseline figures.

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the		
Building Regulations	41.7	22.5
Compliant Development		

Table 3: Baseline carbon emissions.

3.2 Demand Reduction (Be Lean)

3.2.1 Passive Measures

Insulation

U-values for external elements have been improved from the Part L notional standards, as shown in the table below.

Element	U-Value	G-Value	Part L Notional
Element	(W/m²K)		Values (W/m²K)
Walls	0.15	-	0.18
Ground Floors	0.11	-	0.13
Exposed Floors	0.11	-	0.13
Roof	0.11	-	0.13
Solid Door	1.00	-	1.0
Window (Glass & Frame)	1.30	0.50	1.4

Table 4: Building fabric U-values.

Air Tightness

An air permeability of 3 $\text{m}^3/\text{m}^2/\text{hr}$ (@50pa) has been allowed for these calculations, and this represents a low leakage rate even for a new building. The intention will be to build the scheme to be as airtight as possible, however this will remain speculative until construction is finished. Following completion, the result of the pressure test will be used to update the calculations, so there is potential for the offset payments to reduce following a positive result.



Thermal Bridging

Accredited construction details have been included in the modelling.

3.2.2 Active Measures

Heating

As required by the energy hierarchy, for the Be Lean stage this is provided by communal gas boilers with an efficiency that matches the notional building. This enables the savings from other energy efficiency measures to be seen in the results at this stage. The heating will be controlled by a programmer and a least two thermostats.

Hot Water

Domestic hot water will be provided by the community heating system via heat interface units in each apartment, with a temperature top-up from an instantaneous hot water heater. Although there is no hot water storage in apartments, there will be a buffer vessel on the roof to help manage peaks in the hot water load. All primary pipework will be insulated.

Cooling

Cooling will be provided by an air-source chiller, a chilled water communal loop linked to cooling interface units in each apartment, and fan coil units in each apartment. The manufacturer's declared efficiency (SEER) for the proposed chiller is 4.88 (see the Be Green section for the data sheet). This is an energy efficient way to provide cooling in summer which is shown to be required in the Overheating Report written by CBG Consultants.

Ventilation

The mechanical ventilation with heat recovery (MVHR) systems will have low specific fan power and high heat recovery efficiencies (at least 90%) to reduce heat loss and energy consumption.

Lighting

All dwellings will be designed with 100% low energy lighting.

3.2.3 Be Lean Carbon Emissions Reduction

Table 5 shows the resulting carbon emissions before and after applying the "Be Lean" measures outlined above.

The carbon emissions are predicted to be lower than the base case due to the high performance of building fabric and services. These measures save 7.4 tonnes of carbon which is an 18% reduction over the baseline. As this is more than 10%, the London Plan criterion for this stage is met.



	Carbon Dioxide Emissions for domestic buildings (Tonnes CO₂ per annum)		
	Regulated Unregulated		
Baseline: Part L 2013 of the			
Building Regulations	41.7	22.5	
Compliant Development			
After energy demand	34.3	22.5	
reduction (be lean)	31.3	22.3	

Table 5: Be Lean carbon emissions.

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	59.40	48.08	19%

Table 6: Fabric Energy Efficiency (FEES).

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	41.7		
Be lean	34.3	7.4	18%

Table 7: Site wide carbon saving after Be Lean stage.

3.3 System Efficiency (Be Clean)

The draft London Plan Policy SI3 heating hierarchy states developments should have a communal low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

- a) Connect to local existing or planned heat networks.
- b) Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required).
- c) Use low-emission combined heat and power (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network).
- d) Use ultra-low NOx gas boilers.

3.3.1 Connection to District Heating Network

The map below shows the proposed development (green circle) in relation to potential district heat networks (orange and purple) and existing ones (red). The nearest existing network are all on the other side of the Thames, and even the nearest potential networks are approximately 5km away. The Wandsworth Heat Map Report states the site is not within one of the nine identified heat load clusters. There is no Energy Master Plan for Wandsworth.



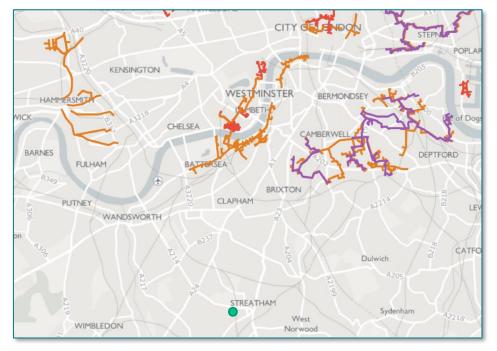


Figure 3: London heat map. The green dot shows the site. Red indicates existing networks, proposed networks are shown in orange and purple.

For a development of this size, it would not be economical to connect into a heat network at this stage. However, by using a community heating system in the development, a future connection would not be compromised. See the Be Green Section for more information about the proposed system and its ability to connect into a district heating system.

3.3.2 Zero Emission and/or Local Secondary Heat Sources

The second step of the heating hierarchy encourages the exploitation of local energy opportunities to maximise the use of locally available energy sources whilst minimising primary energy demand and carbon emissions. Sources of waste heat are not available on or adjacent to the site.

3.3.3 Combined Heat and Power (CHP)

CHP has not been considered appropriate for the site on the basis that:

- There is insufficient number of dwellings to make it viable.
- The revised fuel factors reflecting decarbonisation of grid electricity make CHP unfavourable.

3.3.4 Use Ultra-Low Nox Gas Boilers

A heating strategy led by ultra-low NOx gas boilers should only be considered when it has been clearly demonstrated that all other options in the heating hierarchy (a to c) have been fully investigated and ruled out. The above options have been ruled out, but the use of gas boilers are not required, as the proposed solution uses heat pumps as a green energy source.



3.3.5 Carbon Emissions Reduction

Since a district heating connection or on-site CHP is unviable, no carbon emissions reductions are available using these measures.

3.4 Renewable Energy (Be Green)

3.4.1 Technology Options

An initial review was conducted to eliminate any technologies which from the outset have been identified as unviable. This can be found in Appendix 1. From this study, air source heat pumps (ASHPs) and photovoltaics (PV) have been identified as the most appropriate for the site.

Air Source Heat Pumps

The proposed design uses Heat Interface Units (HIUs) in each dwelling connected to a central hot water loop. ASHPs on the roof will heat the central water loop to 55°C (50°C return). The proposed system will be able to connect to future heat networks as there is a communal heating loop.

Cooling will be provided by the same roof top ASHPs. The chilled water communal loop will be linked to cooling interface units in each apartment and fan coil units in living spaces and bedrooms.

Figure 4 shows the efficiency data for the for the proposed communal ASHP (Mitsubishi EAHV-P1500YBL-N) to be used in the carbon calculations: an SCOP of 2.89 and an SEER of 4.88.



Product Information Making a e-Series Modular Chiller (90-1,080kW) World of Difference Cooling Only or Heat Pump 3No. units for the Alders MODEL EAHV-P900YA-N He EAHV-P1500YBL-N Heating/Cooling EAHV-P1800YBL-N Heating/Coolin POWER SOURCE 3-phase 4-wire 3-phase 4-wire 3-phase 4-wire 380-400-415v, 50/60Hz 380-400-415v, 50/60Hz 380-400-415v, 50/60Hz COOLING CAPACITY kW 180.0 kcal/h BTU/h 614,160 kW 30.6 59.01 EER (Pump input is not included) IPLV *5 3.30 6.34 3.33 3.05 Water Flow Rate 15.5 25.8 31 COOLING CAPACITY 90 77,400 307,080 148.6 127,779 506,955 177.8 152,874 606,517 WATER kcal/h BTU/h Power Input EER 61.25 2.90 kW Eurovent Efficiency Class A 4.74 ESEER " 4.71 4.45 SEER (ŋsc) (BS EN14825) Water Flow Rate 4.62 (181%) m³/h Minimum Water Circuit Volume 780 1450 1450 kW HEATING CAPACITY 13 90.0 150 180 kcal/h BTU/h 77,400 307,080 129,000 154,800 511.800 614,160 Power Input *3 3.50 15.5 3.36 3.23 Water Flow Rate m³/h kW HEATING CAPACITY (EN14511)*4 90.0 77,400 151.42 130,221 182.24 156,726 307,080 27.6 3.25 516,645 46.01 621,803 57.92 Power Input *3 COP 3.29 Eurovent Efficiency Class SCOP Low/Medium 3.24 (127%) / 2.85 (112%) 31.0 3.66 (143%) / 2.89 (113%) 3.24 (127%) / 2.85 (112%)

Figure 4: Manufacturer efficiency data for proposed system design.

Photovoltaics

The amount of PV has been maximised on the available roof spaces, taking account for the need to access plant areas – see Figure 5. A total PV array of approximately 21.6 kWp could be accommodated in these areas ($72 \times 300 \text{ W}$ panels = 21.6 kWp). Panels will have an inclination of ~ 10° and will face south. The electricity generated from the PV array will be used in the landlord areas or exported to the grid, but for the purposes of reporting carbon savings, the energy generated has been split equally between dwellings ($21.6 \text{ kWp} \div 34 \text{ dwellings} = 0.635 \text{ kWp}$ per dwelling).



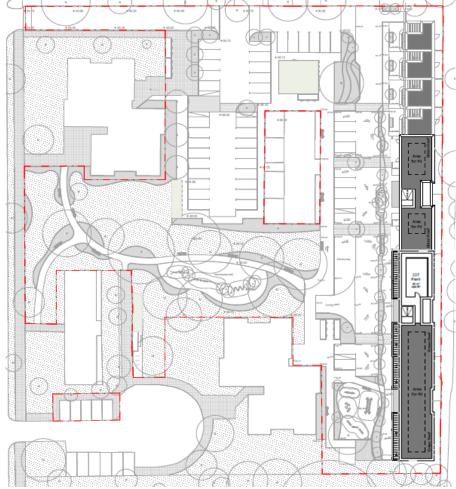


Figure 5: Proposed area for PV panels on roofs (within dashed lines).

3.4.2 Carbon Emissions Reduction

Table 8 shows the carbon reduction when the ASHPs and PV are included in the design. The regulated carbon emissions are now reduced to 11.2 tonnes, corresponding to a 73% saving over the baseline. This greatly exceeds the 35% on-site reduction required for the London Plan.

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)		
	Regulated	Unregulated	
Baseline: Part L 2013 of the			
Building Regulations	41.7	22.5	
Compliant Development			
After energy demand	34.3	22.5	
reduction (be lean)	54.5	22.3	
After heat network	34.3	22.5	
connection (be clean)	34.3	22.3	
After renewable energy	11.2	22.5	
(be green)	11.2	22.5	

Table 8: Be green carbon emissions.



To achieve zero carbon, these 11.2 tonnes can be offset through the payment mechanism. Each borough can have its own an established price for this offsetting. However, in the case of Wandsworth it is £95/tonne for a period of 30 years, as stated in the draft London Plan.

At this rate, the 11.2 tonnes of regulated carbon a year would need to be compensated with an upfront payment of £31,868 ($^{\sim}$ 11.2 tonnes x £95/tonne/year x 30 years).

It should be noted that this is all paid before the building is occupied and no further payments are due afterwards. The "30 years" is only relevant in calculating the amount to be paid upfront.

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	41.7		
Be lean	34.3	7.4	18%
Be clean	34.3	0.0	0%
Be green	11.2	23.2	56%
Total Savings	-	30.5	73%
	-	CO2 savings off-set (Tonnes CO ₂)	-
Off-set	-	335.5	-

Table 9: Site wide carbon saving after Be Green stage.

3.5 Energy Storage

Although there is no hot water storage in apartments, there will be a buffer vessel on the roof to help manage peaks in the hot water load. As more buildings switch to electric heating, the peak demand on the grid needs to be managed. Having local thermal storage helps reduce these peaks and hot water can be generated during low demand. As smart meters become more common it is likely that electricity prices will vary with demand and using electricity during low demand will be cheaper.



4. BUILDING REGULATIONS COMPLIANCE

The requirements for building regulations slightly differ from the London Plan. They are generally less onerous but are also based on different carbon factors, so the predicted emissions will differ for this reason. As per the draft London Plan guidance, results have been reported after both the Be Lean and Be Green Stages.

4.1 Building Regulations Compliance – Be Lean

The calculated carbon emission rate for The Alders is lower than the Part L1A target:

Average Dwelling Emission Rate (DER) (kg.CO₂/m²): 17.48

Average Target Emission Rate (TER) (kg.CO₂/m²): 20.14

The scheme's Dwelling Fabric Energy Efficiency is also less than the target:

Average Dwelling Fabric Energy Efficiency (DFEE) (kWh/m²): 48.08

Average Target Fabric Energy Efficiency (TFEE) (kWh/m²): 59.40

As a result, the dwellings are compliant with criterion 1 of Part L1A of the building regulations.

4.2 Building Regulations Compliance – Be Green

The calculated carbon emission rate for The Alders is lower than the Part L1A target:

Average Dwelling Emission Rate (DER) (kg.CO₂/m²): 10.80

Average Target Emission Rate (TER) (kg.CO₂/m²): 29.63

The scheme's Dwelling Fabric Energy Efficiency is also less than the target:

Average Dwelling Fabric Energy Efficiency (DFEE) (kWh/m²): 48.08

Average Target Fabric Energy Efficiency (TFEE) (kWh/m²): 59.40

As a result, the dwellings are compliant with criterion 1 of Part L1A of the building regulations.



5. CONCLUSIONS

5.1 London Plan

The Be Lean, Clean, Green hierarchy has been followed to achieve a low energy, low carbon design for The Alders development:

- Be Lean: High specification of building fabric and energy efficient services to minimise energy demand, including Mechanical Ventilation with Heat Recovery (MVHR).
- Be Clean: The site is not currently suitable for a local CHP system or connection to a district network. Therefore, no carbon savings are possible using this measure (although connect to a network in the future will be possible).
- Be Green: The heating and hot water for all dwellings will be provided by Air Source Heat Pumps (ASHPs) with additional carbon offset from photovoltaics.

Through efficient building fabric, the Be Lean stage achieves an 18% reduction which exceeds the London Plan's 10% target for this stage. With the inclusion of air source heat pumps and PV in the Be Green stage, an overall reduction of 73% has been calculated, greatly exceeding the 35% minimum onsite reduction. With a carbon offset payment of £31,868, the scheme is able to reach zero carbon and comply with the London Plan targets.

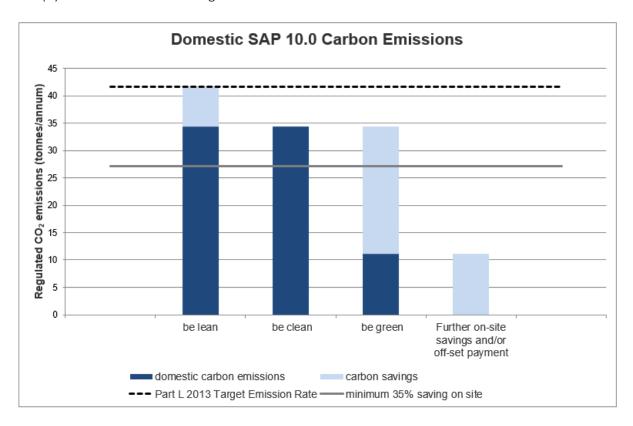


Figure 6: Carbon reduction summary.



	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	41.7		
Be lean	34.3	7.4	18%
Be clean	34.3	0.0	0%
Be green	11.2	23.2	56%
Total Savings	-	30.5	73%
	-	CO2 savings off-set (Tonnes CO₂)	-
Off-set	-	335.5	-

Table 10: Site wide carbon emissions and savings.

5.2 Building Regulations

Both the Dwelling Emission Rate and Fabric Energy Efficiency comply with the domestic Part L1A targets.



APPENDIX 1: PRELIMINARY APPRIASAL OF RENEWABLE ENERGY OPTIONS

This appendix summarises the preliminary analysis of renewable energy options, and identifies which should be assessed in further detail, and which should be discounted because of clear technical reasons or other obstacles.

LZC Technology	Basic Technical Information	Technical, Environmental & Economic implications / Considerations	Suited Application	Site Specific Comment	Detailed Analysis?
Solar thermal	Solar collectors	+ Government grants available (RHIs)	Domestic and	There is limited roof space	No
oolar tirerina	(flat plate or tube)			and the hot water load may	
	transfer energy	DHW demand	applications	not be consistent enough to	
		- Efficiency effected by site factors –	1 ' '	make this viable. Carbon	
	•	' '			
	to a closed loop		hot water load;	savings will be minimal.	
	twin coil hot	-Requires considerable hot water demand	leisure centres,		
	water cylinder	all year round to be finically beneficial	canteens,		
			washrooms		
Wind turbine		+ Government grants available (FITs)	Large sized	The site is located in a dense	No
	converts wind	+ Allows on site generation of renewable	turbines in non-	urban area and further	
	energy to	electricity	urban or	planning approvals would be	
	electrical power.	- Can create structural, vibrations and	offshore	required.	
		noise implications	locations will be		
		- Not suited for urban environments	more effective		
		- Costs can be high in relation to the actual			
		amount of electricity generated			
		- Potential for additional planning issues			
Solar	Converts sunlight	+ Allows on site generation of renewable	Wide range of	There is little roof space for	Yes
Photovoltaics	to DC electrical	electricity	building types	the size of the development	
	power which then	+ Generally payback between 7-12 years	particularly	and the recent removal of	
	using an inverter	+ Low maintenance requirements	buildings with	Feed-In and Export Tariff	
	to convert to DC.	- No government grants available	limited solar	make this less favourable.	
	to convert to be.	- Efficiency effected by site factors –	shading and	make this less lavourable.	
		' '			
		shading, orientation and roof/ground space	_	Although the area available	
			roof	for PV will not achieve a 35%	
				carbon alone, it could still be	
				included in the design to	
				maximise carbon savings.	
Air source heat	Air Source Heat	+ Lower installation cost that ground	Wide range of	The apartments have enough	Yes
pump	Pumps (ASHP)	source heat pump	building types	space on the roof for the	
	capture heat from	+ Can provide heating and cooling	particularly	outdoor unit, where	
	the outside air	+ Government grants available (RHIs)	building	acoustics and aesthetics are	
	and transfer the	- COP is not as good during the heating	designed to	unlikely to be an issue.	
	heat directly to		have low	,	
	the air inside the	often less than the ground temperature	temperature		
	building or	- Can restrict distribution strategies	heat emitters.		
	transferring the	Carried distribution strategies	near children.		
	_				
	heat to a liquid				
	medium that can				
	be pumped				
	around the				
	building				
Ground Source	Ground Source	' '	Suits building	The high capital cost of this is	No
Heat Pump	Heat Pumps	+ Government grants available (RHIs)	designed to	prohibitive.	
	(GSHP) capture	- Requires area for ground collector or	have low		
	heat from the	borehole	temperature		
	ground and	- High initial capital cost	heat emitters		
	transfer the heat		with sufficient		
	1	1	1	I control of the cont	



	to a liquid	- Can restrict distribution strategies	space for		
	medium that can		necessary		
	be pumped		ground works		
	around the				
	building				
Biomass	Uses biomass as a	+ Government grants available (RHIs)	Building/site	There is insufficient storage	No
	fuel source for	+ Renewable source of heating	with sufficient	space and very limited access	No
	space heating and	- Requires large fuel storage capacity	access and	for regular deliveries to	
	hot water	- Generally a large capital cost	storage facilities	warrant further investigation.	
			and a capable		
			maintenance		
			team		



APPENDIX 2: KEY MODELLING INPUTS

Parameter	Units	Comments
Corridor Heated	-	No
Accredited Construction Details (ACDs)	-	Yes
Water use target	l/p/day	< 105
Air Permeability	m³/hr.m²	3
Wall U-value	W/m ² K	0.15
Roof U-value	W/m ² K	0.11
Ground / Exposed Floor U-value	W/m ² K	0.11
Window U-value	W/m ² K	1.3
Window g-value	-	0.5
Glazed Door U-value	W/m ² K	1.3
Solid Door U-value	W/m ² K	1.0
Party Wall construction	-	Fully-filled cavity
Weight of building	-	Light
MVHR	-	MRXBOXAB-ECO3 (Townhouses); MRXBOXAB-ECO2 (Flats)
Heat Pump	-	Community ASHP – Daikin Alterma
Seasonal Heating Efficiency	%	289
Seasonal Cooling Efficiency	%	488
Heating Emitter	-	Radiators
Heating Controls	-	Charging system linked to use of community heating,
Heating Controls		programmer & at least 2 room thermostats
Heat Distribution System	-	Piping >= 1991, pre-insulated, low temp, variable flow
Cylinder volume	I	N/A
Percentage low energy light fittings	%	100



APPENDIX 3: SUPPORTING BREDEM CALCULATION (SAMPLE)

Building Name	Townhouse 1	Townhouse 2
Freated Floor Area (m2)	100.92	100.92
Io. Occupants	2.7	2.7
Jser input (if no. occupants known)	5	5
Io. Occupants	5.0	5.0
Appliance Fragge Consumption		
Appliance Energy Consumption nitial annual appliance energy, E_A' (kWh/yr)	3474	3474
Month	Energy Consumption (kWh)	Energy Consumption (kWh)
1		430
2		399
		414 342
5		278
6		200
7		160
8		149
9		171
10		236
11		302
12	383	383
Annual Energy Consumption (kWh/yr)	3464	3464
Cooking Energy Consumption		
Type of cooker Is the cooker an Aga type appliance (on all the time)?	Normal size cooker: electric No	Normal size cooker: electric
E C1A	275	275
C1B	55	55
E C2A	0	0
 E_C2B	0	0
E_C1	550	550
E_C2	0	0
Range power consumption (W)	1500	1500
Month	E_C,m (kWh)	E_C,m (kWh)
1		46.7
2	42.2	42.2
3	46.7	46.7
4	45.2	45.2
5	46.7	46.7
6	45.2	45.2
7	46.7	46.7
8	46.7	46.7
9		45.2
10		46.7
11		45.2
12		46.7
Annual Energy Consumption (kWh/yr)	550	550
Month	E_R,m (kWh)	E_R,m (kWh)
1		
2		
3		
6		
6		
6 7		
6 7 8		
6 7 8 9 10		
6 7 8 9 10		
6 7 8 9 10 11 12		
6 7 8 9 10		
6 7 8 9 10 11 12 Annual Energy Consumption (kWh/yr) Total Cooking Energy (kWh/yr)	-	5
6 7 8 9 10 11 12 Innual Energy Consumption (kWh/yr) Total Cooking Energy (kWh/yr) Total Unregulated Energy Consumption (kWh)	550 4,014	4,01
6 7 8 8 9 10 11 12 Annual Energy Consumption (kWh/yr)	- 550	4,01



APPENDIX 4: AIR QUALITY IMPACT ASSESSMENT

To assist with the assessment of air quality impacts, the following table has been completed. The Alders development site has been designed to operate using electricity as the only fuel:

Energy source	Total fuel consumption (MWh/year)
Grid electricity	64.4
Domestic/communal gas	0
boilers	
Gas CHP	0
Connection to existing DH	0
network	
Other gas use (e.g. cookers)	0



APPENDIX 5: BE LEAN MODELLING OUTPUT SHEETS

	l	User Details:			
Assessor Name:	Lindsey Arnott	Stroma Num	nber: S	TRO035000	
Software Name:	Stroma FSAP 2012	Software Ve	rsion: V	ersion: 1.0.5.9	
		perty Address: Townh	nouse 1		
Address :	The Alders, Aldrington Road,	SW16 1TW			
1. Overall dwelling dime	ensions:	A	Ass. Haladatas	V - I (2)	
Ground floor		Area(m²) 39.87 (1a) x	Av. Height(m)	Volume(m³) 107.65	(3a)
First floor		34.85 (1b) x	3 (2b	104.55	(3b)
Second floor		26.2 (1c) x	2.9 (2c)) = 75.98	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	100.92 (4)			
Dwelling volume		(3a)+(3l	o)+(3c)+(3d)+(3e)+(3n)	288.18	(5)
2. Ventilation rate:					_
	main secondary heating heating	other	total	m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ns		0 x 10 =	0	(7a)
Number of passive vents			0 x 10 =	0	(7b)
Number of flueless gas fi	ires		0 x 40 =	0	(7c)
			A	ir changes per hou	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	0 ÷ (5)	= 0	(8)
If a pressurisation test has b	een carried out or is intended, proceed t	to (17), otherwise continue i	from (9) to (16)		_
Number of storeys in the	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0	0.1 = 0	(10)
	.25 for steel or timber frame or 0	•	ruction	0	(11)
if both types of wall are pi deducting areas of openir	resent, use the value corresponding to th nas): if equal user 0.35	he greater wall area (after			
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0			0	(13)
Percentage of windows	s and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + ((12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope are	ea 3	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		0.15	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used		_
Number of sides sheltere	ed			1	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	[19)] =	0.92	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =		0.14	(21)
Infiltration rate modified f	or monthly wind speed				
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov [Dec	
Monthly average wind sp	eed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

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	1	
Adjusted infiltration rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		1		1	
0.18 0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16]	
Calculate effective air	-	rate for t	he appli	cable ca	ise						_	
If mechanical ventila		andiv N. (2	2h) _ (22a	a) Em. (nauation (VEVV otho	ruino (22h	v)			0.5	(23a)
If exhaust air heat pump of)) = (23a)			0.5	(23b)
If balanced with heat reco	-	-	_					Ol- \ /	(00k) ['4 (00 a)	75.65	(23c)
a) If balanced mecha	_{0.29}	0.27	0.27	0.25	0.25	1R) (248 0.25	m = (2.00)	2b)m + (0.27	230) × [0.28	$\frac{1 - (230)}{0.28}$) ÷ 100]]	(24a)
` '				<u> </u>	Į	ļ	<u>l</u>	<u>l</u>		0.20	J	(24a)
b) If balanced mecha	anicai ve	ntilation	without	neat red	covery (r	0 (240	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	26)m + (1 0	23b) ₀	0	1	(24b)
								0		0	J	(240)
c) If whole house ex if (22b)m < 0.5 x			•	•				5 x (23t	o)			
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0	1	(24c)
d) If natural ventilation	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	loft	<u> </u>	<u> </u>		J	
if $(22b)m = 1$, the				•				0.5]				
(24d)m= 0 0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)			-	_	
(25)m= 0.3 0.3	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.28	0.28]	(25)
3. Heat losses and he	eat loss r	paramete	er:									
3. Heat losses and he ELEMENT Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value		A X k kJ/K
ELEMENT Gros	SS	Openin	gs		m²							
ELEMENT Gros	SS	Openin	gs	A ,r	m² x	W/m2	2K	(W/				kJ/K
ELEMENT Gros area Doors Type 1 Doors Type 2	SS	Openin	gs	A ,r 2.43 2.74	m² x	W/m2	2K = =	(W/ 2.43 2.74				kJ/K (26) (26)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1	SS	Openin	gs	A ,r 2.43 2.74 4.88	m ² x x x x1	W/m2 1 1 /[1/(1.3)+	2K = = = • 0.04] =	(W/ 2.43 2.74 6.03				kJ/K (26) (26) (27)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2	SS	Openin	gs	A ,r 2.43 2.74 4.88 2.92	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61				kJ/K (26) (26) (27) (27)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3	SS	Openin	gs	A ,r 2.43 2.74 4.88 2.92 13.47	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	2K = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65	K)			kJ/K (26) (26) (27) (27) (27)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor	es (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	= = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857	K)			(26) (26) (27) (27) (27) (28)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15	eK = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9	K)			(26) (26) (27) (27) (27) (28) (29)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	= = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857	K)			(26) (26) (27) (27) (27) (28) (29) (30)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8 Total area of elements	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)			(26) (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8 Total area of elements Party wall	ss (m²) 41 77 , m²	26.44 0	gs 2	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	к 	(26) (26) (27) (27) (27) (28) (29) (30)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8 Total area of elements	41 -7 , m ² pws, use e	Openin m 26.44 0	gs ² andow U-va	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcul	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	к 	(26) (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172. Roof 39.8 Total area of elements Party wall * for windows and roof windows	41 41 7 7 7 9 9 9 9 9 9 9 9 9 9 9 9 9	26.44 0 ffective will ternal wall	gs ² andow U-va	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcul	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11	2K = = -0.04 = -0.04 = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	к 	(26) (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8 Total area of elements Party wall * for windows and roof windows include the areas on both	41 7 , m ² ows, use e sides of in	26.44 0 ffective will ternal wall	gs ² andow U-va	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcul	m ²	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1	2K = = -0.04 = -0.04 = = = = = = = = + (1/U-value) + (32) = = + (32) = = + (32) = = + (32) = = + (32) = + (32) = = + (32) = + (3	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	K	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8 Total area of elements Party wall * for windows and roof windows include the areas on both Fabric heat loss, W/K =	41 77 , m ² bws, use esides of interest of interes	Openin m 26.44 0 ffective winternal walk	gs 2 4 Indow U-va ds and part	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcultitions	x x x1 x1 x1 x1 x x1 x x1 x x1 x x1 x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1	2K = = 0.04 = 0.04 = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	h 3.2	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Floor Walls Roof 39.8 Total area of elements Party wall * for windows and roof windows include the areas on both Fabric heat loss, W/K = Heat capacity Cm = S(ss (m²) 41 7 7 7 9 9 9 9 9 9 9 9 1 1 1 1 1	Openin m 26.44 0 ffective winternal wall U) P = Cm ÷	gs 2 4 ndow U-va ls and part	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calculatitions	x x x1 x1 x1 x x1 x x1 x x1 x x1 x x1	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1 (26)(30)	2K = = -0.04 = -0.04 = = = = = = = (1/8). Indica	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39 0 ue)+0.04] a	K)	kJ/m²-	h 3.2 62.12 7544.3	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Gros area Doors Type 1 Doors Type 2 Windows Type 1 Windows Type 2 Windows Type 3 Floor Walls 172.4 Roof 39.8 Total area of elements Party wall * for windows and roof windows include the areas on both Fabric heat loss, W/K = Heat capacity Cm = S(Thermal mass parame	ss (m²) 41 77 77 78 79 79 79 79 79 79 79	Openin m 26.44 0 ffective winternal walk U) P = Cm ÷ tails of the ulation.	gs 2 4 Indow U-va Is and part - TFA) ir constructi	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calculatitions n kJ/m²K	x x x1	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1 (26)(30)	2K = = -0.04 = -0.04 = = = = = = = (1/8). Indica	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39 0 ue)+0.04] a	K)	kJ/m²-	h 3.2 62.12 7544.3	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)

	n hoot l	loss	laulatad	monthly	,					$(36) = 0.33 \times ($	25)m v (5)	L	87.77	(37
			lculated			1	T 1	A	` ,					
-		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(2)
3)m=2	28.4 2	28.07	27.74	26.09	25.76	24.11	24.11	23.78	24.77	25.76	26.42	27.08		(3
eat tran	sfer coe	efficien	nt, W/K						(39)m	= (37) + (3	38)m			
9)m= 1	16.18 1	15.85	115.52	113.87	113.54	111.89	111.89	111.56	112.55	113.54	114.2	114.86		_
oot loog	narama	otor (L	ILP), W/	m2k						Average = = (39)m ÷		12 /12=	113.78	(3
	`	1.15	1.14	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.13	1.14		
	1.10	1.10	1.17	1.10	1.10	'	1	1.1.1		Average =		-	1.13	— (4
umber d	of days i	in mor	nth (Tabl	e 1a)					,	worage =	Cum(40)	127 12-	1.10	`
	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
Water	r heating	n ener	gy requi	rement:								kWh/ye	ar.	
. vvato	rnoami	g crior	gy roqui	TOTTIOTIC.								RVVIII y C	, car.	
	loccupa					/						.75		(4
	> 13.9, l £ 13.9, l		+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0)013 x (ΓFA -13.	9)			
	,		iter usac	e in litre	s ner da	av Vd av	erage =	(25 x N)	+ 36		00	0.46		(-
	_		_	•	•	•	designed t	` ,		se target o		9.40		(-
more th	at 125 litre	es per p	erson per	day (all w	ater use, l	hot and co	old)							
Γ.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water u	ısage in lit	res per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
)m= 10	09.41 1	05.43	101.45	97.47	93.49	89.52	89.52	93.49	97.47	101.45	105.43	109.41		
							•			Total - Su	m(44) ₁₁₂ =			\neg
										i Olai – Sui	···(++/)112 -	_	1193.55	(4
ergy con	tent of ho	t water i	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x E	0Tm / 3600			()	L	1193.55	(•
~ -		t water (used - cal	culated mo	onthly = 4. 122.5	190 x Vd,r	97.95	0Tm / 3600 112.4			()	L	1193.55	(
i)m= 16	62.25 1	141.9	146.43	127.66	122.5	105.7	97.95	112.4	113.74	nth (see Ta	144.7	c, 1d)	1193.55	`
i)m= 16	62.25 1	141.9	146.43	127.66	122.5	105.7		112.4	113.74	132.56	144.7	c, 1d)		`
m = 10 $m = 10$ $m = 10$ $m = 10$ $m = 2$	62.25 1 eous wate	141.9 er heatin 21.29	146.43	127.66	122.5	105.7	97.95	112.4	113.74	132.56	144.7	c, 1d)		(4
)m= 10 nstantano)m= 2 ater sto	62.25 1 eous wate 24.34 2 orage los	141.9 er heatin 21.29 SS:	146.43 ng at point 21.96	127.66 of use (no	122.5 hot water 18.37	105.7 r storage),	97.95 enter 0 in 14.69	112.4 boxes (46) 16.86	113.74 116 (61) 17.06	132.56 Total = Sur	nbles 1b, 1 144.7 m(45) ₁₁₂ =	c, 1d)		
)m= 10 nstantano)m= 2 ater sto	eous wate 24.34 2 orage los	141.9 er heatin 21.29 SS: (litres)	146.43 ng at point 21.96 includin	127.66 of use (no. 19.15) g any so	122.5 hot water 18.37 Dlar or W	105.7 r storage), 15.86	97.95 enter 0 in 14.69 storage	112.4 boxes (46) 16.86 within sa	113.74 116 (61) 17.06	132.56 Total = Sur	144.7 m(45) ₁₁₂ =	c, 1d)		(<i>(</i>
nstantane i)m= 2 ater sto orage v	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 SS: (litres)	146.43 ng at point 21.96 includin nd no ta	127.66 of use (not) 19.15 g any so nk in dw	122.5 hot water 18.37 plar or W relling, e	105.7 r storage), 15.86 /WHRS	97.95 enter 0 in 14.69 storage) litres in	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	144.7 m(45) ₁₁₂ =	c, 1d) 157.13 = 23.57		(<i>(</i>
mstantane mstantane mstantane parter sto commu herwise	eous water 24.34 2 prage los volume (anity hear e if no si	er heating 21.29 SS: (litres) ating a	146.43 ng at point 21.96 includin nd no ta	127.66 of use (not) 19.15 g any so nk in dw	122.5 hot water 18.37 plar or W relling, e	105.7 r storage), 15.86 /WHRS	97.95 enter 0 in 14.69 storage	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	144.7 m(45) ₁₁₂ =	c, 1d) 157.13 = 23.57		(<i>(</i>
nstantane	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) ating altored l	146.43 ng at point 21.96 includin nd no ta hot wate	of use (no 19.15 g any so nk in dw er (this in	122.5 hot water 18.37 Dlar or W velling, e	105.7 r storage), 15.86 /WHRS inter 110	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	144.7 m(45) ₁₁₂ = 21.7	c, 1d) 157.13 = 23.57		(4
nstantano nstant	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored l ss: er's de	146.43 og at point 21.96 includin nd no ta hot wate	of use (not) 19.15 g any so nk in dw er (this in)	122.5 hot water 18.37 Dlar or W velling, e	105.7 r storage), 15.86 /WHRS	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	21.7	c, 1d) 157.13 = 23.57 180		(4
nstantane nater sto	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) ating a tored I ss: er's de	146.43 ag at point 21.96 includin nd no ta hot wate eclared lo	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss factor 2b	122.5 that water 18.37 clar or W relling, e	105.7 r storage), 15.86 /WHRS inter 110	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7	c, 1d) 157.13 = 23.57		(4)
instantano instantano	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored I ss: er's de tor fror water	146.43 ag at point 21.96 including and no tale that water eclared learned learned storage	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye	122.5 hot water 18.37 plar or W relling, e acludes i or is kno	105.7 r storage), 15.86 /WHRS enter 110 nstantar wn (kWh	97.95 enter 0 in 14.69 storage 0 litres in neous conh/day):	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7	c, 1d) 157.13 = 23.57 180		
nstantano corage v commu herwise ater sto If man empera	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored I ss: er's de tor from water er's de	146.43 ag at point 21.96 includin nd no ta hot wate eclared lo m Table storage eclared co	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.00	c, 1d) 157.13 = 23.57 180 .2 .6 .72		(4 (4 (4 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5
nstantane nstantane nstantane nrage v commu herwise ater sto If man hergy lo If man ot water	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) atting attored I ss: er's de tor from water er's de e loss	146.43 ag at point 21.96 including and no tale and the water eclared left at the storage eclared of factor fr	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I om Tabl	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 nstantar wn (kWh	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.00	c, 1d) 157.13 23.57 180 .2		(4)
nstantane)m= 2 ater sto orage v commu herwise ater sto lf man mpera lergy lo If man ot water commu	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 sting a tored I ss: er's de tor from water er's de e loss ating setting setti	146.43 ag at point 21.96 includin nd no ta hot wate eclared le m Table storage eclared of	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I om Tabl	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.	c, 1d) 157.13 = 23.57 180 .2 .6 .72		(4)
mstantane mstantane mstantane mstantane mstantane mage v commu herwise ater sto If man mpera mergy lo If man ot water commu olume fa	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored I ss: er's detor from water er's dee loss atting som Tab	146.43 ag at point 21.96 includin nd no ta hot wate eclared le m Table storage eclared of	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I com Tabl con 4.3	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.	c, 1d) 157.13 = 23.57 180 .2 .6 .72		(4)
astantano commu herwise ater sto lf man empera to lf man ot water commu olume fi	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) ating a tored I ss: er's de tor fron water er's de e loss ating se om Tak tor fron	146.43 ag at point 21.96 includin and no ta hot wate eclared le m Table storage eclared of factor fr ee section	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I com Tabl con 4.3	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact e 2 (kW)	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co h/day): known:	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vessers) enter	132.56 Total = Sur 19.88 sel er '0' in (21.7 21.7 0 0.	c, 1d) 157.13 = 23.57 180 .2 .6 .72 0		(4 (4 (4 (4) (4) (4)

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	loss (an	nual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	or each	month (59)m = ((58) ÷ 36	55 × (41)	m					
(modified by	factor fi	rom Tab	e H5 if t	here is s	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 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 heat requ	uired for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 207.83	183.08	192.02	171.78	168.08	149.82	143.53	157.98	157.85	178.14	188.81	202.71		(62)
Solar DHW input of	alculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional	lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (3)	_				
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter											
(64)m= 207.83	183.08	192.02	171.78	168.08	149.82	143.53	157.98	157.85	178.14	188.81	202.71		
		•			-		Outp	out from wa	ater heate	r (annual) ₁	12	2101.62	(64)
Heat gains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	
(65)m= 90.41	80.12	85.15	77.74	77.2	70.44	69.03	73.84	73.11	80.54	00.4	00.71		(65)
			11.17	11.2	'0	09.03	73.04	73.11	60.54	83.4	88.71		(00)
include (57)r	n in calc					<u> </u>		<u> </u>	<u> </u>			eating	(00)
include (57)r		culation o	of (65)m	only if c		<u> </u>		<u> </u>	<u> </u>			eating	(00)
5. Internal ga	ins (see	culation of Table 5	of (65)m and 5a	only if c		<u> </u>		<u> </u>	<u> </u>			eating	(66)
, ,	ins (see	culation of Table 5	of (65)m and 5a	only if c		<u> </u>		<u> </u>	<u> </u>			eating	(00)
5. Internal ga	ins (see s (Table	culation of Table 5	of (65)m and 5a	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. Internal ga Metabolic gain Jan	s (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c): May 137.39	ylinder is Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal ga Metabolic gain Jan (66)m= 137.39	s (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c): May 137.39	ylinder is Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal ga Metabolic gain Jan (66)m= 137.39 Lighting gains	s (Table Feb 137.39 (calcula 20.46	ETable 5 E Table 5 E 5), Wat Mar 137.39 ted in Ap	of (65)m and 5a ts Apr 137.39 ppendix 12.6	only if construction in the construction in th	Jun 137.39 ion L9 or	Jul 137.39 r L9a), a	Aug 137.39 Iso see	Sep 137.39 Table 5	Oct 137.39	Nov 137.39	Dec	eating	(66)
5. Internal gain Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04	s (Table Feb 137.39 (calcula 20.46	ETable 5 E Table 5 E 5), Wat Mar 137.39 ted in Ap	of (65)m and 5a ts Apr 137.39 ppendix 12.6	only if construction in the construction in th	Jun 137.39 ion L9 or	Jul 137.39 r L9a), a	Aug 137.39 Iso see	Sep 137.39 Table 5	Oct 137.39	Nov 137.39	Dec	eating	(66)
5. Internal games Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gain (68)m= 257.81	s (Table Feb 137.39 (calcula 20.46 ns (calc	ted in Apulated in 253.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Appendix 239.39	only if construction in the construction is a second of the construction in the construction in the construction in the construction is a second of the construction in the construction i	Jun 137.39 ion L9 of 7.95 uation L	Jul 137.39 r L9a), a 8.59 13 or L1 192.87	Aug 137.39 Iso see 11.17 3a), also	Sep 137.39 Table 5 14.99 see Tal 196.94	Oct 137.39 19.03 ble 5 211.29	Nov 137.39	Dec 137.39	eating	(66) (67)
5. Internal games Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gain	s (Table Feb 137.39 (calcula 20.46 ns (calc	ted in Apulated in 253.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Appendix 239.39	only if construction in the construction is a second of the construction in the construction in the construction in the construction is a second of the construction in the construction i	Jun 137.39 ion L9 of 7.95 uation L	Jul 137.39 r L9a), a 8.59 13 or L1 192.87	Aug 137.39 Iso see 11.17 3a), also	Sep 137.39 Table 5 14.99 see Tal 196.94	Oct 137.39 19.03 ble 5 211.29	Nov 137.39	Dec 137.39	eating	(66) (67)
5. Internal gain Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains	s (Table Feb 137.39) (calcular 20.46) ns (calcular 260.48) (calcular 36.74)	Table 5 2 5), Wat Mar 137.39 ted in Ap 16.64 ulated in 253.74 ated in Ap 36.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74	May 137.39 L, equati 9.42 dix L, eq 221.27 L, equat	Jun 137.39 ion L9 or 7.95 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.17 3a), also 190.19	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table	Oct 137.39 19.03 ble 5 211.29 5	Nov 137.39 22.21	Dec 137.39 23.68	eating	(66) (67) (68)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74	s (Table Feb 137.39) (calcular 20.46) ns (calcular 260.48) (calcular 36.74)	Table 5 2 5), Wat Mar 137.39 ted in Ap 16.64 ulated in 253.74 ated in Ap 36.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74	May 137.39 L, equati 9.42 dix L, eq 221.27 L, equat	Jun 137.39 ion L9 or 7.95 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.17 3a), also 190.19	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table	Oct 137.39 19.03 ble 5 211.29 5	Nov 137.39 22.21	Dec 137.39 23.68	eating	(66) (67) (68)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0	s (Table Feb 137.39 (calcula 20.46 ns (calcula 260.48 (calcula 36.74 ns gains	ted in Apulated in	of (65)m and 5a ts Apr 137.39 ppendix 12.6 Appendix 239.39 ppendix 36.74 5a)	May 137.39 L, equati 9.42 dix L, equati 221.27 L, equati 36.74	Jun 137.39 ion L9 of 7.95 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 see Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far	s (Table Feb 137.39 (calcular 20.46 ns (calcular 260.48 (calcular 36.74 ns gains 0	ted in Apulated in	of (65)m and 5a ts Apr 137.39 ppendix 12.6 Appendix 239.39 ppendix 36.74 5a)	May 137.39 L, equati 9.42 dix L, equati 221.27 L, equati 36.74	Jun 137.39 ion L9 of 7.95 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 see Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.92	s (Table Feb 137.39 (calcula 20.46 ns (calc 260.48 (calcula 36.74 ns gains 0 aporatio -109.92	ted in Apulated in	of (65)m ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74 5a) 0 tive valu	only if construction only if c	Jun 137.39 ion L9 oi 7.95 uation L 204.24 ion L15 36.74 0	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43 0	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev	s (Table Feb 137.39 (calcula 20.46 ns (calc 260.48 (calcula 36.74 ns gains 0 aporatio -109.92	ted in Apulated in	of (65)m ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74 5a) 0 tive valu	only if construction only if c	Jun 137.39 ion L9 oi 7.95 uation L 204.24 ion L15 36.74 0	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43 0	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.92 Water heating	s (Table Feb 137.39 (calcular 20.46 ns (calcular 260.48 (calcular 36.74 ns gains 0 aporatio -109.92 gains (T	ted in Apulated in 253.74 (Table 5 0 n (negation (negation)) (14.46)	of (65)m and 5a ts Apr 137.39 pendix 12.6 Append 239.39 pendix 36.74 5a) 0 tive valu -109.92	only if constructions	Jun 137.39 ion L9 oi 7.95 uation L 204.24 ion L15 36.74 0 ile 5) -109.92	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 o, also se 36.74 0	Sep 137.39 Table 5 14.99 see Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74 0 -109.92	Nov 137.39 22.21 229.4 36.74 0	Dec 137.39 23.68 246.43 0 -109.92 119.24	eating	(66) (67) (68) (69) (70)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.92 Water heating (72)m= 121.52	s (Table Feb 137.39 (calcular 20.46 ns (calcular 260.48 (calcular 36.74 ns gains 0 aporatio -109.92 gains (T	ted in Apulated in 253.74 (Table 5 0 n (negation (negation)) (14.46)	of (65)m and 5a ts Apr 137.39 pendix 12.6 Append 239.39 pendix 36.74 5a) 0 tive valu -109.92	only if constructions	Jun 137.39 ion L9 oi 7.95 uation L 204.24 ion L15 36.74 0 ile 5) -109.92	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 o, also se 36.74 0	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table 36.74 0 -109.92	Oct 137.39 19.03 ble 5 211.29 5 36.74 0 -109.92	Nov 137.39 22.21 229.4 36.74 0	Dec 137.39 23.68 246.43 0 -109.92 119.24	eating	(66) (67) (68) (69) (70)

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

Orienta	ation:	Access Facto Table 6d	r	Area m²		Flux Table 6a		Ta	g_ able 6b	-	FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4.88	x	10.63	x		0.5] x [0.7	=	12.59	(74)
North	0.9x	0.77	x	4.88	X	20.32	X		0.5	_ × [0.7		24.05	(74)
North	0.9x	0.77	x	4.88	X	34.53	X		0.5	_ x [0.7	=	40.87	(74)
North	0.9x	0.77	x	4.88	X	55.46	X		0.5	_ x [0.7		65.65	(74)
North	0.9x	0.77	x	4.88	X	74.72	X		0.5	x	0.7	=	88.44	(74)
North	0.9x	0.77	x	4.88	X	79.99	X		0.5	_ x [0.7	=	94.67	(74)
North	0.9x	0.77	X	4.88	X	74.68	X		0.5	x [0.7	=	88.39	(74)
North	0.9x	0.77	X	4.88	X	59.25	X		0.5	_ x [0.7	=	70.13	(74)
North	0.9x	0.77	x	4.88	x	41.52	X		0.5	_ x [0.7	=	49.14	(74)
North	0.9x	0.77	x	4.88	X	24.19	X		0.5	_ x [0.7	=	28.63	(74)
North	0.9x	0.77	X	4.88	X	13.12	X		0.5	x [0.7	=	15.53	(74)
North	0.9x	0.77	x	4.88	X	8.86	X		0.5] x [0.7	=	10.49	(74)
East	0.9x	0.77	x	2.92	X	19.64	X		0.5	_ x [0.7	=	13.91	(76)
East	0.9x	0.77	x	2.92	X	38.42	X		0.5	x [0.7	=	27.21	(76)
East	0.9x	0.77	x	2.92	X	63.27	X		0.5] x [0.7	=	44.81	(76)
East	0.9x	0.77	X	2.92	X	92.28	X		0.5	x [0.7	=	65.36	(76)
East	0.9x	0.77	X	2.92	X	113.09	X		0.5	_ x [0.7	=	80.1	(76)
East	0.9x	0.77	x	2.92	X	115.77	X		0.5] x [0.7	=	81.99	(76)
East	0.9x	0.77	x	2.92	X	110.22	X		0.5	x [0.7	=	78.06	(76)
East	0.9x	0.77	X	2.92	X	94.68	X		0.5	_ x [0.7	=	67.05	(76)
East	0.9x	0.77	x	2.92	X	73.59	X		0.5] x [0.7	=	52.12	(76)
East	0.9x	0.77	X	2.92	X	45.59	X		0.5	x [0.7	=	32.29	(76)
East	0.9x	0.77	X	2.92	X	24.49	X		0.5] x [0.7	=	17.34	(76)
East	0.9x	0.77	X	2.92	X	16.15	X		0.5	_ x [0.7	=	11.44	(76)
West	0.9x	0.77	X	13.47	X	19.64	X		0.5	x [0.7	=	64.17	(80)
West	0.9x	0.77	X	13.47	X	38.42	X		0.5	_ x [0.7	=	125.53	(80)
West	0.9x	0.77	X	13.47	X	63.27	X		0.5	_ x [0.7	=	206.72	(80)
West	0.9x	0.77	X	13.47	X	92.28	X		0.5	x	0.7	=	301.49	(80)
West	0.9x	0.77	X	13.47	X	113.09	X		0.5	_ x [0.7	=	369.49	(80)
West	0.9x	0.77	X	13.47	X	115.77	X		0.5	x [0.7	=	378.24	(80)
West	0.9x	0.77	X	13.47	X	110.22	X		0.5	_ x [0.7	=	360.1	(80)
West	0.9x	0.77	X	13.47	X	94.68	X		0.5	x [0.7	=	309.32	(80)
West	0.9x	0.77	X	13.47	X	73.59	X		0.5	_ x [0.7	=	240.43	(80)
West	0.9x	0.77	X	13.47	X	45.59	X		0.5	_ x [0.7	=	148.95	(80)
West	0.9x	0.77	X	13.47	X	24.49	X		0.5] x [0.7	=	80.01	(80)
West	0.9x	0.77	X	13.47	X	16.15	X		0.5	_ x [0.7	=	52.77	(80)
٦		n watts, calcul	$\overline{}$		$\overline{}$				um(74)m				1	
(83)m=	90.66			432.5 538.0		526.55 526.55		6.5	341.69	209.87	112.88	74.7]	(83)
Ĭ		internal and s		` 				, <u>, , , </u>	740 07 1	040.00	F44.55	F00.07	1	(OA)
(84)m=	557.25	641.18 741	.46	856.68 936.6	р э 8	29.15 885.02	<u> </u>	1.33	719.37	612.66	544.55	528.27	J	(84)

7. Me	an inter	nal temp	perature	(heating	season)								
						ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
		•	•			(see Ta		,	(- /					` ′
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.97	0.96	0.93	0.87	0.77	0.63	0.5	0.55	0.75	0.91	0.96	0.98		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	18.53	18.78	19.25	19.87	20.4	20.76	20.91	20.88	20.58	19.88	19.1	18.49		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.96	19.96	19.96	19.98	19.98	19.99	19.99	20	19.99	19.98	19.98	19.97		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.97	0.95	0.92	0.85	0.73	0.56	0.4	0.45	0.7	0.89	0.95	0.97		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	16.64	17.02	17.69	18.58	19.3	19.77	19.93	19.91	19.56	18.62	17.49	16.59		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.26	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	17.12	17.47	18.09	18.91	19.58	20.02	20.18	20.16	19.82	18.94	17.9	17.07		(92)
Apply	adjustr	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.12	17.47	18.09	18.91	19.58	20.02	20.18	20.16	19.82	18.94	17.9	17.07		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u		factor fo				l .								
1 14:11:4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.95	tor for g	ains, nm 0.89	0.82	0.71	0.56	0.40	0.47	0.60	0.06	0.02	0.06		(94)
(94)m=						0.56	0.42	0.47	0.69	0.86	0.93	0.96		(34)
	<u> </u>	hmGm 596.82	, VV = (94 661.64	701.79	4)m 664.1	521.55	372.67	381.06	493.17	526.74	507.44	504.99		(95)
(95)m=							372.07	361.06	493.17	526.74	507.44	504.99		(93)
(96)m=	4.3	age exte	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		l	<u> </u>		<u> </u>	Lm , W =			ļ	ļ	'	4.2		(00)
		1456.13				606.96	400.6	418.99	644.13	946.78	1233.7	1478.68		(97)
						Wh/mont						1470.00		(01)
(98)m=	714.26		504.01	315.2	171.74	0	0	0	0	312.5	522.91	724.43		
, ,		ļ	ļ		ļ	ļ		L Tota	l I per year	l		<u> </u>	3842.52	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/vear				. ,		, ,	,	38.07	(99)
•		oling rec			.,									`
		r June, c			Soo Tal	hla 10h								
Calco	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat		l	l				l		<u> </u>	l		able 10)		
(100)m=		0	0	0	0	1051.75	i	847.84	0	0	0	0		(100)
		tor for lo	ss hm	<u> </u>	I	<u> </u>	!	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>I</u>		
(101)m=		0	0	0	0	0.77	0.83	0.8	0	0	0	0		(101)
												•		

Useful loss, hmLm (Watts) = (100)m x (101)m	
(102)m= 0 0 0 0 0 807.78 685.59 676.61 0 0 0 0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)	
(103)m= 0 0 0 0 0 1180.34 1126.78 1042.12 0 0 0 0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)n]$ set (104)m to zero if (104)m < 3 × (98)m	m] x (41)m
(104)m= 0 0 0 0 0 268.24 328.24 271.94 0 0 0 0	
Total = Sum(1.04) =	868.42 (104)
Cooled fraction $f C = \text{cooled area} \div (4) = Intermittency factor (Table 10b)$	0.6 (105)
(106)m= 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0	
Total = Sum(104) =	0 (106)
Space cooling requirement for month = (104) m × (105) × (106) m	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	129.59 (107)
Space cooling requirement in kWh/m²/year $ (107) \div (4) = $	1.28 (108)
9b. Energy requirements – Community heating scheme	1.28
This part is used for space heating, space cooling or water heating provided by a community scheme	1.
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 source includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	es; the latter
Fraction of heat from Community boilers	1 (303a)
Fraction of total space heat from Community boilers (302) x (303a) =	1 (304a)
Factor for control and charging method (Table 4c(3)) for 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	3842.52
Space heat from Community boilers $(98) \times (304a) \times (305) \times (306) =$	4034.64 (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	2101.62
If DHW from community scheme: Water heat from Community boilers (64) × (303a) × (305) × (306) =	2206.7 (310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)	
Cooling System Energy Efficiency Ratio	6.59 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$	19.67 (315)
Electricity for pumps and fans within dwelling (Table 4f):	
mechanical ventilation - balanced, extract or positive input from outside	263.68 (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) =(331)263.68 Energy for lighting (calculated in Appendix L) (332)406.91 12b. CO2 Emissions – Community heating scheme **Emission factor Emissions Energy** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) (367a) 93.5 CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)1441.85 0.22 Electrical energy for heat distribution [(313) x (372)0.52 32.39 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)1474.24 CO2 associated with space heating (secondary) (309) x (374)0 CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 (375)0 Total CO2 associated with space and water heating (373) + (374) + (375) =(376)1474.24 CO2 associated with space cooling (315) x(377)0.52 10.21 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 136.85 CO2 associated with electricity for lighting (379)(332))) x 0.52 211.19 sum of (376)...(382) =(383) Total CO2, kg/year 1832.49 $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)18.16

El rating (section 14)

(385)

83.17

		User D	etails:					
Assessor Name:	Lindsey Arnott		Stroma	Num	ber:	STRO	035000	
Software Name:	Stroma FSAP 2012		Softwar	e Ver	sion:	Versio	n: 1.0.5.9	
		Property A	Address: 7	Townho	ouse 1			
Address :	The Alders, Aldrington F	Road, SW16	1TW					
1. Overall dwelling dime	nsions:							
Ground floor			9.87 (1	la) x	Av. Height	(m) (2a) = [Volume(m³	(3a)
First floor				lb) x	3	(2b) =	104.55	(3b)
Second floor		2	26.2 (1	lc) x	2.9	(2c) =	75.98	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 10	00.92 (4	1)				
Dwelling volume			((3a)+(3b)	+(3c)+(3d)+(3e	e)+(3n) =	288.18	(5)
2. Ventilation rate:						_		
	main secor heating heati		other		total		m³ per hou	r
Number of chimneys	0 + 0		0	=	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fa	ns				4	x 10 =	40	(7a)
Number of passive vents					0	x 10 =	0	(7b)
Number of flueless gas fi	res				0	x 40 =	0	(7c)
						Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6a)$	b)+(7a)+(7b)+(7	7c) =		40	÷ (5) =	0.14	(8)
	een carried out or is intended, pro	oceed to (17), c	otherwise co	ntinue fr	om (9) to (16)	_		
Number of storeys in the	ne dwelling (ns)						0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber fram resent, use the value correspond		•		uction		0	(11)
deducting areas of openir		ng to the great	or wan area	(anoi				
If suspended wooden f	loor, enter 0.2 (unsealed)	or 0.1 (seale	ed), else e	nter 0			0	(12)
If no draught lobby, en	ter 0.05, else enter 0						0	(13)
Percentage of windows	s and doors draught strippe	ed				Ī	0	(14)
Window infiltration			0.25 - [0.2 x	(14) ÷ 1	00] =		0	(15)
Infiltration rate			(8) + (10) +	(11) + (1	2) + (13) + (15)) =	0	(16)
Air permeability value,	q50, expressed in cubic m	etres per ho	ur per squ	uare m	etre of enve	ope area	5	(17)
If based on air permeabil	ity value, then (18) = [(17) ÷ 2	20]+(8), otherwi	se (18) = (16	6)		Ī	0.39	(18)
Air permeability value applie	s if a pressurisation test has beer	n done or a deg	gree air perm	neability i	is being used	-		_
Number of sides sheltere	d						1	(19)
Shelter factor			(20) = 1 - [0]	.075 x (1	9)] =		0.92	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x	(20) =			0.36	(21)
Infiltration rate modified for	or monthly wind speed				-			
Jan Feb	Mar Apr May J	un Jul	Aug	Sep	Oct N	lov Dec		
Monthly average wind sp	eed from Table 7							

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

	of therma	ii briagirig	are not kn	own (36) =	= 0.05 x (3	1)						_		
	abric he								(33) +	(36) =			95.37	(37)
Ventila	ation hea	it loss ca	alculated	monthly	/				` ,	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	57.55	57.16	56.78	54.99	54.66	53.1	53.1	52.81	53.7	54.66	55.33	56.04		(38)
Heat tr	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	152.92	152.53	152.15	150.36	150.02	148.47	148.47	148.18	149.07	150.02	150.7	151.41		
Heat lo	oss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	` '	12 /12=	150.36	(39)
(40)m=	1.52	1.51	1.51	1.49	1.49	1.47	1.47	1.47	1.48	1.49	1.49	1.5		
									,	Average =	Sum(40) ₁	12 /12=	1.49	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)								,		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	gy requi	rement:								kWh/ye	ar:	
	_	_												
	ned occu			[1 0)(0	(0 0003	40 v /TE	-A 12 O)2)] + 0.0	0012 v /	ΓΕΛ 12		75		(42)
	A > 13.9 A £ 13.9		+ 1.76 X	[т - ехр	(-0.0003	49 X (1F	-A -13.9)2)] + 0.0)013 X (IFA -13.	9)			
		•	ater usac	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		99	.46		(43)
Reduce	the annua	ıl average	hot water	usage by	5% if the a	welling is	designed t	o achieve		se target o				(- /
not more	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	109.41	105.43	101.45	97.47	93.49	89.52	89.52	93.49	97.47	101.45	105.43	109.41		
Energy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600		Total = Sui th (see Ta	. ,	L	1193.55	(44)
(45)m=	162.25	141.9	146.43	127.66	122.5	105.7	97.95	112.4	113.74	132.56	144.7	157.13		
											m(4E) -			7
If instan	taneous w	ator hoatin								Fotal = Su	11(45)112	-	1564.93	(45)
ii iiiotaii		alei Healli	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,		Γotal = Su	11(43)112 =	- L	1564.93	(45)
	24.34	21.29	21.96	of use (no 19.15	hot water 18.37	storage),	enter 0 in 14.69	boxes (46)		Total = Sui 19.88	21.7	23.57	1564.93	(45) (46)
(46)m= Water	storage	21.29 loss:	21.96	19.15	18.37	15.86	14.69	16.86	17.06	19.88		· ·	1564.93	
(46)m= Water	storage	21.29 loss:	21.96	19.15	18.37	15.86	14.69		17.06	19.88	21.7	· ·	1564.93	
(46)m= Water Storag	storage le volum munity h	21.29 loss: e (litres) eating a	21.96 includin	19.15 g any so	18.37 Dlar or W	15.86 /WHRS nter 110	14.69 storage	16.86 within sa (47)	17.06 ame ves	19.88 Sel	21.7	23.57	1564.93	(46)
(46)m= Water Storag If comi	storage le volum munity h vise if no	21.29 loss: e (litres) eating a	21.96 includin	19.15 g any so	18.37 Dlar or W	15.86 /WHRS nter 110	14.69 storage	16.86 within sa	17.06 ame ves	19.88 Sel	21.7	23.57	1564.93	(46)
(46)m= Water Storag If comi Otherv Water	storage je volum munity h vise if no storage	21.29 loss: e (litres) eating a o stored loss:	21.96 includin nd no ta hot wate	19.15 ng any so nk in dw er (this in	18.37 Dlar or W relling, e	15.86 /WHRS nter 110	storage litres in neous co	16.86 within sa (47)	17.06 ame ves	19.88 Sel	21.7	23.57	1564.93	(46) (47)
(46)m= Water Storag If comi Otherv Water a) If m	storage le volum munity h vise if no storage nanufact	21.29 loss: e (litres) eating a o stored loss: urer's de	21.96 including nd no tathet water	19.15 ng any so nk in dw er (this in	18.37 Dlar or W relling, e	15.86 /WHRS nter 110	storage litres in neous co	16.86 within sa (47)	17.06 ame ves	19.88 Sel	21.7	23.57 150 55	1564.93	(46) (47) (48)
(46)m= Water Storag If comi Otherv Water a) If m	storage per volume munity havise if no storage manufact per storage per storag	21.29 loss: e (litres) eating a stored loss: urer's de	21.96 including nd no tathot water eclared logical metals.	19.15 Ig any so nk in dw r (this in oss factor 2b	18.37 plar or Warelling, eacludes it is known in the control of t	15.86 /WHRS nter 110	storage litres in neous co n/day):	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7	23.57	1564.93	(46) (47)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy	storage per volume munity havise if no storage manufact per ature for your lost from the storage per s	21.29 loss: e (litres) eating a o stored loss: urer's de actor from	21.96 including nd no tale hot water eclared lem Table storage	19.15 ng any so nk in dw er (this in coss facto 2b , kWh/ye	18.37 plar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar	storage litres in neous co n/day):	16.86 within sa (47)	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47)	23.57 150 55	1564.93	(46) (47) (48)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa	storage per volume munity havise if no storage manufact perature for anufact parature for anufact parature storage per storage	21.29 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de	21.96 including nd no talend water the clared left storage eclared of factor fr	19.15 Ig any so nk in dw r (this in oss facto 2b , kWh/ye cylinder loom Tabl	18.37 Dlar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47) 1. 0.	23.57 150 55 54	1564.93	(46) (47) (48) (49)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa	storage per volume munity havise if no storage manufact per ature from anufact per storage munity have storage munity have storage munity have storage	21.29 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de age loss eating s	21.96 including nd no tale hot water eclared least storage eclared of factor free sections.	19.15 Ig any so nk in dw r (this in oss facto 2b , kWh/ye cylinder loom Tabl	18.37 Dlar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47) 1. 0.	23.57 150 55 54 84	1564.93	(46) (47) (48) (49) (50) (51)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa If comi	storage per volume munity havise if no storage manufact perature for anufact parature storage munity have factor	21.29 loss: e (litres) eating a o stored loss: urer's de actor froi urer's de age loss eating s from Tal	including and no tale to the clared lead of the colored colored factor free sections and the colored c	19.15 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	18.37 Dlar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47) 1. 0.	23.57 150 55 54 84 0	1564.93	(46) (47) (48) (49) (50) (51) (52)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa If comi Volum Tempe	storage ge volume munity havise if no storage manufact erature fater storage munity have factor erature fater storage munity have factor erature fater storage erature eratu	21.29 loss: e (litres) eating a o stored loss: urer's de actor from urer's de age loss eating s from Tal actor from	including and no tale to the clared lead of the colored colored factor from the colored colored and the colored colored colored and the colored colore	19.15 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	olar or Welling, encludes in the control of the con	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) ombi boild (48) x (49)	17.06 17.06 ame vessers) ente	19.88 sel er 'O' in (21.7 47) 1. 0.	23.57 150 55 54 84	1564.93	(46) (47) (48) (49) (50) (51) (52) (53)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa If comi Volum Tempe Energy	storage per volume munity havise if no storage manufact perature for anufact parature storage munity have factor	21.29 loss: e (litres) eating a o stored loss: urer's de actor froi urer's de age loss eating s from Tal actor froi m water	including and no tale to the clared lead of the color of	19.15 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	olar or Welling, encludes in the control of the con	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vessers) ente	19.88 sel er 'O' in (21.7 47) 1. 0.	23.57 150 55 54 84 0	1564.93	(46) (47) (48) (49) (50) (51) (52)

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(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 Append	ix H	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss 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	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.49	186.38	195.68	175.32	171.74	153.36	147.19	161.64	161.4	181.8	192.35	206.37		(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	I 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 from w	ater hea	ter			-	-			-	-	-		
(64)m= 211.49	186.38	195.68	175.32	171.74	153.36	147.19	161.64	161.4	181.8	192.35	206.37		
	•						Outp	out from wa	ater heate	r (annual)₁	12	2144.72	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	_
(65)m= 93.34	82.77	88.08	80.57	80.12	73.27	71.96	76.77	75.94	83.47	06.00	91.64	<u> </u>	(65)
			00.07	00.12	1 10.21	11.30	10.77	75.94	03.47	86.23	91.04		(00)
include (57)	m in cal				<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(00)
include (57) 5. Internal ga		culation o	of (65)m	only if c	<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(00)
5. Internal ga	ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(66)
5. Internal gair	ains (see	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	(55)
5. Internal ga	ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(66)
5. Internal games 5. Internal games 5. Internal games 5. Internal games 6. Internal	rs (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c : : : : : : : : : : : : : : : : : : :	Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal games 5. Metabolic gain Jan	rs (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c : : : : : : : : : : : : : : : : : : :	Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal gain Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.16	res (Table Feb 137.39 (calcula 20.57	ETable 5 E Table 5 E 5), Wat Mar 137.39 ted in Ap	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67	only if construction in the construction is constructed as the construction in the construction is constructed as the con	Jun 137.39 ion L9 o	Jul 137.39 r L9a), a	Aug 137.39 Iso see	Sep 137.39 Table 5	Oct 137.39	Nov	Dec	eating	(66)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games	res (Table Feb 137.39 (calcula 20.57	Example 5 ted in Apulated in Apulated in Apulated in Apulated in	of (65)m and 5a ts Apr 137.39 opendix 12.67	May 137.39 L, equati 9.47 dix L, eq	Jun 137.39 ion L9 o 7.99 uation L	Jul 137.39 r L9a), a 8.64 13 or L1	Aug 137.39 Iso see 11.23 3a), also	Sep 137.39 Table 5 15.07 see Tal	Oct 137.39 19.13 ble 5	Nov 137.39	Dec 137.39	eating	(66)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games (68)m= 257.81	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48	ted in Apulated in 253.74	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Appendix 239.39	only if construction in the construction is constructed by the construction in the construction in the construction in the construction is constructed by the construction in the construc	Jun 137.39 ion L9 o 7.99 uation L 204.24	Jul 137.39 r L9a), a 8.64 13 or L1 192.87	Aug 137.39 Iso see 11.23 3a), also	Sep 137.39 Table 5 15.07 see Tal 196.94	Oct 137.39 19.13 ble 5 211.29	Nov	Dec	eating	(66) (67)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48	ted in Apulated in 253.74	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Appendix 239.39	only if construction in the construction is constructed by the construction in the construction in the construction in the construction is constructed by the construction in the construc	Jun 137.39 ion L9 o 7.99 uation L 204.24	Jul 137.39 r L9a), a 8.64 13 or L1 192.87	Aug 137.39 Iso see 11.23 3a), also	Sep 137.39 Table 5 15.07 see Tal 196.94	Oct 137.39 19.13 ble 5 211.29	Nov 137.39	Dec 137.39	eating	(66) (67)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48 (calcula 36.74	ted in Apulated in	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74	May 137.39 L, equati 9.47 dix L, equate 221.27 L, equat	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.23 3a), also 190.19	Sep 137.39 Table 5 15.07 See Tal 196.94 ee Table	Oct 137.39 19.13 ble 5 211.29 5	Nov 137.39 22.33	Dec 137.39 23.81	eating	(66) (67) (68)
5. Internal gains Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances gains (68)m= 257.81 Cooking gains	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48 (calcula 36.74	ted in Apulated in	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74	May 137.39 L, equati 9.47 dix L, equate 221.27 L, equat	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.23 3a), also 190.19	Sep 137.39 Table 5 15.07 See Tal 196.94 ee Table	Oct 137.39 19.13 ble 5 211.29 5	Nov 137.39 22.33	Dec 137.39 23.81	eating	(66) (67) (68)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48 (calcula 36.74 ins gains 3	ted in Aputed in	of (65)m and 5a ts Apr 137.39 ppendix 12.67 Appendix 239.39 ppendix 36.74 5a)	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43	eating	(66) (67) (68) (69)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fames	res (Table Feb 137.39 (calcula 20.57 ins (calcula 36.74 ins gains 3 vaporatio	ted in Aputed in	of (65)m and 5a ts Apr 137.39 ppendix 12.67 Appendix 239.39 ppendix 36.74 5a)	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43	eating	(66) (67) (68) (69)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -109.92	reportion (see land) (ted in Ap 253.74 Ulated in Ap 253.74 (Table 5 3 on (negat	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43 36.74	eating	(66) (67) (68) (69)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev	reportion (see land) (ted in Ap 253.74 Ulated in Ap 253.74 (Table 5 3 on (negat	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43 36.74	eating	(66) (67) (68) (69)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -109.92 Water heating (72)m= 125.46	res (Table Feb 137.39 (calcula 20.57 ins (calcula 36.74 ins gains 3 vaporatio gains (Table 123.16	ted in Apulated in 253.74 (Table 5 3 on (negation) 2 able 5) 118.39	of (65)m and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu -109.92	only if constructions	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74 3 le 5) -109.92	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74 3	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74 3 -109.92	Nov 137.39 22.33 229.4 36.74 3	Dec 137.39 23.81 246.43 3 -109.92 123.17	eating	(66) (67) (68) (69) (70)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -109.92 Water heating	res (Table Feb 137.39 (calcula 20.57 ins (calcula 36.74 ins gains 3 vaporatio gains (Table 123.16	ted in Apulated in 253.74 (Table 5 3 on (negation) 2 able 5) 118.39	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if constructions	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74 3 le 5) -109.92	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74 3	Sep 137.39 Table 5 15.07 See Tal 196.94 See Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74 3 -109.92	Nov 137.39 22.33 229.4 36.74 3	Dec 137.39 23.81 246.43 3 -109.92 123.17	eating	(66) (67) (68) (69) (70)

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

Orienta		Access Fact Table 6d	or	Area m²			Flux Table 6a		g_ Table 6b	-	FF Table 6c		Gains (W)	
North	0.9x	0.77	X	4.6		X	10.63	x	0.63	x	0.7	=	14.95	(74)
North	0.9x	0.77	x	4.6		X	20.32	x	0.63	x	0.7	<u> </u>	28.57	(74)
North	0.9x	0.77	X	4.6		X	34.53	x	0.63	x	0.7		48.54	(74)
North	0.9x	0.77	X	4.6		X	55.46	x	0.63	x	0.7	_ = [77.97	(74)
North	0.9x	0.77	X	4.6		X	74.72	x	0.63	x	0.7	_ =	105.04	(74)
North	0.9x	0.77	X	4.6		X	79.99	x	0.63	x	0.7	=	112.44	(74)
North	0.9x	0.77	X	4.6		X	74.68	x	0.63	x	0.7	=	104.98	(74)
North	0.9x	0.77	X	4.6		X	59.25	x	0.63	x	0.7	=	83.29	(74)
North	0.9x	0.77	X	4.6		X	41.52	x	0.63	x	0.7	=	58.36	(74)
North	0.9x	0.77	X	4.6		X	24.19	x	0.63	x	0.7	= [34.01	(74)
North	0.9x	0.77	X	4.6		X	13.12	x	0.63	x	0.7	=	18.44	(74)
North	0.9x	0.77	X	4.6		X	8.86	x	0.63	x	0.7	= [12.46	(74)
East	0.9x	0.77	X	2.75		X	19.64	x	0.63	x	0.7	= [16.51	(76)
East	0.9x	0.77	X	2.75		X	38.42	x	0.63	x	0.7	=	32.29	(76)
East	0.9x	0.77	X	2.75		X	63.27	x	0.63	x	0.7	= [53.18	(76)
East	0.9x	0.77	X	2.75		X	92.28	x	0.63	x	0.7	= [77.56	(76)
East	0.9x	0.77	X	2.75		X	113.09	x	0.63	x	0.7	= [95.05	(76)
East	0.9x	0.77	X	2.75		X	115.77	x	0.63	x	0.7	= [97.3	(76)
East	0.9x	0.77	X	2.75		X	110.22	x	0.63	x	0.7	=	92.63	(76)
East	0.9x	0.77	X	2.75		X	94.68	x	0.63	x	0.7	= [79.57	(76)
East	0.9x	0.77	X	2.75		X	73.59	x	0.63	x	0.7	= [61.85	(76)
East	0.9x	0.77	X	2.75		X	45.59	x	0.63	x	0.7	= [38.31	(76)
East	0.9x	0.77	X	2.75		X	24.49	X	0.63	x	0.7	=	20.58	(76)
East	0.9x	0.77	X	2.75		X	16.15	x	0.63	x	0.7	= [13.57	(76)
West	0.9x	0.77	X	12.7		X	19.64	X	0.63	X	0.7	=	76.23	(80)
West	0.9x	0.77	X	12.7		X	38.42	X	0.63	x	0.7	=	149.12	(80)
West	0.9x	0.77	X	12.7		X	63.27	x	0.63	x	0.7	=	245.58	(80)
West	0.9x	0.77	X	12.7		X	92.28	X	0.63	х	0.7	=	358.17	(80)
West	0.9x	0.77	X	12.7		X	113.09	X	0.63	x	0.7	= [438.95	(80)
West	0.9x	0.77	X	12.7		X	115.77	X	0.63	x	0.7	=	449.34	(80)
West	0.9x	0.77	X	12.7		X	110.22	X	0.63	x	0.7	= [427.79	(80)
West	0.9x	0.77	X	12.7		X	94.68	X	0.63	x	0.7	= [367.46	(80)
West	0.9x	0.77	X	12.7		X	73.59	x	0.63	x	0.7	=	285.62	(80)
West	0.9x	0.77	X	12.7		X	45.59	X	0.63	X	0.7	=	176.94	(80)
West	0.9x	0.77	X	12.7		X	24.49	X	0.63	x	0.7	= [95.05	(80)
West	0.9x	0.77	X	12.7		X	16.15	x	0.63	x	0.7	=	62.69	(80)
٦		watts, calcu	_			$\overline{}$		_	n = Sum(74)m .					(05)
(83)m=			7.3		639.03		59.08 625.4	530	.32 405.83	249.27	134.07	88.72		(83)
Ĭ	581.33	internal and 6 681.41 80	3.38	<u>`</u>	(73)m 044.68	Ť		000	14 700 50	650.00	F70.0	540.25		(84)
(84)m=	561.33	0 001.41 80	ა.პඊ	944.8/	U44.68	1 10	040.3 990.85	902	.14 790.53	659.09	572.8	549.35		(04)

	an inter	nal temp	perature	(heating	season)								
				eriods ir			from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ıble 9a)					l		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.9	0.77	0.61	0.68	0.89	0.98	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.28	19.45	19.77	20.21	20.6	20.87	20.96	20.94	20.72	20.2	19.67	19.25		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.68	19.68	19.68	19.7	19.7	19.71	19.71	19.71	19.7	19.7	19.69	19.69		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.99	0.95	0.86	0.66	0.46	0.52	0.83	0.97	0.99	1		(89)
Mean	internal	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	17.41	17.66	18.13	18.77	19.3	19.62	19.7	19.69	19.47	18.77	17.99	17.39		(90)
			-		-		-	-	f	LA = Livin	g area ÷ (4	1) =	0.26	(91)
Mean	internal	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=		18.12	18.55	19.13	19.64	19.94	20.02	20.01	19.79	19.13	18.42	17.86		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	re appro	priate	!			
(93)m=	17.89	18.12	18.55	19.13	19.64	19.94	20.02	20.01	19.79	19.13	18.42	17.86		(93)
8. Sp	ace hea	ting requ	uirement											
				mperatui using Ta		ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
tilo di	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac			<u> </u>	· · ·	<u> </u>	!	<u> </u>	•	ļ.	ļ.			
(94)m=	1	0.99	0.00	1										
l leafı		0.55	0.98	0.94	0.85	0.68	0.5	0.56	0.83	0.97	0.99	1		(94)
OSCIO	ul gains,		<u> </u>	0.94 4)m x (8		0.68	0.5	0.56	0.83	0.97	0.99	1		(94)
(95)m=	JI gains, 578.94		<u> </u>			711.46	0.5 491.55	0.56	0.83 658.05	0.97 637.55	0.99	547.56		(94) (95)
(95)m=	578.94	hmGm 675.89	, W = (94 787.43	4)m x (8	4)m 891.34	711.46	!							
(95)m= Montl (96)m=	578.94 hly avera	hmGm 675.89 age exte	, W = (94 787.43 ernal tem 6.5	4)m x (8- 891.21 perature 8.9	4)m 891.34 e from Ta	711.46 able 8 14.6	491.55	507.91	658.05	637.55				
(95)m= Montl (96)m= Heat	578.94 hly avera 4.3 loss rate	hmGm 675.89 age exte 4.9	, W = (94 787.43 ernal tem 6.5 an intern	4)m x (84 891.21 aperature 8.9 nal tempe	4)m 891.34 e from Ta 11.7 erature,	711.46 able 8 14.6 Lm , W =	491.55 16.6 =[(39)m	507.91 16.4 x [(93)m	658.05 14.1 – (96)m	637.55	7.1	547.56		(95) (96)
(95)m= Montl (96)m= Heat (97)m=	578.94 hly avera 4.3 loss rate 2077.84	675.89 age exte 4.9 e for mea 2016.16	, W = (94 787.43 ernal tem 6.5 an intern 1832.81	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65	4)m 891.34 e from Ta 11.7 erature, 1190.56	711.46 able 8 14.6 Lm , W =	491.55 16.6 =[(39)m : 507.5	507.91 16.4 x [(93)m 534.46	658.05 14.1 – (96)m 848.03	637.55 10.6] 1280.28	7.1	547.56		(95)
(95)m= Month (96)m= Heat (97)m= Space	578.94 hly avera 4.3 loss rate 2077.84 e heating	hmGm 675.89 age exter 4.9 e for mea 2016.16 g require	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement fo	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n	4)m 891.34 e from Ta 11.7 erature, 1190.56	711.46 able 8 14.6 Lm, W = 792.55	491.55 16.6 =[(39)m : 507.5 th = 0.02	507.91 16.4 x [(93)m 534.46 24 x [(97	658.05 14.1 – (96)m 848.03)m – (95	637.55 10.6] 1280.28)m] x (4	7.1 1705.44 1)m	547.56 4.2 2068.56		(95) (96)
(95)m= Month (96)m= Heat (97)m= Space	578.94 hly avera 4.3 loss rate 2077.84	hmGm 675.89 age exter 4.9 e for mea 2016.16 g require	, W = (94 787.43 ernal tem 6.5 an intern 1832.81	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65	4)m 891.34 e from Ta 11.7 erature, 1190.56	711.46 able 8 14.6 Lm , W =	491.55 16.6 =[(39)m : 507.5	507.91 16.4 x [(93)m 534.46 24 x [(97	658.05 14.1 – (96)m 848.03)m – (95	637.55 10.6] 1280.28)m] x (4 478.19	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	5040.94	(95) (96) (97)
(95)m= Montil (96)m= Heat (97)m= Spac (98)m=	578.94 hly avera 4.3 loss rate 2077.84 e heating 1115.18	675.89 age exter 4.9 e for mea 2016.16 g require 900.66	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement fo	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n 466.15	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62	711.46 able 8 14.6 Lm, W = 792.55	491.55 16.6 =[(39)m : 507.5 th = 0.02	507.91 16.4 x [(93)m 534.46 24 x [(97	658.05 14.1 – (96)m 848.03)m – (95	637.55 10.6] 1280.28)m] x (4 478.19	7.1 1705.44 1)m	547.56 4.2 2068.56 1131.63	5910.84	(95) (96) (97)
(95)m= Montil (96)m= Heat (97)m= Spac (98)m=	578.94 hly avera 4.3 loss rate 2077.84 e heating 1115.18	675.89 age exter 4.9 e for mea 2016.16 g require 900.66	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement fo	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62	711.46 able 8 14.6 Lm, W = 792.55	491.55 16.6 =[(39)m : 507.5 th = 0.02	507.91 16.4 x [(93)m 534.46 24 x [(97	658.05 14.1 – (96)m 848.03)m – (95	637.55 10.6] 1280.28)m] x (4 478.19	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	5910.84 58.57	(95) (96) (97)
(95)m= Montil (96)m= Heat (97)m= Space (98)m=	578.94 hly avera 4.3 loss rate 2077.84 e heating	hmGm 675.89 age exte 4.9 e for mea 2016.16 g require 900.66	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement fo 777.77	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n 466.15	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62	711.46 able 8 14.6 Lm , W = 792.55 Wh/mon	491.55 16.6 =[(39)m : 507.5 th = 0.02	507.91 16.4 x [(93)m 534.46 24 x [(97 0	658.05 14.1 — (96)m 848.03)m — (95 0 I per year	637.55 10.6] 1280.28)m] x (4 478.19	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63		(95) (96) (97)
(95)m= Montil (96)m= Heat (97)m= Space (98)m= Space 9a. En	578.94 hly avera 4.3 loss rate 2077.84 e heating 1115.18 e heating ergy rec e heating	hmGm 675.89 age exte 4.9 e for mea 2016.16 g require 900.66 g require	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement fo 777.77	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n 466.15 kWh/m²	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62	711.46 able 8 14.6 Lm , W = 792.55 Wh/mon	491.55 16.6 =[(39)m : 507.5 th = 0.02 0	507.91 16.4 x [(93)m 534.46 24 x [(97 0 Total	658.05 14.1 — (96)m 848.03)m — (95 0 I per year	637.55 10.6] 1280.28)m] x (4 478.19	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	58.57	(95) (96) (97) (98) (99)
(95)m= Montil (96)m= Heat (97)m= Space (98)m= Space 9a. En	578.94 hly avera 4.3 loss rate 2077.84 e heating 1115.18 e heating ergy receive heating ion of sp	hmGm 675.89 age exter 4.9 e for mea 2016.16 g require 900.66 g require uiremen	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement for 777.77 ement in at from set from s	4)m x (8- 891.21 apperature 8.9 all tempe 1538.65 or each n 466.15 kWh/m² ividual h	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62 eating sy/supple	711.46 able 8 14.6 Lm , W = 792.55 Wh/mon	491.55 16.6 =[(39)m : 507.5 th = 0.02 0 ncluding	507.91 16.4 x [(93)m 534.46 24 x [(97 0 Total	658.05 14.1 — (96)m 848.03)m — (95 0 I per year	637.55 10.6] 1280.28)m] x (4 478.19	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	58.57	(95) (96) (97) (98) (99)
(95)m= Montil (96)m= Heat (97)m= Space (98)m= Space Fract Fract	578.94 hly avera 4.3 loss rate 2077.84 e heating 1115.18 e heating ergy receive heating ion of sp	hmGm 675.89 age exter 4.9 e for mea 2016.16 g require 900.66 g require uirement pace hea pace hea	, W = (94 787.43 ernal tem 6.5 an intern 1832.81 ement for 777.77 ement in 185 – Indiat from sat from material fro	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n 466.15 kWh/m²	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62 eating s y/supple em(s)	711.46 able 8 14.6 Lm , W = 792.55 Wh/mon	491.55 16.6 =[(39)m : 507.5 th = 0.02 0	507.91 16.4 x [(93)m 534.46 24 x [(97 0 Total	658.05 14.1 - (96)m 848.03 m - (95 0 I per year	637.55 10.6] 1280.28)m] x (4 478.19 (kWh/year	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	58.57	(95) (96) (97) (98) (99)
(95)m= Montil (96)m= Heat (97)m= Space (98)m= Space Fract Fract Fract	578.94 hly avera 4.3 loss rate 2077.84 e heating ergy receive heating ion of sp ion of tot	hmGm 675.89 age exter 4.9 e for mea 2016.16 g require 900.66 g require uirement pace hea tal heating	W = (94) 787.43 ernal tem 6.5 an intern 1832.81 ement fo 777.77 ement in at from seat from many from	4)m x (8- 891.21 sperature 8.9 sal tempe 1538.65 or each n 466.15 kWh/m² ividual h econdary nain syst	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62 eating sy y/supple em(s) stem 1	711.46 able 8 14.6 Lm , W = 792.55 Wh/mon	491.55 16.6 =[(39)m : 507.5 th = 0.02 0	507.91 16.4 x [(93)m 534.46 24 x [(97 0 Total	658.05 14.1 - (96)m 848.03 m - (95 0 I per year	637.55 10.6] 1280.28)m] x (4 478.19 (kWh/year	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	0 1	(95) (96) (97) (98) (99) (201) (202)
(95)m= Montil (96)m= Heat (97)m= Spac (98)m= Spac Fract Fract Fract Efficie	578.94 hly avera 4.3 loss rate 2077.84 e heating 1115.18 e heating ergy receive heating ion of sp ion of tot ency of received as a second content of tot ency of total content	hmGm 675.89 age exter 4.9 e for mea 2016.16 g require 900.66 g require uirement bace hea bace hea tal heatin	w = (94) 787.43 ernal tem 6.5 an intern 1832.81 ement fo 777.77 ement in at from so at from m ace heat	4)m x (8- 891.21 perature 8.9 nal tempe 1538.65 or each n 466.15 kWh/m² ividual h econdary nain syst	4)m 891.34 e from Ta 11.7 erature, 1190.56 nonth, k\ 222.62 eating sy y/supple em(s) stem 1 em 1	711.46 able 8 14.6 Lm , W = 792.55 Wh/mon 0	491.55 16.6 =[(39)m: 507.5 th = 0.02 0 ncluding	507.91 16.4 x [(93)m 534.46 24 x [(97 0 Total	658.05 14.1 - (96)m 848.03 m - (95 0 I per year	637.55 10.6] 1280.28)m] x (4 478.19 (kWh/year	7.1 1705.44 1)m 818.64	547.56 4.2 2068.56 1131.63	0 1 1	(95) (96) (97) (98) (99) (201) (202) (204)

									_	
Jan Feb Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated			ı			ı	ı	ı	1	
1115.18 900.66 777.77 466.15	222.62	0	0	0	0	478.19	818.64	1131.63		
(211) m = {[(98)m x (204)] } x 100 ÷ (206)		0				544.44	075.55	4040.00	1	(211)
1192.71 963.27 831.84 498.56	238.1	0	0	0 Tota	0 L(k\Wh/vea	511.44 ar) =Sum(2	875.55	1210.29	0004.75	(211)
Space heating fuel (secondary), kWh/n	month			Tota	i (RVVIII) y CC	ar) =00m(2	- ' '/15,1012		6321.75	(211)
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$	HOHUI									
(215)m= 0 0 0 0	0	0	0	0	0	0	0	0		
	•			Tota	l (kWh/yea	ar) =Sum(2	215),15,1012	=	0	(215)
Water heating										_
Output from water heater (calculated ab		450.00	447.40	404.04	404.4	104.0	400.05	200 27	1	
211.49 186.38 195.68 175.32 Efficiency of water heater	171.74	153.36	147.19	161.64	161.4	181.8	192.35	206.37	70.0	(216)
(217)m= 88.61 88.47 88.12 87.3	85.51	79.8	79.8	79.8	79.8	87.28	88.25	88.67	79.8	(217)
Fuel for water heating, kWh/month	00.01	75.0	7 3.0	75.0	75.0	07.20	00.20	00.07		(211)
(219) m = (64) m × $100 \div (217)$ m									•	
(219)m= 238.69 210.68 222.04 200.82	200.85	192.18	184.45	202.56	202.25	208.3	217.96	232.75		_
				Tota	I = Sum(2	2			2513.54	(219)
Annual totals Space heating fuel used, main system 1	1					k\	Wh/year		kWh/year	٦
	1								6321.75	
Water heating fuel used									2513.54	
Electricity for pumps, fans and electric k	keep-hot								1	
central heating pump:								30		(230c)
boiler with a fan-assisted flue								45		(230e)
Total electricity for the above, kWh/year	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting									409.05	(232)
12a. CO2 emissions – Individual heatir	ng syste	ms inclu	uding mi	cro-CHP)					
		Fn	ergy			Fmice	ion fac	tor	Emissions	
			/h/year			kg CO		lOi	kg CO2/yea	
Space heating (main system 1)		(211	1) x			0.2	16	=	1365.5	(261)
Space heating (secondary)		(215	5) x			0.5	19	=	0	
Water heating		(219	9) x			0.2	16	=	542.93	」 [264]
Space and water heating		(261	1) + (262) -	+ (263) + (264) =				1908.42	(265)
Electricity for pumps, fans and electric k	ceep-hot	(231	1) x			0.5	19	=	38.93	(267)
Electricity for lighting		(232	2) x			0.5	19	=	212.3] (268)
Total CO2, kg/year					sum o	of (265)(2	271) =		2159.64	
										_ ^
TER =									21.4	(273)
									•	_

			User D	etails:						
Assessor Name:	Lindsey Arnot	tt		Stroma	a Num	ber:		STRO	035000	
Software Name:	Stroma FSAP	2012		Softwa	are Ve	rsion:		Versic	n: 1.0.5.9	
		Р	roperty .	Address:	Flat 05					
Address :	The Alders, Ald	drington Road	l, SW16	1TW						
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	7	Volume(m	<u> </u>
Ground floor			7	1.42	(1a) x	2	2.85	(2a) =	203.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d))+(1e)+(1r	1) 7	1.42	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	203.55	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0	+ 0	7 + [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 fa	ans				 _	0	X	10 =	0	 (7a)
Number of passive vents	3				L	0	x	10 =	0	` ´ (7b)
Number of flueless gas f					Ļ			40 =		╡`
number of flueless gas i	ires					0	^	-	0	(7c)
								Air ch	anges per h	our
Infiltration due to chimne	eys, flues and fans	s = (6a) + (6b) + (7a)	'a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is i	ntended, procee	d to (17), d	otherwise o	ontinue fr	rom (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	uction			0	(11)
if both types of wall are p deducting areas of open			the great	er wall are	a (after					
If suspended wooden			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else ente	er 0							0	(13)
Percentage of window	rs and doors drau	ght stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value	, q50, expressed ii	n cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then (18	$(3) = [(17) \div 20] + (8)$	B), otherwi	ise (18) = (16)				0.15	(18)
Air permeability value appli	es if a pressurisation te	est has been dor	ne or a deg	gree air pei	rmeability	is being u	sed			
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpora				(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified		·		1		1	1		1	
Jan Feb	Mar Apr I	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp						1	1		•	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m ∸ 4									
(00-) 4 07 4 05	<u> </u>	00 005	0.05			1 4 00	1 440	1 4 4 0	Ī	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.16	0.16	0.16	0.14	0.14	0.12	0.12	(21a) x	(22a)m 0.13	0.14	0.14	0.15		
Calculate effe			-	_	l -	_	0.12	0.13	0.14	0.14	0.15		
If mechanica	al ventila	ition:										0.5	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	n Table 4h) =				76.5	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	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 h if (22b)r	ouse ext n < 0.5 ×			•	•				5 × (23b))			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation			•	•				0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•		
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25
3. Heat losse	c and he	nat loce r	aramata	or:									
	Gros	•	Openin		Net Ar	00	U-valı	10	AXU		k-value	Δ Λ	Χk
ELEMENT	area		m		A,r		W/m2		(W/I	K)	kJ/m²-k		J/K
Doors					2.68	X	1	= [2.68				(26)
Windows Type) 1				5.74	x1,	/[1/(1.3)+	0.04] =	7.09	$\overline{}$			(27
Windows Type	2				6.05	x1,	/[1/(1.3)+	0.04] =	7.48				(27
Floor					71.42	<u>x</u>	0.11	=	7.8562			$\neg \vdash$	(28
Walls Type1	60.2	25	14.4	7	45.78	x	0.15	=	6.87				(29
Walls Type2	18.4	12	0		18.42	. x	0.13	<u> </u>	2.43				(29
Total area of e	lements	, m²			150.09	9							(31
Party wall					19.66	x	0	=	0	\neg			(32
* for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	 ated using	formula 1	 /[(1/U-valu	re)+0.04] a	as given in	paragraph	3.2	
** include the area				ls and par	titions								
Fabric heat los		•	U)				(26)(30)	+ (32) =			ļ	34.41	(33
Heat capacity	,								.(30) + (32	, , ,	(32e) =	9148.2	(34
Thermal mass	•	•		•					tive Value		l	100	(35
For design assess can be used inste				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						11.24	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =		ĺ	45.65	(37
Total fabric he		alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)		
Total fabric he Ventilation hea	at ioss ca				1	Jul	Aug	Sep	Oct	Nov	Dec		
	Feb	Mar	Apr	May	Jun	o a i					1 200 1		
Ventilation hea		Mar 18.38	Apr 17.31	May 17.1	16.03	16.03	15.81	16.46	17.1	17.53	17.96		(38
Jan 38)m= 18.81	Feb 18.6	18.38	·				<u> </u>	16.46	17.1 = (37) + (37)	17.53	+		(38
Ventilation hea	Feb 18.6	18.38	·				<u> </u>	16.46	<u> </u>	17.53	+		(38)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.9	0.9	0.9	0.88	0.88	0.86	0.86	0.86	0.87	0.88	0.88	0.89		
				•		•	•	•	Average =	Sum(40) ₁ .	12 /12=	0.88	(40)
Number of day	<u> </u>	<u> </u>				l				T			
Jan 34	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/	C										1.10/1./		
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i										1			
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
_										m(44) ₁₁₂ =	<u> </u>	1060.23	(44)
Energy content of) kWh/mor			c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
If instantaneous v	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	<u> </u>	1390.13	(45)
(46)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Water storage				<u> </u>		<u> </u>	<u> </u>						
Storage volum	ne (litres)) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	-			_			, ,		(01.1/				
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):				1	.2		(48)
Temperature f	actor fro	m Table	2b							0	.6		(49)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(48) x (49)) =		0.	72		(50)
b) If manufact			-										
Hot water stor If community h	-			ie 2 (KVV	n/litre/da	ay)					0		(51)
Volume factor	•		511 4.5								0		(52)
Temperature f	actor fro	m Table	2b							—	0		(53)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	72		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)	 -		
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

0 1 - 1		((04)	(00)	05 (44)	.						
Combi loss				,	` ,	· ` `		Ι ,	Ι ,	Ι ,	Ι ,	1	(61)
(61)m= 0		0	0	0	0	0	0	0	0	0	0	(50)	(01)
	-i						` 		` 	ì ´ 	` ´ 	(59)m + (61)m 1	(00)
(62)m= 189.		175.66	157.52	154.4	138.01	132.59	145.43	145.15	163.33	172.65	185.16	J	(62)
Solar DHW inp									r contribut	ion to wate	er heating)		
(add additio	1				applies 0	, see Ap) 0	0	0		1	(63)
(63)m = 0	0	0	0	0	U	0	0		0	0	0	J	(03)
Output from			457.50	454.4	400.04	100.50	445.40	145.15	100.00	470.05	405.40	1	
(64)m= 189.	71 167.23	175.66	157.52	154.4	138.01	132.59	145.43	L	163.33	172.65	185.16	1926.82	(64)
Llast value	£	l ti	L-\ \ / / / /		- ′ [0 0=	(45)				r (annual)](04)
Heat gains	1	1				1	r e	T T	T T	1	1	·] 1	(65)
(65)m= 84.3		79.72	73	72.65	66.51	65.4	69.66	68.88	75.62	78.03	82.88]	(03)
,	57)m in cald			•	ylınder ı	s in the o	dwelling	or hot w	ater is f	rom com	munity r	ieating	
5. Interna	gains (see	e Table 5	and 5a):									
Metabolic g			_				l .		<u> </u>	T	-	1	
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(66)m= 114		114	114	114	114	114	114	114	114	114	114	J	(66)
Lighting gai	<u> </u>											1	
(67)m= 18.5	16.47	13.39	10.14	7.58	6.4	6.92	8.99	12.06	15.32	17.88	19.06	J	(67)
Appliances	` 	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		1	1	
(68)m= 200.	59 202.67	197.42	186.26	172.16	158.91	150.06	147.98	153.23	164.39	178.49	191.74		(68)
Cooking ga	ins (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5				
(69)m= 34.	4 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and	fans gains	(Table 5	ia)									_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporation	n (negat	ive valu	es) (Tab	le 5)		_			_		_	
(71)m= -91.	2 -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heati	ng gains (T	Table 5)										_	
(72)m= 113.	42 111.38	107.15	101.38	97.64	92.38	87.9	93.64	95.67	101.64	108.37	111.39		(72)
Total interi	nal gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 389.	76 387.73	375.17	354.98	334.59	314.89	302.08	307.81	318.17	338.55	361.94	379.39		(73)
6. Solar ga	ains:												
-	re calculated	•				•	itions to co	onvert to th	ne applical		tion.		
Orientation:			Area m²		Flu		7	g_ able 6b	т	FF		Gains	
	Table 6d					ble 6a	,	able ob	_ '	able 6c		(W)	_
East 0.9	0.77	х	5.7	' 4	X 1	9.64	x	0.5	x	0.7	=	27.34	(76)
East 0.9	0.77	X	5.7	' 4	x 3	38.42	х	0.5	X	0.7	=	53.49	(76)
East 0.9	0.77	X	5.7	' 4	x (3.27	x	0.5	x	0.7	=	88.09	(76)
East 0.9	0.77	X	5.7	74	x 9	92.28	x	0.5	x	0.7	=	128.48	(76)
East 0.9	0.77	х	5.7	' 4	x 1	13.09	x	0.5	x	0.7	=	157.45	(76)

	-											_			_		_
East	0.9x	0.77	X	5.7	74	x	1	15.77	X		0.5	X	0.7		<u></u> =	161.18	(76)
East	0.9x	0.77	X	5.7	74	x	1	10.22	X		0.5	X	0.7] =	153.45	(76)
East	0.9x	0.77	X	5.7	74	x [g	94.68	X		0.5	X	0.7] =	131.81	(76)
East	0.9x	0.77	X	5.7	74	x	7	'3.59	X		0.5	X	0.7] =	102.45	(76)
East	0.9x	0.77	X	5.7	74	x	4	5.59	X		0.5	x	0.7] =	63.47	(76)
East	0.9x	0.77	X	5.7	74	x [2	24.49	X		0.5	X	0.7] =	34.09	(76)
East	0.9x	0.77	X	5.7	74	x [1	6.15	x		0.5	x	0.7		=	22.49	(76)
West	0.9x	0.77	X	6.0)5	x [1	9.64	X		0.5	x	0.7] =	28.82	(80)
West	0.9x	0.77	X	6.0)5	x	3	88.42	X		0.5	x	0.7] =	56.38	(80)
West	0.9x	0.77	X	6.0)5	x	6	3.27	x		0.5	x	0.7] =	92.85	(80)
West	0.9x	0.77	X	6.0)5	x	9	2.28	x		0.5	×	0.7] =	135.41	(80)
West	0.9x	0.77	x	6.0)5	x	1	13.09	x		0.5	×	0.7		<u> </u>	165.96	(80)
West	0.9x	0.77	x	6.0)5	x [1	15.77	x		0.5	x	0.7		=	169.88	(80)
West	0.9x	0.77	x	6.0)5	×	1	10.22	x		0.5	x	0.7		=	161.74	(80)
West	0.9x	0.77	х	6.0)5	×	9	94.68	x		0.5	x	0.7		=	138.93	(80)
West	0.9x	0.77	x	6.0)5	x	7	' 3.59	x		0.5	×	0.7		Ī =	107.99	(80)
West	0.9x	0.77	x	6.0)5	x [4	15.59	x		0.5	×	0.7		j =	66.9	(80)
West	0.9x	0.77	x	6.0)5	x [2	24.49	x		0.5	x	0.7		Ī =	35.94	(80)
West	0.9x	0.77	x	6.0)5	×	1	6.15	x		0.5	×	0.7		Ī =	23.7	(80)
	-					•									_		
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	n = Su	m(74)m .	(82)m				_	
(83)m=	56.16	109.87	180.94	263.89	323.41	33	31.06	315.19	270	.74	210.44	130.3	7 70.03	4	6.19		(83)
Total g	ains – i	nternal a	and solar	r (84)m =	= (73)m	+ (8	33)m	, watts					-	•		•	
(84)m=	445.92	497.6	556.11	618.87	657.99	64	15.96	617.27	578	.55	528.61	468.9	2 431.97	42	25.58		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	า)											
Temp	erature	during h	neating p	eriods in	n the livi	ing a	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for g	ains for	living are	ea, h1,m	า (ระ	ee Ta	ıble 9a)									
	Jan	Feb	Mar	Apr	May	T,	Jun	Jul	Α	ug	Sep	Oct	Nov	,	Dec		
(86)m=	0.96	0.94	0.9	0.83	0.71	0).55	0.42	0.4	16	0.67	0.86	0.94	C).96		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able	9c)			•			
(87)m=	19.22	19.45	19.83	20.31	20.68	1	20.9	20.97	20.		20.8	20.32	19.7	1	9.19		(87)
Temn	oraturo	during h	eating r	ariode in	rest of	: dw	مااام	from Ta	عاما	Th	2 (°C)		_!	_!			
(88)m=	20.17	20.17	20.17	20.18	20.19	1	20.2	20.2	20		20.19	20.19	20.18	2	0.18		(88)
			<u> </u>	<u> </u>	<u> </u>			<u> </u>	L								` ,
I		tor for g	î .	ì		1	•	ì	r –	o T	0.62	0.94	0.02		0.06		(89)
(89)m=	0.95	0.93	0.89	0.81	0.67		0.5	0.35	0.3		0.62	0.84	0.93	1,	0.96		(09)
I		l temper	i e	i e	i e	ΤŤ	•	i	i –							1	<i>(</i>)
(90)m=	17.77	18.1	18.65	19.33	19.82	2	20.1	20.18	20.	17	19.99	19.35			7.73		(90) —
											f	LA = Liv	/ing area ÷	(4) =		0.38	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellino	g) = fl	LA × T1	+ (1	– fL/	A) × T2						
																	
(92)m=	18.33	18.62	19.1	19.71	20.15	~	0.41	20.48	20.	_	20.3	19.72	18.94	1	8.29		(92)

1			Γ	1	Ι	1		ı	ı		i	ı	l	(00)
(93)m=	18.33	18.62	19.1	19.71	20.15	20.41	20.48	20.47	20.3	19.72	18.94	18.29		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	ulata	
				nperatui using Ta		ied at st	ер 11 от	rable 9	o, so tna	it 11,m=(76)m an	d re-calc	sulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	<u> </u>				19						
(94)m=	0.94	0.92	0.87	0.79	0.67	0.51	0.38	0.41	0.63	0.83	0.91	0.94		(94)
Usefu	ıl gains,	hmGm ,	, W = (9	4)m x (8	4)m								l	
(95)m=	418.21	455.76	485.31	489.31	440.66	330.71	231.64	239.72	331.87	387.31	394.64	401.88		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able 8	!		•	!	•	•	l	
(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 mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	904.26	881.18	806.93	680.29	530.11	358.04	239.22	250.14	385	572.24	748.04	896.08		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	361.62	285.88	239.29	137.5	66.55	0	0	0	0	137.59	254.45	367.68		
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1850.56	(98)
Space	e heating	g require	ement in	kWh/m²	² /year								25.91	(99)
8c Sr	nace cod	olina rea	uiremer	nt	•									
				August.	See Ta	hle 10h								
Odiod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat			<u> </u>	<u> </u>	<u> </u>	rnal tem			<u> </u>		ļ			
(100)m=		0	0	0	0	579.74	456.39	467.1	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm		<u>I</u>	1	<u>I</u>			<u>I</u>				
(101)m=	0	0	0	0	0	0.87	0.92	0.9	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	(101)m		ı			ı				
(102)m=	0	0	0	0	0	506.5	418.57	421.04	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		•	•	l	
(103)m=	0	0	0	0	0	829.08	794.13	749.99	0	0	0	0		(103)
						dwelling,	continu	ous (kW	h = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
,		Ì		3 × (98	Í						1		ı	
(104)m=	0	0	0	0	0	232.26	279.41	244.74	0	0	0	0		_
01	l f !									l = Sum(•	=	756.4	(104)
	d fraction		able 10b	`					1 C =	coolea	area ÷ (4	4) =	0.74	(105)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)	Ů					1 0.20	1 0.20	0.20		l = Sum(=	0	(106)
Space	coolina	reauirer	ment for	month =	: (104)m	× (105)	× (106)r	m	rota	ı – Gam	18081)		U	(100)
(107)m=		0	0	0	0	42.74	51.42	45.04	0	0	0	0		
				Į		!	<u> </u>	ļ.	 Total	l = Sum(107)	=	139.19	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear) ÷ (4) =	,		1.95	(108)
		•			•	scheme			(.07)	, . (.) =			1.00	
				· ·	Ĭ	ing or wa		ting prov	ided by	a comm	unity och	nomo		
						nentary l					urinty SCI	ieilie.	0	(301)
	-			-		-	_		,					닠` `
riactio	iii oi spa	ice neat	пош со	mmunity	system	1 – (30	1)=						1	(302)

The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se		our other heat source	s; the		7(202-)
Fraction of heat from Community boilers		(202) × (2025)	F	1	(303a)
Fraction of total space heat from Community boilers	itu baatiaa ayataa	(302) x (303a) =		1	(304a)
Factor for control and charging method (Table 4c(3)) for commun			Ļ	1	(305)
Distribution loss factor (Table 12c) for community heating system				1.05	(306)
Space heating Annual space heating requirement			Г	1850.56	기
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =		1943.09	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	ndix E)		0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 1	100 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				1926.82]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =		2023.16	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)]	- [39.66	(313)
Cooling System Energy Efficiency Ratio				6.59	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=		21.13	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from or	utside			161.41	(330a)
warm air heating system fans			F	0	(330b)
pump for solar water heating			F	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		161.41	(331)
Energy for lighting (calculated in Appendix L)				327.49	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		nissions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using to	wo fuels repeat (363) to	(366) for the second	fuel	93.5	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	=	916.27	(367)
Electrical energy for heat distribution [(3	313) x	0.52	=	20.58	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372	2)	=	936.85	(373)
CO2 associated with space heating (secondary) (36	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) =			936.85	(376)
CO2 associated with space cooling (3	15) x	0.52	=	10.97	(377)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	=	83.77	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	=	169.97	(379)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate $(383) \div (4) =$ El rating (section 14)

1201.56	(383)
16.82	(384)
86.17	(385)

			User D) otoilo:						
Assessor Name:	Lindsey Arnott			Strom:	o Nium	bor		STDC	0035000	
Software Name:	Stroma FSAP 20)12		Softwa					on: 1.0.5.9	
Continuito Italiio.	3. 3. 1. 3. 1. 2. 3. 1. 3.			Address				7 0 10 10	71101010	
Address :	The Alders, Aldrin		i i							
1. Overall dwelling dime		<u> </u>	,							
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			7	1.42	(1a) x	2	.85	(2a) =	203.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	le)+(1r	1) 7	1.42	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	203.55	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	- - -	0	Ī = Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	3	x ·	10 =	30	(7a)
Number of passive vents	S				<u> </u>	0	x ·	10 =	0	(7b)
Number of flueless gas f						0	x	40 =	0	(7c)
rtambor of hadrood gad h										(70)
								Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(7c) =	Γ	30		÷ (5) =	0.15	(8)
If a pressurisation test has b	peen carried out or is inten	ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
deducting areas of openi	resent, use the value corr ings); if equal user 0.35	esponding to	tne great	er wall are	a (atter					
If suspended wooden	• / .	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else enter 0)							0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	-								0.4	(18)
Air permeability value applie		as been dor	ne or a deg	gree air pe	rmeability	is being u	sed			_
Number of sides shelters Shelter factor	ed			(20) = 1 -	n 075 x (1	9)1 –			2	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		0/] —			0.85	(20)
Infiltration rate modified f		ad		(21) - (10)	/ X (20) -				0.34	(21)
Jan Feb	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec	1	
<u> </u>		/ J Juli	Jui	Aug	ОСР	001	1407	Dec]	
Monthly average wind sp (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	
()	77	1 0.0	I	I	7	I +.0	1 7.0	I	1	
Wind Factor (22a)m = (2	2)m ÷ 4		•	•					7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	(22a)m _{0.34}	0.36	0.38	0.4]	
	ctive air	change i			cable ca	se				<u> </u>	!]	
If mechanica												0	(23
If exhaust air h		0 11		, ,	,	. `	,, .	•) = (23a)			0	(23
If balanced with		•	•	_								0	(23
a) If balance	1					- ` ` 		<u> </u>	 		- ` ` `) ÷ 100] ī	10.
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	1							<u> </u>	- 	- 	1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h		tract ven ‹ (23b), t		•	-				5 x (23h	<i>)</i>			
$\frac{11(225)1}{24c)m=0}$	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(24
d) If natural]	`
		en (24d)							0.5]				
24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(25
2 Heat lease	o and he	ot loss r	oromot	S#1									
3. Heat losse		·			Not Am		اميدا		A V I I		بريامير با	- Λ	V I
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		X k J/K
Ooors					2.68	x	1		2.68	,			(26
Vindows Type	e 1				5.74	x1,	/[1/(1.4)+	0.041 =	7.61				(27
Vindows Type													(21
	e 2				6.05	x ₁ ,	/[1/(1.4)+	L		=			
Floor	e 2				6.05	=		L	8.02	9 [(27)
loor		25	14.4	7	71.42	2 x	0.13	0.04] = [8.02 9.28459	9 [(27
loor Valls Type1	60.2		14.4	7	71.42	2 x x x	0.13	0.04] = [8.02 9.28459 8.24	9 [(27)
Floor Valls Type1 Valls Type2	60.2	12	14.4	7	71.42 45.78 18.42	2 x x x x x x	0.13	0.04] = [8.02 9.28459	9 [(27)
Floor Valls Type1 Valls Type2 Fotal area of e	60.2	12		7	71.42 45.78 18.42	2 x 3 x 2 x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32	9 [(27) (28) (29) (29) (31)
Tloor Valls Type1 Valls Type2 Total area of ee Party wall	60.2 18.4 elements	, m²	0		71.42 45.78 18.42 150.0	2 x 3 x 2 x 9 x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32		paragraph		(27)
Floor Valls Type1 Valls Type2 Fotal area of experty wall for windows and	60.2 18.4 elements	, m²	0	ndow U-va	71.42 45.78 18.42 150.0 19.66	2 x 3 x 2 x 9 x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32		paragrapi	h 3.2	(27)
Floor Valls Type1 Valls Type2 Fotal area of earty wall for windows and tinclude the area	60.2 18.4 Elements	, m² ows, use e	0 Iffective winternal wall	ndow U-va	71.42 45.78 18.42 150.0 19.66	x x x x y x x y x x y x x y x x y x x y x x y x x x y x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32		paragrapi	h 3.2	(27)
Floor Valls Type1 Valls Type2 Fotal area of experty wall for windows and * include the area Fabric heat los	60.2 18.4 Elements Troof winders on both ss, W/K =	, m ² ows, use e sides of in = S (A x	0 Iffective winternal wall	ndow U-va	71.42 45.78 18.42 150.0 19.66	x x x x y x x y x x y x x y x x y x x y x x y x x x y x	0.13 0.18 0.18 0 formula 1	$0.04] = \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix} /[(1/U-valu) + (32)] = \begin{bmatrix} \\ \\ \end{bmatrix}$	8.02 9.28459 8.24 3.32	as given in			(27 (28 (29 (29 (31 (32
Floor Valls Type1 Valls Type2 Fotal area of exparty wall for windows and * include the area Fabric heat lost Heat capacity	60.2 18.4 elements froof winder as on both as, W/K = Cm = S(ows, use e sides of in = S (A x (A x k)	0 Iffective winternal walk	ndow U-va	71.42 45.78 18.42 150.0 19.66 alue calculatitions	x x x x y x y x x x y x x y x x y x x y x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1	$0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} + (32) = ((28)$	8.02 9.28459 8.24 3.32 0 (e)+0.04] a	as given in 2) + (32a).		39.15	(25) (25) (25) (37) (37) (37) (37)
Floor Valls Type1 Valls Type2 Fotal area of expansion of	60.2 18.4 I roof winder as on both as S, W/K: Cm = S(is parameter symmetry when the symmetry when	ows, use e sides of in = S (A x (A x k) ster (TMF	offective winternal walk U) P = Cm ÷	ndow U-va Is and part	71.42 45.78 18.42 150.0 19.66 alue calculatitions	x x x y x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2	(27) (28) (29) (32) (32) (32) (32)
Floor Valls Type1 Valls Type2 Fotal area of every wall for windows and the include the area fabric heat loss leat capacity Thermal mass for design assess an be used inste	60.2 18.4 Plements I roof winder as on both ss, W/K = Cm = S(a parame asments wheread of a decease.	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu	offective winternal wall U) P = Cm - tails of the culation.	ndow U-ve ls and part - TFA) ir constructi	71.42 45.78 18.42 150.0 19.66 alue calculatitions	x x x y x y x x y x t known pr	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2 250	(27) (28) (29) (32) (32) (32) (32) (32)
Floor Valls Type1 Valls Type2 Fotal area of experiments For windows and the include the area Fabric heat loss fleat capacity Thermal mass for design assess an be used inste	60.2 18.4 I roof winder as on both as S, W/K: Cm = S(a parame as sments where ad of a decrease is S (L	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	offective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x y x x y x t known pr	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2	(27 (28 (29 (31) (32)
Floor Valls Type1 Valls Type2 Fotal area of exparty wall for windows and include the area fabric heat los fleat capacity fleat mass for design assess an be used inste fleatals of thermal	60.2 18.4 I roof winder as on both as on both ss, W/K: Cm = S(s parame sments whead of a decrease is S (L. al bridging)	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	offective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x x x y x x x x x x x x y x x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2 250 8.02	(27) (28) (29) (32) (32) (32) (34)
Valls Type1 Valls Type2 Total area of every wall for windows and invited the area Tabric heat loss deat capacity Thermal mass for design assess an be used instevential bridge details of thermal fotal fabric he	60.2 18.4 Pelements I roof winder as on both as, W/K: Cm = S(a parame and of a december is S (L al bridging at loss	ows, use e sides of in S (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	offective winternal walk U) P = Cm : tails of the ulation. culated to own (36) =	ndow U-vals and part - TFA) ir constructi using Ap	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x x x y x x x x x x x x y x x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 (a) + (a) 4 3.32 1.(30) + (a) 4 2.(30) + (a) 4 3.32 1.(30) + (a) 4 3.(30) + (a) 4 3.(as given in 2) + (32a). : Medium TMP in Ta	(32e) =	39.15 9148.2 250	(27 (28 (29 (31 (32 (32 (32 (34 (36)
Valls Type1 Valls Type2 Total area of every wall for windows and the include the area Fabric heat loss and the capacity Thermal mass for design assess and be used instermal bridge the thermal bridge of details of thermal fotal fabric hermal	60.2 18.4 Plements I roof winder as on both as, W/K = Cm = S(aparame and of a december is S (L al bridging at loss at loss ca	ows, use e sides of in = S (A x k) eter (TMF) ere the de tailed calculated are not kn	offective winternal walk U) P = Cm : tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir constructi using Ap	71.42 45.78 18.42 150.0 19.66 alue calculatitions h kJ/m²K ion are not opendix k	x x x y x x y x x y x x y x x y x x x y x x x x y x x x x x y x	0.13 0.18 0.18 0 formula 1. (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 (a) + (32) (ive Value e values of (36) = 0.33 × (2) + (32a).: Medium	(32e) = able 1f	39.15 9148.2 250 8.02	(27) (28) (29) (32) (32) (32) (34)
Floor Valls Type1 Valls Type2 Total area of experience of	60.2 18.4 Pelements I roof winder as on both as, W/K: Cm = S(a parame and of a december is S (L al bridging at loss	ows, use e sides of in S (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	offective winternal walk U) P = Cm : tails of the ulation. culated to own (36) =	ndow U-vals and part - TFA) ir constructi using Ap	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x x x y x x x x x x x x y x x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 10 10 10 10 10 10 10 10 10	as given in 2) + (32a). : Medium TMP in Ta	(32e) =	39.15 9148.2 250 8.02	(27 (28 (29 (31 (32 (33 (34 (35)
Valls Type1 Valls Type2 Total area of exparty wall for windows and include the area Tabric heat loss deat capacity Thermal mass for design assess an be used insternated bridge details of thermal fotal fabric head ventilation head	60.2 18.4 Pelements I roof winder as on both as, W/K: Cm = S(a parame and of a decese : S (L al bridging at loss at loss cat Feb 39.57	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn alculated Mar 39.34	offective winternal walk U) P = Cm + tails of the culation. culated (count) C	ndow U-vals and part - TFA) ir constructi using Ap = 0.05 x (3	71.42 45.78 18.42 150.0 19.66 alue calculations kJ/m²K ion are not opendix h 1) Jun	x x x y x y x y x y x y x y x y x y x y	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 1e)+0.04] a 1ive Value of values of (36) = 0.33 × (0) Oct	2) + (32a). : Medium : TMP in Ta 25)m x (5) Nov 38.43	(32e) = able 1f Dec	39.15 9148.2 250 8.02	(27 (28 (29 (31 (32 (32 (32 (33 (34 (35) (36)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.22	1.21	1.21	1.2	1.19	1.18	1.18	1.18	1.18	1.19	1.2	1.2		
` /				<u> </u>		<u> </u>	<u> </u>	<u> </u>	L Average =	Sum(40) ₁ .	12 /12=	1.2	(40)
Number of day	s in mo	nth (Tabl	e 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
-													
4. Water heat	ing ono	rav roqui	romont:								kWh/ye	or:	
4. Water Heat	ing ene	igy requi	rement.								KVVII/ ye	zai.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		28		(42)
Annual averag	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.35		(43)
not more that 125	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 ir	n litres pe	r day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
-	h = 1= 1 =				400 - 1/-/ -		T / 000/			m(44) ₁₁₂ =		1060.23	(44)
Energy content of		usea - car		ontniy = 4.	190 x va,r		1 m / 3600) KVVII/MOR	ıtrı (see 18		c, 1a)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		– ,
If instantaneous w	ater heati	na at noint	of use (no	n hot water	· storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	- I	1390.13	(45)
			-						17.00	1 40 00			(46)
(46)m= 21.62 Water storage	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Storage volum) includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '		•			•					100		(**)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	55		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	84		(50)
b) If manufact			-										
Hot water stora	-			le 2 (kW	h/litre/da	ay)					0		(51)
If community h	•		JII 4.3										(52)
Temperature fa			2b							—	0		(53)
Energy lost fro				aar			(47) x (51)) x (52) x (53) -				(54)
Enter (50) or (_	, KVVII/ y	Jai			(47) X (01)) X (02) X (00) =	-	0 84		(55)
Water storage		,	or each	month			((56)m = ((55) × (41)	m	<u> </u>	<u> </u>		()
					05.44		·	1	ī	25.14	25.00		(56)
(56)m= 25.98 If cylinder contains	23.47	d solar sto	25.14	25.98 m = (56) m	25.14 x [(50) – (25.98 H11)] ÷ (5)	25.98 0), else (5	25.14 7)m = (56)	25.98 m where (25.14 H11) is fro	25.98 m Append	ix H	(30)
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
` ′				<u>l</u>									, ,
Primary circuit	•	•			E0\	(EO) - OC	SE /44\	·m			0		(58)
Primary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
(33)111- 23.20	21.01	20.20	١ ٠٠.٦	25.20	22.01	25.20	25.20	22.01	25.20	22.01	20.20		(55)

Combi loss c	alculated	for oach	month ((61)m –	(60) · 3	65 v (41	/m						
(61)m= 0	0 0	0	0	0	0	05 x (41	0	0	0	0	0	1	(61)
	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				ļ	J · (59)m + (61)m	
(62)m= 193.37	`	179.32	161.06	158.06	141.55	136.25	149.0		166.99	176.19	188.82]	(62)
Solar DHW inpu	t calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter	'0' if no sola	r contribut	tion to wate	er heating)	,	
(add addition	al lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	water hea	ter											
(64)m= 193.37	7 170.53	179.32	161.06	158.06	141.55	136.25	149.0	148.69	166.99	176.19	188.82		_
							0	utput from w	ater heate	r (annual)	112	1969.92	(64)
Heat gains from	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	k [(46)m	+ (57)m	+ (59)m	<u>.</u>]	
(65)m= 87.32	77.49	82.64	75.83	75.57	69.34	68.32	72.59	71.72	78.55	80.86	85.8]	(65)
include (57)m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):									
Metabolic gai	ins (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_	
(67)m= 18.54	16.47	13.39	10.14	7.58	6.4	6.92	8.99	12.06	15.32	17.88	19.06		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5				
(68)m= 200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.9	3 153.23	164.39	178.49	191.74		(68)
Cooking gain	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5				
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and fa	ans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heating	g gains (T	able 5)										_	
(72)m= 117.36	115.32	111.08	105.32	101.58	96.31	91.83	97.57	99.61	105.57	112.31	115.33		(72)
Total interna	al gains =				(66)m + (67)m	n + (68)r	n + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 396.69	394.66	382.1	361.92	341.52	321.83	309.01	314.7	325.1	345.49	368.88	386.33		(73)
6. Solar gair													
Solar gains are		_					itions to	convert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
- .							, –						1
East 0.9x		X	5.7	74	X	19.64]	0.63		0.7	=	34.45	(76)
East 0.9x		X	5.7			38.42] X _	0.63	×	0.7	=	67.4	[(76)
East 0.9x		X	5.7			63.27] X _	0.63	×	0.7	=	110.99	[(76)
East 0.9x		X	5.7			92.28]	0.63	x	0.7	=	161.88	(76)
East 0.9x	0.77	X	5.7	74	x 1	13.09	X	0.63	Х	0.7	=	198.39	(76)

	_								_						
East	0.9x	0.77	Х	5.7	' 4	X	1	15.77	X	0.63	X	0.7	=	203.09	(76)
East	0.9x	0.77	X	5.7	' 4	X	1	10.22	X	0.63	X	0.7	=	193.35	(76)
East	0.9x	0.77	X	5.7	' 4	X	9	94.68	X	0.63	X	0.7	=	166.08	(76)
East	0.9x	0.77	X	5.7	' 4	X	7	73.59	x	0.63	X	0.7	=	129.09	(76)
East	0.9x	0.77	X	5.7	' 4	X	4	15.59	X	0.63	X	0.7	=	79.97	(76)
East	0.9x	0.77	X	5.7	' 4	X	2	24.49	х	0.63	X	0.7	=	42.96	(76)
East	0.9x	0.77	X	5.7	' 4	x	1	6.15	x	0.63	X	0.7	=	28.33	(76)
West	0.9x	0.77	x	6.0)5	X	1	9.64	x	0.63	x	0.7	_ =	36.31	(80)
West	0.9x	0.77	X	6.0)5	X	3	88.42	x	0.63	x	0.7	-	71.04	(80)
West	0.9x	0.77	X	6.0)5	X	6	3.27	x	0.63	x	0.7		116.99	(80)
West	0.9x	0.77	x	6.0)5	X	9)2.28	x	0.63	x	0.7	=	170.62	(80)
West	0.9x	0.77	X	6.0)5	X	1	13.09	x	0.63	x	0.7	=	209.1	(80)
West	0.9x	0.77	X	6.0)5	X	1	15.77	x	0.63	x	0.7	-	214.05	(80)
West	0.9x	0.77	X	6.0)5	X	1	10.22	x	0.63	x	0.7	-	203.79	(80)
West	0.9x	0.77	X	6.0)5	X	9	94.68	x	0.63	X	0.7		175.05	(80)
West	0.9x	0.77	x	6.0)5	X	7	' 3.59	x	0.63	×	0.7	-	136.06	(80)
West	0.9x	0.77	X	6.0)5	X	4	15.59	X	0.63	×	0.7	-	84.29	(80)
West	0.9x	0.77	X	6.0)5	X	2	24.49	X	0.63	×	0.7	-	45.28	(80)
West	0.9x	0.77	x	6.0)5	X	1	6.15	x	0.63	×	0.7	-	29.86	(80)
	_								_						
Solar g	ains in	watts, ca	alculated	I for eac	h month	า			(83)m	n = Sum(74)m	(82)m				
(83)m=	70.77	138.44	227.98	332.5	407.49	$\overline{}$	17.14	397.14	341	.13 265.16	164.2	7 88.24	58.2]	(83)
Total g	ains – i	nternal a	nd solar	(84)m =	(73)m	+ (83)m	, watts		•		•	!	-	
(84)m=	467.46	533.1	610.09	694.42	749.02	7	38.97	706.15	655	.88 590.26	509.7	5 457.12	444.52]	(84)
7. Mea	an inter	nal temp	erature	(heating	seasoi	า)									
				`			area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	ctor for g	ains for I	living are	ea, h1,n	- n (s	ee Ta	ıble 9a)							
[Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	А	ug Sep	Oct	Nov	Dec]	
(86)m=	1	0.99	0.98	0.95	0.85		0.68	0.51	0.5	0.83	0.97	0.99	1	1	(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	ollo	w ste	ns 3 to 7	7 in T	able 9c)	•	•	•	_	
(87)m=	19.72	19.87	20.15	20.51	20.8	_	20.95	20.99	20.		20.49	20.04	19.7]	(87)
Temp	oraturo	during h	eating n	ariade ir	rest of	F dv	elling	from Ta	ahla (9, Th2 (°C)	!		<u>!</u>	1	
(88)m=	19.91	19.91	19.91	19.92	19.93	_	19.94	19.94	19.	` 	19.93	19.92	19.92	1	(88)
L								<u> </u>			1	1		_	, ,
Utilisa (89)m=	tion fac	tor for g	0.98	0.93	welling, _{0.8}	1	, m (se 0.59	0.4	9a) 0.4	15 0.75	0.96	0.99	1	1	(89)
L		<u> </u>						<u> </u>		<u> </u>		0.99	ļ !]	(00)
г				1	1	Ť	•	i	r i —	to 7 in Tab	'		ı	1	(2.0)
(90)m=	18.21	18.44	18.84	19.36	19.73		9.91	19.93	19.		19.34	_!	18.18		(90)
											TLA = Li	ving area ÷ (4) =	0.38	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	g) = f	LA × T1	+ (1	– fLA) × T2				-	
(92)m=	18.79	18.99	19.34	19.8	20.14	2	20.31	20.34	20.	34 20.23	19.78	19.21	18.76		(92)
Apply	adjustr	nent to th	ne mean	interna	tempe	ratu	ire fro	m Table	4e,	where appr	opriate	:			

(02)	40.70	40.00	40.24	40.0	20.44	20.24	20.24	00.04	20.00	40.70	40.04	40.70	1	(93)
(93)m=	18.79	18.99	19.34	19.8	20.14	20.31	20.34	20.34	20.23	19.78	19.21	18.76		(93)
			uirement				44 -4	Table 0	41	4 T: /	70)	-11-	lata	
			or gains			ed at ste	ер ттог	rable 9	b, so tha	t 11,m=(rojm an	a re-caid	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					1					•	
(94)m=	0.99	0.99	0.97	0.93	0.81	0.62	0.44	0.5	0.77	0.95	0.99	1		(94)
			, W = (94	<u> </u>			ı	1					Ī	(0.7)
(95)m=		527.5	594.32	642.87	608.7	458.75	311.56	325.06	456.32	485.85	452.31	442.62		(95)
			rnal tem					T			<u> </u>		ı	(0.0)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
							-``	- ` 	– (96)m		1	1	I	(0-)
			1110.86		719.18	480.66	314.86	330.75	518.81	782.02	1036.64	1253.11		(97)
		· · ·	ı				ı)m – (95	 `	r		1	
(98)m=	591.74	466.75	384.31	207.28	82.19	0	0	0	0	220.35	420.72	603.01		٦
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2976.35	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								41.67	(99)
9a. En	ergy rec	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					_
	e heatir								,					
•		•	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	alculate	d above))	•		•				•	
	591.74	466.75	384.31	207.28	82.19	0	0	0	0	220.35	420.72	603.01		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20	06)		•	•	•		•	•	•	(211)
, ,	632.88	499.2	411.02	221.69	87.91	0	0	0	0	235.67	449.97	644.93		
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	3183.26	(211)
Space	e heatin	a fuel (s	econdar	v). kWh/	month									_
•		•	00 ÷ (20	• , .										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u> </u>	0	(215)
Water	heating	ı												_
	_		ter (calc	ulated al	bove)									
·	193.37	170.53	179.32	161.06	158.06	141.55	136.25	149.09	148.69	166.99	176.19	188.82		
Efficier	ncy of w	ater hea	iter										79.8	(216)
(217)m=	87.61	87.37	86.8	85.49	83.16	79.8	79.8	79.8	79.8	85.55	87.05	87.7		(217)
Fuel fo	r water	heating,	kWh/mo	onth									•	
. ,) ÷ (217)					ī					Ī	
(219)m=	220.72	195.19	206.6	188.4	190.05	177.38	170.74	186.83	186.33	195.19	202.39	215.31		,
								Tota	I = Sum(2				2335.14	(219)
	l totals	ا در د			4					k'	Wh/year	•	kWh/year	7
Space	neating	tuel use	ed, main	system	1								3183.26	_

					_
Water heating fuel used				2335.14	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =		75	(231)
Electricity for lighting				327.49	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	687.58	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	504.39	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=		1191.97	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	169.97	(268)
Total CO2, kg/year	SU	ım of (265)(271) =		1400.87	(272)

TER =

(273)

19.61

			User D	Notoile:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20			Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address:	Flat 13					
1. Overall dwelling dim		tori rtoac	i, OVV 10							
	0.10.01.01		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.85	(2a) =	203.55	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 7	71.42	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	203.55	(5)
2. Ventilation rate:										
		econdar heating	у	other	_	total			m³ per hou	ır
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent for	ans					0	X '	10 =	0	(7a)
Number of passive vent	S				Γ	0	x -	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	X 4	40 =	0	(7c)
					_			Air ch	nanges per ho	
Inditination due to object	over flyer and force	So) ((6b) (/7	'a) ı (7 b) ı ((7 0) –	_					_
Infiltration due to chimne	been carried out or is intend				continue fr	0 om (9) to		÷ (5) =	0	(8)
Number of storeys in		, p, 0000	a to (11),	01110111100	oriando m	0,11 (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	y constr	uction			0	(11)
	present, use the value corre	sponding to	the great	ter wall are	a (after					
deducting areas of open	nings); if equal user 0.35 floor, enter 0.2 (unsea	uled) or 0	1 (seale	ed) else	enter 0				0	(12)
·	nter 0.05, else enter 0	ilou) oi o.	i (ocaic	<i>Ju)</i> , 0100	Cittor o				0	(13)
•	vs and doors draught s	tripped							0	(14)
Window infiltration	· ·	• •		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value	, q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeab	ility value, then (18) = [(17) ÷ 20]+(8	3), otherw	ise (18) = (16)				0.15	(18)
	ies if a pressurisation test ha	as been don	ne or a de	gree air pe	rmeability	is being u	sed			- 1
Number of sides shelter Shelter factor	red			(20) = 1 -	0.075 x (1	9)1 =			2	(19)
Infiltration rate incorpora	ating shelter factor			(21) = (18		-/1			0.85	(20)
Infiltration rate modified	•	d		() (-)	(- /				0.13	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s	1 . 1 .			1 3			1	<u> </u>	J	
(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	
		1	1	1	·	ı	1	ı	ı	
Wind Factor (22a)m = $(2^{2})^{2}$		1005	0.05	T 0.00		4.00		1 4 4 2	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltration rate (allowing for shelter ar	nd wind 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 effective air change rate for the appl	1 ' 1 '	1				1]	
If mechanical ventilation:							0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23	a) × Fmv (equation	(N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing	for in-use factor (fro	m Table 4h) =				76.5	(23c)
a) If balanced mechanical ventilation with he	, , , , , , , , , , , , , , , , , , , 		í `	 		- ` ´	÷ 100]	
(24a)m= 0.28 0.28 0.27 0.26 0.25	0.24 0.24	0.24	0.24	0.25	0.26	0.27		(24a)
b) If balanced mechanical ventilation without	t heat recovery (MV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positif (22b)m < 0.5 \times (23b), then (24c) = (23b)	•			5 × (23b	o)			
(24c)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other				0.5]				
(24d)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (2	4d) in bo	x (25)	-	-	-		
(25)m= 0.28 0.28 0.27 0.26 0.25	0.24 0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losses and heat loss parameter:								
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-val W/m2		A X U (W/		k-value kJ/m²-		X k /K
Doors	2.12 ×	1		2.12	<u></u>			(26)
Windows Type 1	5.74 ×	 1/[1/(1.3)+	0.04] =	7.09	一			(27)
Windows Type 2		1/[1/(1.3)+		16.18	=			(27)
Floor	71.42 x			7.8562	<u>-</u>		\neg	(28)
Walls Type1 60.25 18.83	41.42 X			6.21	=		╡┝	(29)
Walls Type2 10.57 2.12	8.45 X	0.14	╡┇	1.19	=			(29)
Walls Type3 7.84 0	7.84 X			1.04	=		-	(29)
Total area of elements, m ²		0.13		1.04	[(31)
Party wall	150.08							
* for windows and roof windows, use effective window U-v	19.66 X		= /[(1/ ₋ valu	0	L	naragrani		(32)
** include the areas on both sides of internal walls and par		g romaia r	7[(17 0 Valu	0,10.04,0	so giveii iii	paragrapi	7 0.2	
Fabric heat loss, W/K = S (A x U)		(26)(30) + (32) =				41.69	(33)
Heat capacity $Cm = S(A \times k)$			((28)	.(30) + (32	2) + (32a).	(32e) =	6557.64	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) i	n kJ/m²K		Indica	tive Value	: Low		100	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	tion are not known p	precisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges: S (L x Y) calculated using A	ppendix K						12.91	(36)
if details of thermal bridging are not known (36) = $0.05 x$ (37)	31)		(22)	(00)				7,
Total fabric heat loss				(36) =	(2E) (E)	\	54.59	(37)
Ventilation heat loss calculated monthly	1 1 1 11	1 0	``		(25)m x (5)		1	
Jan Feb Mar Apr May	Jun Jul 16.03 16.03	Aug	Sep 16.46	Oct	Nov	17.96	1	(38)
	16.03 16.03	15.81	ļ	17.1	17.53	17.90	J	(50)
Heat transfer coefficient, W/K	70.00 70.00	70.44	1	= (37) + (1	70.55	1	
(39)m= 73.41 73.19 72.98 71.91 71.69	70.62 70.62	70.41	71.05	71.69	72.12	72.55	74.05	(30)
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) - http://wv	vw.stroma.com		,	-verage =	Sum(39)₁	12 / 1∠=	71.8 5 age	<u>2 of 87</u>

0)m= 1.03	meter (F	ILP), W/	m²K		,			(40)m	= (39)m ÷	(4)			
	1.02	1.02	1.01	1	0.99	0.99	0.99	0.99	1	1.01	1.02		
umber of day	o in mar	oth /Tabl	lo 1o)					1	Average =	Sum(40) ₁ .	12 /12=	1.01	(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
′													,
. Water heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1 ·		[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (¯	ΓFA -13.		28		(4
nual averageduce the annual throng that 125	al average	hot water i	usage by t	5% if the d	welling is	designed t			se target o		.35		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage in	ı litres per	day for ea	ch month	Vd,m = fac	ctor from T	able 1c x	(43)			!			
)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
argy contant of	hot water	unad aak	ouloted me	onthly — 4	100 v Vd n	n v nm v [Tm / 2600			m(44) ₁₁₂ =		1060.23	(
ergy content of													
m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53 m(45) ₁₁₂ =	139.58	1390.13	
stantaneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		i olai = Su	III(45) ₁₁₂ =	L	1390.13	
)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(
ater storage													
orage volum	` ,		•			ŭ		ame ves	sel		180		(
community herwise if no	•			•			` '	ers) ente	er 'O' in <i>(</i>	(47)			
ater storage		not wate	1 (4110 111	oluuco II	iotaritar	10000 00	THE DOIL	oro, oric) III (71)			
If manufacti	urer's de	clared lo	oss facto	or is kno	wn (kWh	n/day):				1	.2		(
mperature fa	actor fro	m Table	2b							0	.6		(
		-	kWh/ve	ar							72		
ergy lost fro			-				(48) x (49)) =		0.	12		(
ergy lost from			ylinder l	oss facto		known:	(48) x (49)) =					
ergy lost from If manufaction t water stora	age loss	factor fro	ylinder l om Tabl	oss facto		known:	(48) x (49)) =			0		
ergy lost from If manufactor t water stora community h	age loss eating s	factor fro ee section	ylinder l om Tabl	oss facto		known:	(48) x (49)) =					(
ergy lost from If manufactor t water storal community he	age loss eating s from Tal	factor fro ee section ble 2a	cylinder loom Table on 4.3	oss facto		known:	(48) x (49)) =			0		(
ergy lost from If manufactor t water storal ommunity he lume factor to mperature factor from	age loss eating so from Tab actor from m water	factor from the section of the secti	cylinder loom Table on 4.3 2b	oss facto e 2 (kWl		known: ay)	. , , , ,) =) x (52) x (52)	53) =		0		((
ergy lost from If manufactor water store community had been stored and the manufactor from the manufactor from the following stored (50) or (50).	age loss eating se from Tal actor from m water (54) in (5	factor from the factor from th	eylinder I om Tabl on 4.3 2b , kWh/ye	oss facto e 2 (kWl ear		known: y)	(47) x (51)) × (52) × (0 0		((
ergy lost from If manufaction If water store community he lume factor in mperature factor ergy lost from iter (50) or (in mater storage	age loss eating se from Tal actor from m water (54) in (5	factor from the factor from th	eylinder I om Tabl on 4.3 2b , kWh/ye	oss facto e 2 (kWl ear		known: y)	(47) x (51)				0 0 0 0 0 0		((((
ergy lost from If manufaction water storage ergy lost from the regy lo	age loss eating so from Tab actor from water (54) in (5 loss calc	factor from the factor from th	eylinder loom Table on 4.3 2b , kWh/yetor each	oss factore 2 (kWlear month	n/litre/da	known: y)	(47) x (51) ((56)m = (22.32) x (52) x (55) x (41) (21.6	m 22.32	0.	0 0 0 0 72 22.32		(((; (;
ergy lost from If manufacture water store community had been stored from the regy lost fr	age loss eating so from Tab actor from water (54) in (5 loss calc	factor from the factor from th	eylinder loom Table on 4.3 2b , kWh/yetor each	oss factore 2 (kWlear month	n/litre/da	known: y)	(47) x (51) ((56)m = (22.32) x (52) x (55) x (41) (21.6	m 22.32	0.	0 0 0 0 72 22.32	«Н	(((; (;
ergy lost from If manufaction If water store community he lume factor if mperature factor ergy lost from ter (50) or (atter storage	age loss eating so from Tab actor from water (54) in (5 loss calc	factor from the factor from th	eylinder loom Table on 4.3 2b , kWh/yetor each	oss factore 2 (kWlear month	n/litre/da	known: y)	(47) x (51) ((56)m = (22.32) x (52) x (55) x (41) (21.6	m 22.32	0.	0 0 0 0 72 22.32	κН	()
ergy lost from If manufactor to water storage lost from the following	age loss eating soften Table actor from water (54) in (5 loss calculated 20.16	factor from the factor from th	cylinder loom Table on 4.3 2b , kWh/ye for each 21.6 rage, (57)r	ear month 22.32 m = (56)m 22.32	21.6 x [(50) – (known: y) 22.32 H11)] ÷ (5	(47) x (51) ((56)m = (22.32 0), else (5) x (52) x (41)ı 55) x (41)ı 21.6 7)m = (56)	m 22.32 m where (0. 21.6 H11) is fro	0 0 0 0 72 22.32 m Appendix	«Н	(; (; (; (;
ergy lost from If manufactor to water storal from If	age loss eating so from Tab actor from water 54) in (5 loss cald 20.16 s dedicated 20.16 loss (an loss cald	factor from the factor from th	cylinder I om Table on 4.3 2b , kWh/ye for each 21.6 21.6 m Table for each	ear month 22.32 m = (56)m 22.32 m onth (50)	21.6 x [(50) – (21.6 59)m = (22.32 H11)] ÷ (50 22.32	$(47) \times (51)$ ((56)m = (22.32 0), else (5) 22.32) x (52) x (41)(55) x (41)(67)m = (56)(21.6)	m 22.32 m where (22.32	0. 21.6 H11) is fro	0 0 0 72 22.32 m Appendix 22.32	∢Н	

Comb:	Combi loss calculated for each month (61)m = (60) \div 365 × (41)m																
Ī	0	1	or ea	Cn	montn (0	(60 T	0) ÷ 30 0	05 × (41)			0		Τ ο	Ι ,	٦	(61)
(61)m=		0	<u> </u>	ᆜ			Ļ			(22)		0	0	0 (40)	0		(01)
1		_		_			_			`	_		` 	``	`	+ (59)m + (61)m ¬	(62)
(62)m=	189.71	167.23	175.6		157.52	154.4		38.01	132.59	145		145.15	163.33		185.16		(62)
			_					-					r contrib	ution to wat	er heating))	
` .		al lines if		(S &			ap T		·	-		•				٦	(63)
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0	J	(63)
· 1		ater hea			457.50	4544	<u> </u>	20.04	1,00.50		40	145.45	100.00	170.05	1,05,40	7	
(64)m=	189.71	167.23	175.6	6	157.52	154.4	13	38.01	132.59	145		145.15	163.33		185.16		7(64)
									1					er (annual)		1926.82	(64)
Ĭ		_		Ť			_		- ` ´ 	r È	_	_	-``	n + (57)m	- ` ´	n] ¬	(0-)
(65)m=	84.39	74.85	79.72		73	72.65	<u> </u>	6.51	65.4	69.		68.88	75.62		82.88		(65)
inclu	de (57)	m in calc	culatio	n o	f (65)m	only if o	ylir	nder i	s in the o	llewb	ing	or hot w	ater is	from com	munity	heating	
5. Internal gains (see Table 5 and 5a):																	
Metabo	Metabolic gains (Table 5), Watts																
	Jan	Feb	Ма	r	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m=	114	114	114		114	114	·	114	114	11	4	114	114	114	114		(66)
Lighting	g gains	(calcula	ted in	Apı	pendix I	L, equat	ion	L9 o	r L9a), a	lso s	ee T	Table 5				_	
(67)m=	17.88	15.88	12.92	2	9.78	7.31	6	6.17	6.67	8.6	67	11.63	14.77	17.24	18.38		(67)
Appliar	nces ga	ins (calc	ulated	l in	Append	dix L, eq	uat	ion L	13 or L1	3a),	also	see Tal	ble 5				
(68)m=	200.59	202.67	197.4	2	186.26	172.16	15	58.91	150.06	147	.98	153.23	164.39	178.49	191.74	7	(68)
Cookin	g gains	s (calcula	ited in	Ар	pendix	L, equa	tion	L15	or L15a)	, als	o se	e Table	5	-		_	
(69)m=	34.4	34.4	34.4		34.4	34.4	3	34.4	34.4	34	.4	34.4	34.4	34.4	34.4	7	(69)
Pumps	and fa	ns gains	(Tabl	e 5	a)		•							•		_	
(70)m=	0	0	0		0	0		0	0	0)	0	0	0	0	7	(70)
Losses	e.g. e	vaporatio	n (ne	gati	ve valu	es) (Tab	le :	5)					•	-		_	
(71)m=	-91.2	-91.2	-91.2	2	-91.2	-91.2	-:	91.2	-91.2	-91	.2	-91.2	-91.2	-91.2	-91.2	7	(71)
Water l	heating	gains (T	able	. 5)					•	•				•	•	_	
(72)m=	113.42	111.38	107.1	5	101.38	97.64	9	2.38	87.9	93.	64	95.67	101.64	108.37	111.39	7	(72)
Total i	nterna	l gains =						(66))m + (67)m	1 + (68	3)m +	- (69)m + ((70)m +	(71)m + (72)m	_	
(73)m=	389.1	387.14	374.6	9	354.62	334.32	3′	14.66	301.83	307	.49	317.74	338	361.3	378.71	7	(73)
6. Sol	ar gain	s:													<u>.</u>		
Solar g	ains are	calculated	using s	olar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e applic	able orienta	tion.		
Orienta		Access F			Area			Flu				g_		FF		Gains	
		Table 6d			m²			Tal	ble 6a		Т	able 6b		Table 6c		(W)	
East	0.9x	0.77		x	5.7	'4	x	1	9.64	X		0.5	X	0.7	=	27.34	(76)
East	0.9x	0.77		x	5.7	4	x	3	88.42	x		0.5	x	0.7		53.49	(76)
East	0.9x	0.77		x	5.7	4	x	6	3.27	x		0.5	x	0.7	<u> </u>	88.09	(76)
East	0.9x	0.77		x	5.7	4	x	9	92.28	x		0.5	×	0.7	=	128.48	(76)
East	0.9x	0.77		x	5.7	'4	x	1	13.09	x		0.5	×	0.7	<u> </u>	157.45	(76)

	-								1								٦ .
East	0.9x	0.77	X	5.7	74	X	1	15.77	X		0.5	×	0.7	=	161.	18	(76)
East	0.9x	0.77	Х	5.7	74	X	1	10.22	X		0.5	×	0.7	=	153.	45	(76)
East	0.9x	0.77	X	5.7	74	X	9	94.68	X		0.5	X	0.7	=	131.	81	(76)
East	0.9x	0.77	X	5.7	74	X	7	73.59	Х		0.5	X	0.7	=	102.	45	(76)
East	0.9x	0.77	X	5.7	74	X	4	5.59	X		0.5	X	0.7	=	63.4	17	(76)
East	0.9x	0.77	X	5.7	74	X	2	24.49	X		0.5	х	0.7	=	34.0)9	(76)
East	0.9x	0.77	Х	5.7	74	X	1	6.15	X		0.5	X	0.7	=	22.4	19	(76)
West	0.9x	0.77	X	13.	09	X	1	9.64	X		0.5	X	0.7	=	62.3	36	(80)
West	0.9x	0.77	X	13.	09	X	3	88.42	X		0.5	X	0.7	=	121.	98	(80)
West	0.9x	0.77	X	13.	09	X	6	3.27	x		0.5	X	0.7	=	200.	89	(80)
West	0.9x	0.77	X	13.	09	X	9	2.28	x		0.5	x	0.7	=	292.	99	(80)
West	0.9x	0.77	X	13.	09	X	1	13.09	x		0.5	x	0.7	=	359.	07	(80)
West	0.9x	0.77	Х	13.	09	X	1	15.77	x		0.5	x	0.7	=	367.	57	(80)
West	0.9x	0.77	Х	13.	09	X	1	10.22	x		0.5	х	0.7	=	349.	94	(80)
West	0.9x	0.77	х	13.	09	X	9	94.68	X		0.5	x	0.7	=	300.	59	(80)
West	0.9x	0.77	X	13.	09	X	7	'3.59	x		0.5	x	0.7		233.	64	(80)
West	0.9x	0.77	X	13.	09	X	4	15.59	x		0.5	x	0.7		144.	74	(80)
West	0.9x	0.77	X	13.	09	X	2	24.49	x		0.5	x	0.7		77.	75	(80)
West	0.9x	0.77	x	13.	09	X	1	6.15	x		0.5	x	0.7		51.2	28	(80)
•		watts, ca				$\overline{}$			Ė		n(74)m .				7		
(83)m=	89.7	175.47	288.98	421.46	516.52		28.75	503.39	432	2.41	336.1	208.22	111.85	73.77			(83)
_		nternal a		`	<u> </u>	,							1 .== .=		7		(0.4)
(84)m=	478.8	562.61	663.67	776.09	850.84	8	43.41	805.22	739	.89	653.83	546.22	473.15	452.48			(84)
		nal temp		`													
•		during h	٠.			•			ole 9	, Th1	(°C)				2′		(85)
Utilisa		tor for g				-							_		7		
	Jan	Feb	Mar	Apr	May	+	Jun	Jul	 	ug	Sep	Oct	Nov	Dec	4		
(86)m=	0.95	0.93	0.88	0.78	0.64	(0.49	0.37	0.4	41	0.63	0.84	0.93	0.96			(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)		_		_		
(87)m=	18.99	19.29	19.76	20.3	20.69		20.9	20.97	20.	95	20.79	20.25	19.53	18.94			(87)
Temp	erature	during h	eating p	eriods i	n rest of	dw	elling	from Ta	able 9	9, Th2	2 (°C)						
(88)m=	20.06	20.06	20.07	20.08	20.08	2	20.09	20.09	20	.1	20.09	20.08	20.08	20.07			(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (se	ee Table	9a)					-	_		
(89)m=	0.95	0.92	0.86	0.75	0.6	_	0.43	0.3	0.3	34	0.57	0.81	0.92	0.96			(89)
Mean	interna	l temper	ature in	the rest	of dwel	lina	T2 (f	ollow ste	eps 3		in Tabl	e 9c)	•		_		
(90)m=	17.37	17.8	18.47	19.23	19.74	T	20	20.07	20.		19.88	19.17	18.15	17.31	7		(90)
	<u> </u>	I						I			f	LA = Liv	ing area ÷ (4) =	0.5	5	(91)
Maas	intorno	l tompor	aturo (fo	or the wh	مام طبید	منالد	a) - f	ΙΛ ω Τ 4	 / 4	_ fl ^) v To						_
(92)m=	18.19	l temper	19.12	19.77	20.22	_	9) = 11 20.45	20.52	20.		20.34	19.72	18.85	18.13	٦		(92)
		nent to t		<u> </u>	<u> </u>	1							1 10.00	1 .0.10	_		(3-)
, ipply	aajaoti		moui		c.npc		5 110		0,		c appi	pilato					

4			l	T		T	T	l			l			(00)
(93)m=	18.19	18.55	19.12	19.77	20.22	20.45	20.52	20.51	20.34	19.72	18.85	18.13		(93)
			uirement			! 4 4	44 -£	Table O	41	4 T: (70)	-ll-	ulata	
				nperatui using Ta		ned at sto	ер 11 от	rable 9	o, so tna	t 11,m=(76)m an	d re-caid	sulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	<u> </u>	,			19						
(94)m=	0.93	0.9	0.84	0.74	0.61	0.46	0.33	0.37	0.59	0.8	0.91	0.94		(94)
Usefu	шшш ıl gains,	hmGm	, W = (9	4)m x (8	4)m		I							
(95)m=	446.42	507.36	560.18	576.03	517.51	384.39	268.39	277.35	382.83	438.15	428.24	425.38		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able 8	•		•		•			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1019.57	998.96	920.8	781.76	610.58	413.4	277.01	289.51	443.22	653.52	847.09	1010.79		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	426.43	330.36	268.3	148.12	69.25	0	0	0	0	160.24	301.57	435.54		
								Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2139.81	(98)
Space	e heating	g require	ement in	kWh/m²	² /year								29.96	(99)
8c St	nace cod	olina rec	uiremer	nt	•									
				August.	See Ta	ble 10b								
Odiod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat			<u> </u>	<u> </u>		rnal tem			<u> </u>					
(100)m=		0	0	0	0	663.86	522.61	535.11	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm		l .					<u> </u>				
(101)m=	0	0	0	0	0	0.88	0.92	0.9	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	(101)m)	!				!			
(102)m=	0	0	0	0	0	586.49	481.71	483.6	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		•			
(103)m=	0	0	0	0	0	1059.57	1013.49	938.14	0	0	0	0		(103)
						dwelling,	continu	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
•				3 × (98					ı					
(104)m=	0	0	0	0	0	340.62	395.64	338.18	0	0	0	0		_
01	l f !									= Sum(=	1074.45	(104)
	d fraction		able 10b	`					1 C =	coolea	area ÷ (4	+) =	0.86	(105)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)=	Ů				Ů	0.20	0.20	0.20		 = Sum(=	0	(106)
Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n	rota	– oam	1008-17	_	U	(100)
(107)m=		0	0	0	0	73.52	85.39	72.99	0	0	0	0		
				l			l	l	L Total	= Sum(107)	=	231.9	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear					· · + (4) =	,		3.25	(108)
		•				achama			(107)	, . (-1) –			3.23	(100)
				· ·	Ĭ	scheme		ling pro-	idod by	0.0000	unitu aal	omo		
						ing or wannentary l					uriity SCf	ieme.	0	(301)
	-			_		_	_		,	-				_
Fractio	iii or spa	ice neat	ILOLU CO	mmunity	system	1 – (30	1)=						1	(302)

The community scheme may obtain heat from several sources. The procedure allo includes boilers, heat pumps, geothermal and waste heat from power stations. See		our other heat sour	ces; the	latter	_
Fraction of heat from Community boilers				1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =		1	(304a)
Factor for control and charging method (Table 4c(3)) for communi-	ty heating system			1	(305)
Distribution loss factor (Table 12c) for community heating system				1.05	(306)
Space heating			_	kWh/year	_
Annual space heating requirement			L	2139.81	
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =		2246.8	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	dix E)	L	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 1	00 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				1926.82]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =		2023.16	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	42.7	(313)
Cooling System Energy Efficiency Ratio			Ī	6.59	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	Ē	35.2	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from our	utside			161.41	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating			Ē	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330l	o) + (330g) =	Ē	161.41	(331)
Energy for lighting (calculated in Appendix L)				315.81	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy	Emission fac			
	kWh/year	kg CO2/kWh	ΚÇ	g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using tw	vo fuels repeat (363) to	(366) for the secon	d fuel	93.5	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	0.22	=	986.43	(367)
Electrical energy for heat distribution [(3:	13) x	0.52	=	22.16	(372)
Total CO2 associated with community systems (36	63)(366) + (368)(372	2)	=	1008.59	(373)
CO2 associated with space heating (secondary) (30	99) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating (37	73) + (374) + (375) =			1008.59	(376)
CO2 associated with space cooling (31	5) x	0.52	=	18.27	(377)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	83.77	(378)
CO2 associated with electricity for lighting (33	32))) x	0.52	=	163.91	(379)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate $(383) \div (4) =$ El rating (section 14)

1274.54	(383)
17.85	(384)
85.33	(385)

			l loor [Details:										
A	205000													
Assessor Name:	Lindsey Ar			Strom					035000					
Software Name:	Stroma FS	AP 2012	_	Softwa				Versic	n: 1.0.5.9					
			Property		: Flat 13									
Address :		Aldrington Ro	ad, SW16	TTW										
1. Overall dwelling dime	ensions:													
			Are	a(m²)		Av. He	ight(m)	_	Volume(m ³	<u>-</u>				
Ground floor				71.42	(1a) x	2	2.85	(2a) =	203.55	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+((1d)+(1e)+	(1n)	71.42	(4)									
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	203.55	(5)				
2. Ventilation rate:														
	main heating	second heatin		other		total			m³ per hou	ır				
Number of chimneys	0	+ 0	+	0] = [0	X	40 =	0	(6a)				
Number of open flues	0	+ 0	= +	0	-	0	x	20 =	0	(6b)				
Number of intermittent fa	ans					3	x	10 =	30	(7a)				
Number of passive vents	3				F	0	x	10 =	0	(7b)				
Number of flueless gas f	umber of flueless gas fires $0 $													
					_			Air ch	nanges per ho	our —				
Infiltration due to chimne	•				L	30		÷ (5) =	0.15	(8)				
If a pressurisation test has b			eed to (17),	otherwise (continue fr	om (9) to	(16)			– ,				
Number of storeys in t	he dwelling (ns	5)							0	(9)				
Additional infiltration							[(9))-1]x0.1 =	0	(10)				
Structural infiltration: 0					•	ruction			0	(11)				
if both types of wall are p deducting areas of openi			g to the grea	ter wall are	a (atter									
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)				
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)				
Percentage of window	s and doors dr	aught stripped	d d						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,	q50, expresse	d in cubic me	tres per h	our per s	quare m	etre of	envelope	area	5	(17)				
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$]+(8), otherw	rise (18) =	(16)		-		0.4	(18)				
Air permeability value applie	es if a pressurisation	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 (²	19)] =			0.85	(20)				
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.34	(21)				
Infiltration rate modified	for monthly win	d speed					_		_					
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp	peed from Tabl	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													
(22)		1.00		T 0.02			1	1	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

djusted infilti	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m		_		-	
0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
<i>alculate effe If mechanic</i>		•	rate for t	he appli	cable ca	se							
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N5)) . othei	wise (23h) = (23a)			0	
If balanced wit		0 11		, ,	,	. `	,, .	`	(200)			0	
		-	-	_					Oh)m ı (22h) v [1 (220)	. 1001	
a) If balance			0	0	0	0	1 (24 <i>a</i>	0	0	23b) x [0	- 100j	
b) If balance	<u> </u>	<u> </u>					·						
1b) ii balance 1b)m= 0			0	0	0	0	0 0	0	0	0	0	l	
c) If whole h		<u> </u>											
,					•		c) = (22b		.5 × (23b	o)			
lc)m= 0	0	0	0	0	0	0	0	0	0	0	0		
d) If natural	ventilatio	n or wh	ole hous	L nositiv	/e input	ventilati	on from l	oft			<u>Į</u>	l	
,				•			0.5 + [(2		0.5]				
ld)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-			
5)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		
. Heat losse	e and he	at loss i	naramet	or:									
EMENT	Gros		Openin		Net Ar	ea	U-valı	ıe	AXU		k-value)	АХ
	area	(m^2)	· m		A ,r	n²	W/m2	K	(W/	K)	kJ/m²·l	<	kJ/K
ors					2.12	X	1	=	2.12				
ndows Type	e 1				4.8	x1	/[1/(1.4)+	0.04] =	6.36				
indows Typ	e 2				10.94	x1	/[1/(1.4)+	0.04] =	14.5				
oor					71.42	<u>x</u>	0.13	□ = i	9.28459	9			
alls Type1	60.2	25	15.7	4	44.51	x	0.18		8.01	F i		7 7	
alls Type2	10.5	57	2.12		8.45	x	0.18	= =	1.52	F i		- -	
alls Type3	7.8		0		7.84		0.18	=	1.41	=		7	
otal area of					150.0	=	0.10		1.71				
arty wall	o o o o o o o o o o o o o o o o o o o	,				=							
or windows and	l roof wind	owe use c	offective wi	ndow I I-vs	19.66		0 formula 1	= [(1/ ₋ \/2	0		naragranh		
include the are						aleu usiriç	y ioiiniaia ii	/[(1/O-vait	1 0 /+0.0+j 6	is given in	paragrapi	1 3.2	
bric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				43.2	2
eat capacity	Cm = S	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	6600	.9
nermal mass	parame	ter (TMF	P = Cm +	- TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250)
r design asses	sments wh	ere the de	tails of the	construct	ion are not	t known p	recisely the	indicative	e values of	TMP in T	able 1f		
n be used inste						,							
ermal bridg	,	,			•	`						11.7	7
letails of therm Ital fabric he		are not kn	own (36) =	= U.U5 X (3	1)			(33) +	(36) =			54.9	g.
entilation he		alculated	monthly	/					= 0.33 × ((25)m x (5))	04.8	<u> </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
39.81	39.57	39.34	38.22	38.01	37.04	37.04	36.86	37.42	38.01	38.43	38.88		
	ļ	<u> </u>			1		1			<u> </u>	1		
eat transfer	COETTICIE	it, VV/K						(39)m	= (37) + (37)	sø)m			
94.8	94.55	94.32	93.2	93	92.03	92.03	91.85	92.4	93	93.42	93.86		

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.33	1.32	1.32	1.31	1.3	1.29	1.29	1.29	1.29	1.3	1.31	1.31		
()									<u> </u>	Sum(40) ₁ .		1.3	(40)
Number of day	s in mo	nth (Tabl	le 1a)							(),			`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 Motor boot	ing one	rav roqui	romonti								Is\A/b/ye	NOT!	
4. Water heat	ing ene	rgy requi	rement.								kWh/ye	al.	
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.		28		(42)
Annual averag									se target o		.35		(43)
not more that 125	_		•		-	-	o acmeve	a water us	se largel o	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Διια	Sep	Oct	Nov	Dec		
Hot water usage in			Apr ach month	<u></u>			Aug (43)	Sep	Oct	INOV	Dec		
	,			1			, ,	00.50	00.40	00.05	07.40		
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19	1000.00	7(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1060.23	(44)
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
(40)111= 144.10	120.00	150.00	110.4	100.01	33.3	07.01	33.03			m(45) ₁₁₂ =	l l	1390.13	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar = Su	III(45) ₁₁₂ =	- I	1390.13	(43)
(46)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Water storage		10.01	17.01	10.02	14.00	10.00	14.00	10.10	17.00	10.20	20.04		(10)
Storage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	ınd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	55		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	84		(50)
b) If manufact			-										
Hot water stora	-			e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	•		on 4.3										(50)
Temperature fa			2h							—	0		(52) (53)
•							(47) (54)) (5 0) (50 \		0		
Energy lost fro Enter (50) or (_	, KVVII/ye	ear			(47) X (51)) x (52) x (53) =	-	0		(54) (55)
` ' '		,	or oach	month			((EG)m - (EE) ~ (44);	~	0.	84		(33)
Water storage		cuiateu i	or each			1	((56))11 = (55) × (41)ı	· · · · · · · · · · · · · · · · · · ·				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by	factor f	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	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m=	0	0	0	0	0 0	00) + \	000 x (41)III 0		0	0	0	0]	(61)
L			<u> </u>			<u> </u>	Į	<u> </u>				ļ		」 · (59)m + (61)m	
(62)m=	193.37	_	179.32		158.06	141.55		149.	_	148.69	166.99	176.19	188.82		(62)
Solar DH	IW input	calculated	using Ap	pendix G o	r Appendix	: H (nega	tive quantit	y) (ente	er '0'	if no sola	r contribut	ion to wate	er heating)	1	
(add ad	dition	al lines if	FGHR	S and/or \	NWHRS	applie	s, see Ap	pend	ix G	S)					
(63)m=	0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output	from v	vater hea	ter	-	-		-				-		-	-	
(64)m=	193.37	170.53	179.32	161.06	158.06	141.55	136.25	149.	09	148.69	166.99	176.19	188.82		_
								(Outp	ut from wa	ater heate	r (annual) ₁	12	1969.92	(64)
Heat ga	ains fro	m water	heating	g, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m] + 0.8 >	د [(46)m	+ (57)m	+ (59)m	<u>[</u>]	
(65)m=	87.32	77.49	82.64	75.83	75.57	69.34	68.32	72.5	59	71.72	78.55	80.86	85.8		(65)
inclu	de (57)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwelli	ing	or hot w	ater is f	rom com	munity h	neating	
5. Inte	ernal g	ains (see	Table	5 and 5a):										
Metabo	lic gai	ns (Table	5), Wa	itts										-	
Ţ	Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	лg	Sep	Oct	Nov	Dec		
(66)m=	114	114	114	114	114	114	114	114	4	114	114	114	114		(66)
Lighting	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso s	ee 7	Table 5				-	
(67)m=	17.89	15.89	12.92	9.78	7.31	6.17	6.67	8.6	7	11.64	14.78	17.25	18.38		(67)
Applian	ices ga	ains (calc	ulated i	n Appen	dix L, eq	uation	_13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m=	200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.	98	153.23	164.39	178.49	191.74]	(68)
Cookin	g gain	s (calcula	ted in A	Appendix	L, equa	ion L1	or L15a), also	o se	e Table	5			_	
(69)m=	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.	4	34.4	34.4	34.4	34.4]	(69)
Pumps	and fa	ns gains	(Table	5a)				_			_	_		_	
(70)m=	3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses	e.g. e	vaporatio	n (nega	ative valu	es) (Tab	le 5)	_				_			_	
(71)m=	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91	.2	-91.2	-91.2	-91.2	-91.2]	(71)
Water h	neating	g gains (T	able 5)				_	_						_	
(72)m=	117.36	115.32	111.08	105.32	101.58	96.31	91.83	97.5	57	99.61	105.57	112.31	115.33		(72)
Total ir	nterna	l gains =				(6	6)m + (67)n	n + (68)m +	· (69)m + ((70)m + (7	'1)m + (72))m	_	
(73)m=	396.04	394.08	381.63	361.56	341.25	321.6	308.77	314.	42	324.68	344.94	368.24	385.65		(73)
6. Sola															
_		calculated	_					ations t	0 CO		e applical		tion.		
Orienta		Access F Table 6d		Area m²			ux able 6a		T:	g_ able 6b	т	FF able 6c		Gains (W)	
Foot						_		1 1					_	. ,	7,
East	0.9x			4.		X _	19.64] X [0.63	_ ×	0.7	_ =	28.81	[76]
East	0.9x	0.77				X	38.42	X [0.63	×	0.7	_ =	56.36	 (76)
East	0.9x	0.77		4.		X	63.27] X [0.63	_ ×	0.7	=	92.82	 (76)
East	0.9x	0.77		4.		X	92.28] X [0.63	_ ×	0.7	=	135.37	 1 (76)
East	0.9x	0.77)	4.	8	X	113.09	X		0.63	Х	0.7	=	165.9	(76)

	_								_		_				_
East	0.9x	0.77	X	4.	8	X	1	15.77	X	0.63	X	0.7	=	169.83	(76)
East	0.9x	0.77	Х	4.	8	X	1	10.22	X	0.63	X	0.7	=	161.68	(76)
East	0.9x	0.77	Х	4.	8	X	9	94.68	X	0.63	X	0.7	=	138.88	(76)
East	0.9x	0.77	X	4.	8	X	7	'3.59	X	0.63	X	0.7	=	107.95	(76)
East	0.9x	0.77	Х	4.	8	X	4	5.59	X	0.63	X	0.7	=	66.88	(76)
East	0.9x	0.77	Х	4.	8	X	2	24.49	X	0.63	X	0.7	=	35.92	(76)
East	0.9x	0.77	X	4.	8	X	1	6.15	X	0.63	X	0.7	=	23.69	(76)
West	0.9x	0.77	X	10	94	X	1	9.64	X	0.63	X	0.7	=	65.67	(80)
West	0.9x	0.77	X	10	94	X	3	88.42	X	0.63	X	0.7	=	128.46	(80)
West	0.9x	0.77	X	10	94	X	6	3.27	X	0.63	X	0.7	=	211.55	(80)
West	0.9x	0.77	X	10.	94	x	9	2.28	x	0.63	x	0.7	_ =	308.53	(80)
West	0.9x	0.77	х	10.	94	X	1	13.09	X	0.63	x	0.7	<u>=</u>	378.11	(80)
West	0.9x	0.77	X	10.	94	x	1	15.77	X	0.63	×	0.7	=	387.07	(80)
West	0.9x	0.77	X	10.	94	X	1	10.22	X	0.63	x	0.7	=	368.5	(80)
West	0.9x	0.77	X	10.	94	X	9	94.68	X	0.63	x	0.7	=	316.54	(80)
West	0.9x	0.77	X	10	94	X	7	'3.59	j x	0.63	x	0.7		246.04	(80)
West	0.9x	0.77	X	10.	94	X	4	15.59	X	0.63	x	0.7		152.42	(80)
West	0.9x	0.77	X	10	94	X	2	24.49	X	0.63	x	0.7	=	81.88	(80)
West	0.9x	0.77	X	10	94	X	1	6.15	j x	0.63	x	0.7		54	(80)
	•								-						
Solar g	ains in	watts, ca	alculate	d for eac	h mont	h			(83)m	n = Sum(74)m	(82)m			_	
(83)m=	94.48	184.82	304.37	443.9	544.02	: 5	556.9	530.19	455	.42 353.99	219.3	117.8	77.69		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (83)m	, watts						_	
(84)m=	490.51	578.89	685.99	805.46	885.27		378.5	838.96	769	.85 678.67	564.2	4 486.04	463.35		(84)
7. Mea	an inte	nal temp	erature	(heating	seaso	n)									
Temp	erature	during h	eating p	periods i	n the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	ctor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	<u>' </u>	Jun	Jul	А	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.81		0.63	0.47	0.5	0.79	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	19.61	19.79	20.11	20.51	20.81	7	20.96	20.99	20.	98 20.87	20.46	19.96	19.58]	(87)
Temp	erature	durina h	eating i	eriods i	n rest o	f dw	/elling	from Ta	able 9	9, Th2 (°C)	•	•	•	_	
(88)m=	19.82	19.82	19.82	19.84	19.84	_	19.85	19.85	19.		19.84	19.83	19.83]	(88)
ا دعااtا ا	tion fac	ctor for g	aine for	rest of d	welling	 h2	m (se	L Tahla	02)	I	!		!	1	
(89)m=	1	0.99	0.97	0.9	0.75	_	0.53	0.35	0.4	1 0.71	0.94	0.99	1	1	(89)
L		<u> </u>		Į				<u> </u>	<u> </u>	I		1 333		_	, ,
г	17.99	18.26		the rest 19.29	1	Ť		i	i -	to 7 in Tab	<u> </u>	10.51	17.95	1	(90)
(90)m=	17.99	10.20	18.72	19.29	19.67		19.82	19.85	19.		19.23	18.51 ving area ÷ (ļ	0.5	(90)
												ing area + (., –	0.5	(91)
Г				1		$\overline{}$		i e		– fLA) × T2	1		•	7	
(92)m=	18.8	19.03	19.42	19.91	20.24		20.39	20.42	20.		19.85		18.77]	(92)
Apply	adjustr	nent to th	ne meai	n interna	i tempe	eratu	ıre fro	m Table	e 4e,	where appr	opriate	!			

(00)	40.0	10.02	40.40	40.04	20.04	20.20	20.42	00.40	20.22	40.05	10.04	40.77		(93)
(93)m=	18.8	19.03	19.42	19.91	20.24	20.39	20.42	20.42	20.32	19.85	19.24	18.77		(93)
			uirement				44 -4	Table O	41	4 T: /	70\	-11-	lata	
			or gains	•		ed at ste	ер ттог	rable 9i	b, so tha	t 11,m=(rojin an	d re-caid	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	1:			,	,				1	ı	
(94)m=	0.99	0.99	0.97	0.9	0.77	0.58	0.41	0.47	0.75	0.94	0.99	1		(94)
Usefu			W = (94)				ı	,			ı	ı	ı	
(95)m=		571.19	662.49	727.45	684.34	510.68	348.07	362.57	506.56	532.77	480.06	461.05		(95)
	nly aver	age exte	rnal tem	perature			•	,					ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			i				-``	- ` 	– (96)m				ı	
	1374.83		1218.7	1025.75	794.52	533.21	351.87	369.22	574.49	860	1133.99	1367.55		(97)
Space		<u> </u>	ı	i	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	 	1	ı	
(98)m=	660.24	514.07	413.82	214.78	81.97	0	0	0	0	243.46	470.83	674.44		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3273.61	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								45.84	(99)
9a En	erav rea	wiremer	nts — Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					
	e heatir		no ma	Madain	oainig oʻ	y otorno r	rioraanig	, moro c)					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =				1	(202)
	•		ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-				(-) (- / [(/]			93.5	(206)
	•	-	ry/suppl			n evetam	n %						0	(208)
Lillon						-			Can	0-4	Nav	Daa	_	」` ′
Snac	Jan	Feb	Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Opac	660.24	514.07	413.82	214.78	81.97	0	0	0	0	243.46	470.83	674.44		
(044)			<u> </u>			Ů			Ŭ	240.40	470.00	074.44		(0.1.1)
(211)n			(4)] } x 1			0		Ι ο		200 20	502.57	704.00		(211)
	706.14	549.81	442.59	229.71	87.67	0	0	O Tota	0 II (kWh/yea	260.39	503.57	721.32		7(044)
_								Tota	ii (KVVII/yea	ar) =3urri(2	2 1) _{15,1012}		3501.19	(211)
•		`	econdar	• , .	month									
			00 ÷ (20		0	0		Ι ο			0	0		
(215)m=	0	0	0	0	0	0	0	O Tota	0 II (kWh/yea	0	_	0		7(045)
								TOTA	ii (KVVII/yea	ar) =Surri(2	213) _{15,1012}	F	0	(215)
	heating													
Output	193.37	ater hea 170.53	ter (calc 179.32	161.06	158.06	141.55	136.25	149.09	148.69	166.99	176.19	188.82		
Efficio		ater hea		101.00	130.00	141.55	130.23	149.09	148.09	100.99	170.19	100.02	70.0	(216)
				05.50	00.40	70.0	70.0	70.0	70.0	05.00	07.04	07.00	79.8	┙
(217)m=		87.57	86.97	85.58	83.16	79.8	79.8	79.8	79.8	85.82	87.31	87.92		(217)
		•	kWh/mo (217) ÷ (
	220.16	194.73	206.17	188.19	190.07	177.38	170.74	186.83	186.33	194.59	201.79	214.76		
•			I	I				<u> </u>	l = Sum(2		l .		2331.74	(219)
Annus	al totals								•		Wh/year	•	kWh/year	١٠٠٠/
		fuel use	ed, main	system	1					IX.	, 		3501.19	7
•	J			-									<u> </u>	_

					_
Water heating fuel used				2331.74	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sur	n of (230a)(230g) =		75	(231)
Electricity for lighting				315.9	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CH	P			
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	756.26	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	503.66	(264)
Space and water heating	(261) + (262) + (263) +	(264) =		1259.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	163.95	(268)
Total CO2, kg/year		sum of (265)(271) =		1462.79	(272)

TER =

(273)

20.48

		User	Details:						
Assessor Name:	Lindsey Arnott		Stroma	Numl	her:		STRO	035000	
Software Name:	Stroma FSAP 201	12	Softwa					n: 1.0.5.9	
			/ Address:		010111				
Address :	The Alders, Aldring	•							
1. Overall dwelling dime		·							
		Ar	ea(m²)		Av. Hei	ght(m)		Volume(m ³	3)
Ground floor			71.42	1a) x	2.	85	(2a) =	203.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	71.42	4)					
Dwelling volume				(3a)+(3b)	+(3c)+(3d))+(3e)+	(3n) =	203.55	(5)
2. Ventilation rate:							L		
2. Voltalation fato.		econdary	other		total			m³ per hou	ır
Number of chimneys	heating h	neating +	0	= [0	X	40 =	0	(6a)
Number of open flues	0 +	0 +	0	=	0	x:	20 =	0	(6b)
Number of intermittent fa	ans			F	0	x	10 = [0	(7a)
Number of passive vents	8			F	0	x	10 = [0	(7b)
Number of flueless gas f				<u> </u>	0	x	40 = [0	(7c)
Trainibor of hadrood gad i							L		(,,,
							Air ch	anges per ho	our
Infiltration due to chimne	evs. flues and fans = (6	6a)+(6b)+(7a)+(7b)	+(7c) =		0	_	÷ (5) =	0	(8)
If a pressurisation test has I				ntinue fro			. (6)		(0)
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber	frame or 0.35 f	or masonry	constru	uction			0	(11)
	present, use the value corres	sponding to the gre	ater wall area	(after					
deducting areas of open	floor, enter 0.2 (unsea	led) or 0.1 (sea	ıled) else e	nter 0			[0	(12)
If no draught lobby, er	•	, 0. 0 (000	,,					0	(13)
Percentage of window		tripped					[0	(14)
Window infiltration			0.25 - [0.2 x	(14) ÷ 10	00] =		[0	(15)
Infiltration rate			(8) + (10) +	(11) + (1)	2) + (13) +	- (15) =	[0	(16)
Air permeability value,	q50, expressed in cub	oic metres per l	nour per sq	uare me	etre of e	nvelope	area	3	(17)
If based on air permeabi		•				•		0.15	(18)
Air permeability value appli	es if a pressurisation test ha	s been done or a c	legree air pern	neability i	s being us	ed	L		` ′
Number of sides sheltered	ed							1	(19)
Shelter factor			(20) = 1 - [0	.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified	for monthly wind speed	t e					, ,		
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	:∠)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 infiltration rate (allowing for sh	elter and wind s	need) = (21a) x	(22a)m					
0.18 0.17 0.17 0.15	0.15 0.13	0.13 0.13	0.14	0.15	0.16	0.16		
Calculate effective air change rate for the		l I	1 -					
If mechanical ventilation:							0.5	(23a)
If exhaust air heat pump using Appendix N, (23				= (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in %	allowing for in-use fa	actor (from Table 4	n) =				76.5	(23c)
a) If balanced mechanical ventilation		, , ,	 	, ,		``	÷ 100]	
(24a)m= 0.29 0.29 0.29 0.27	0.27 0.25	0.25 0.25	0.26	0.27	0.27	0.28		(24a)
b) If balanced mechanical ventilation		, , , , , , , , , , , , , , , , , , ,	 	, ,		1	1	
(24b)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation of 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 hous if (22b)m = 1, then (24d)m = (22b)				0.5]		-		
(24d)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24d)
Effective air change rate - enter (24a)	or (24b) or (24c	c) or (24d) in bo	x (25)				•	
(25)m= 0.29 0.29 0.29 0.27	0.27 0.25	0.25 0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losses and heat loss parameter	ar.							
ELEMENT Gross Opening area (m²)	gs Net Are			A X U (W/I		k-value kJ/m²-l		X k /K
Doors Type 1	2.68	x 1		2.68	$\stackrel{\prime}{\Box}$			(26)
Doors Type 2	2.74	X 1	≓ ₌ i	2.74	=			(26)
Windows Type 1	4.16	x1/[1/(1.3)·	+ 0.04] = [5.14	=			(27)
Windows Type 2	6.05		ــا = [0.04+	7.48	=			(27)
Windows Type 3	2.85	x1/[1/(1.3)·	ــا آ ₌ [0.04+	3.52	=			(27)
Floor	71.42	x 0.11		7.8562	=			(28)
Walls Type1 79.91 18.48		= ==	=	9.21	-			(29)
Walls Type 2 18.41 0	18.41	= ==		2.43	룩 ;			(29)
Total area of elements, m ²	169.74	= -		2.40				(31)
* for windows and roof windows, use effective wir ** include the areas on both sides of internal walls	ndow U-value calcula		1/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	(01)
Fabric heat loss, W/K = S (A x U)	o arra paranorio	(26)(30	0) + (32) =				41.06	(33)
Heat capacity Cm = S(A x k)			((28)	.(30) + (32	2) + (32a).	(32e) =	8973.96	(34)
Thermal mass parameter (TMP = Cm ÷	TFA) in kJ/m²K		Indicat	ive Value	: Low		100	(35)
For design assessments where the details of the can be used instead of a detailed calculation.	construction are not	known precisely th	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges : S (L x Y) calculated u	ısing Appendix K	(12.3	(36)
if details of thermal bridging are not known (36) =	0.05 x (31)							_
Total fabric heat loss			(33) +				53.36	(37)
Ventilation heat loss calculated monthly	1	.,	1 ` ´ 1		25)m x (5)		1	
Jan Feb Mar Apr	May Jun	Jul Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 19.78 19.54 19.31 18.14	17.91 16.75	16.75 16.51	17.21	17.91	18.38	18.84		(38)
Heat transfer coefficient, W/K		1	1 1	= (37) + (3		1	1	
(39)m= 73.14 72.91 72.67 71.51	71.27 70.11	70.11 69.88	70.58	71.27	71.74	72.21		7(00)
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) -	http://www.stroma.c	com	A	verage =	Sum(39) ₁	12 /12=	71.4 5 age	2 of 8 ⁽¹⁾

Heat loss para	ımeter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.02	1.02	1.02	1	1	0.98	0.98	0.98	0.99	1	1	1.01		
							ı	,	Average =	Sum(40) ₁ .	12 /12=	1	(40)
Number of day	1	nth (Tab	le 1a)	1	ı	1		ı		i			
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	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 226	1 20.	1	••		
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
	<u>!</u>	!		<u>!</u>	ļ.	!	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1060.23	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
If instantaneous v	votor booti	na at naint	of upo /pr	a hat water	r otorogol	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	-	1390.13	(45)
If instantaneous w			,		, , , , , , , , , , , , , , , , , , ,		, ,	, , , I		1	i I		(40)
(46)m= 21.62 Water storage	18.91 loss:	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Storage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	neating a	and no ta	nk in dw	velling, e	nter 110) litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1	.2		(48)
Temperature f										0	.6		(49)
Energy lost fro		_	-		or io not		(48) x (49)) =		0.	72		(50)
b) If manufactHot water store			-								0		(51)
If community h	-			((((((((((((((((((((,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-,,					<u> </u>		()
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	72		(55)
Water storage	loss cal	culated f	or each	month	_	_	((56)m = ((55) × (41)	m	_			
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61)m = (60) - 365 x (41)m = (60) - 80	Oznaki Izaz zal		f l		(04)	(00) - 0	DE (44)							
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 88.71		r			,	,	· ` `		Ι ,	Ι ,	Ι ,		1	(61)
(62) (62) (62) (62) (62) (62) (62) (62) (63)		!	ļ						<u> </u>		<u> </u>	<u> </u>	(50)	(01)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter for if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)								<u> </u>		` 	` 	`	(59)m + (61)m I	(00)
Company Comp	` ′						<u> </u>							(62)
Compute Comp										r contribut	ion to wate	er heating)		
Output from water heater (64)me	`						· ·		ŕ –		Ι ο		I	(62)
189.71 167.23 175.66 157.52 154.4 138.01 132.59 145.43 145.15 163.33 172.65 185.16				U	0	U	0	U	0		0	0		(03)
Heat gains from water heating, kWh/month 0.25				457.50	454.4	420.04	422.50	4.45.40	14545	400.00	470.05	405.40	1	
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m 84.39 74.85 79.72 73 72.65 66.51 65.4 69.66 68.88 75.62 78.03 82.88 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating S. Internal gains (see Table 5 and 5a):	(64)m= 189.71	167.23	1/5.00	157.52	154.4	138.01	132.59		L		ļ		1026.82	1(64)
Common Section Secti	Hartaria (con		b C	1.14/1. /	(1 - 0 - 0)	- / [0 05	(45)							(04)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			r				r		i e	1	i -	ı —]	(CE)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 114 11	` '								ļ		ļ			(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 114 114 114 114 114 114 114 114 114 11	include (57)n	n in calc	ulation o	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	5. Internal ga	ins (see	Table 5	and 5a):									
Color 114	Metabolic gains	s (Table	5), Watt	ts									•	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)= 18.22	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(67)m=	(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 200.59 202.67 197.42 186.26 172.16 158.91 150.06 147.98 153.23 164.39 178.49 191.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 3	Lighting gains ((calculat	ed in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(68)m= 200.59 202.67 197.42 186.26 172.16 158.91 150.06 147.98 153.23 164.39 178.49 191.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.	(67)m= 18.22	16.18	13.16	9.96	7.45	6.29	6.79	8.83	11.85	15.05	17.57	18.73		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.	Appliances gair	ns (calcı	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
Company Comp	(68)m= 200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.98	153.23	164.39	178.49	191.74		(68)
Pumps and fans gains (Table 5a) (70)m=	Cooking gains	(calculat	ted in Ap	pendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•		•	
Comparison of the control of the con	(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m=	Pumps and fan	s gains	(Table 5	ia)			•		•	•	•	•	•	
(71)m=	(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Water heating gains (Table 5) (72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 63.84 (76)	Losses e.g. eva	aporatio	n (negat	ive valu	es) (Tab	le 5)					•		•	
(72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c (W) East 0.9x 0.77	(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
(72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Water heating	gains (T	able 5)				!		•	•				
(73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c FF Gains Table 6c Table 6d M2 Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)				101.38	97.64	92.38	87.9	93.64	95.67	101.64	108.37	111.39		(72)
(73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c FF Gains Table 6c Table 6d M2 Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Total internal	gains =	Į			(66)	ım + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	1 (1)m + (72)	m	l	
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 6d m^2 Table 6a Table 6b Table 6c (W) East 0.9×0.77 $\times 4.16$ $\times 19.64$ $\times 0.5$ $\times 0.7$ = 19.82 (76) East 0.9×0.77 $\times 4.16$ $\times 38.42$ $\times 0.5$ $\times 0.7$ = 38.77 (76) East 0.9×0.77 $\times 4.16$ $\times 63.27$ $\times 0.5$ $\times 0.7$ = 63.84 (76)		- 	374.93	354.81	334.45					· · · · · · · · · · · · · · · · · · ·	· · · · · ·			(73)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_{-} FF Gains Table 6d m^2 Table 6a Table 6b Table 6c (W) East $0.9x$ 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East $0.9x$ 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East $0.9x$ 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 63.84 (76)	` ′													
Table 6d m ² Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)			using solar	flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Table 6d m ² Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Orientation: A	ccess F	actor	Area		Flu	X		g_		FF		Gains	
East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Ta	able 6d		m²		Tal	ble 6a	7		Т	able 6c		(W)	
East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	East 0.9x	0.77	х	4.1	6	x 1	9.64	x	0.5	x	0.7		19.82	(76)
East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	East 0.9x	0.77	×	4.1	6	x 3	88.42	x	0.5	= x	0.7		38.77	(76)
	East 0.9x		x					x		= x		= =		_
	_							×		╡⋄╞		= =		_
East 0.9x 0.77 x 4.16 x 113.09 x 0.5 x 0.7 = 114.11 (76)						_		╎┝		⊣		╡ -		-

East	0.9x	0.77		X	4.16	一 .	_x [115.77	1 x		0.5	7 x [0.7		116.81	(76)
East	0.9x	0.77		x	4.16	=	·· L	110.22] x		0.5	_	0.7		111.21	(76)
East	0.9x	0.77		x	4.16	=	Х [94.68]]		0.5		0.7		95.53	(76)
East	0.9x	0.77		X	4.16	=	x [73.59]]		0.5		0.7	= =	74.25	(76)
East	0.9x	0.77		x	4.16	=	x [45.59]]		0.5		0.7	= =	46	(76)
East	0.9x	0.77		X	4.16	=	x [24.49) x		0.5		0.7	= =	24.71	(76)
East	0.9x	0.77		X	4.16	╡ :	x [16.15] x		0.5		0.7	= =	16.3	(76)
South	0.9x	0.77		X	2.85	=	x [46.75) x		0.5	_	0.7		32.32	(78)
South	0.9x	0.77		X	2.85	╡:	x [76.57	X		0.5	×	0.7	=	52.93	(78)
South	0.9x	0.77		X	2.85	╡ :	x [97.53	X		0.5	x	0.7		67.42	(78)
South	0.9x	0.77		X	2.85	╡ :	x [110.23	x		0.5	X	0.7		76.2	(78)
South	0.9x	0.77		X	2.85	7	x [114.87	x		0.5	×	0.7		79.41	(78)
South	0.9x	0.77		X	2.85	=	x [110.55	x		0.5	×	0.7		76.42	(78)
South	0.9x	0.77		X	2.85	╡:	x [108.01	х		0.5	×	0.7	=	74.67	(78)
South	0.9x	0.77		X	2.85	=	x [104.89	x		0.5	x	0.7	=	72.51	(78)
South	0.9x	0.77		X	2.85	=	x [101.89	x		0.5	T x	0.7	=	70.43	(78)
South	0.9x	0.77		X	2.85	=	x [82.59	x		0.5	x	0.7	=	57.09	(78)
South	0.9x	0.77		X	2.85		x [55.42	x		0.5	x	0.7	=	38.31	(78)
South	0.9x	0.77		X	2.85		x [40.4	x		0.5	×	0.7	=	27.93	(78)
West	0.9x	0.77		X	6.05		x [19.64	x		0.5	x	0.7	=	28.82	(80)
West	0.9x	0.77		X	6.05		x [38.42	x		0.5	x	0.7	=	56.38	(80)
West	0.9x	0.77		X	6.05		x [63.27	x		0.5	x	0.7	=	92.85	(80)
West	0.9x	0.77		X	6.05		x [92.28	x		0.5	x	0.7	=	135.41	(80)
West	0.9x	0.77		X	6.05		x [113.09	x		0.5	×	0.7	=	165.96	(80)
West	0.9x	0.77		X	6.05		x [115.77	x		0.5	x	0.7	=	169.88	(80)
West	0.9x	0.77		X	6.05		x [110.22	X		0.5	X	0.7	=	161.74	(80)
West	0.9x	0.77		X	6.05		x [94.68	x		0.5	x	0.7	=	138.93	(80)
West	0.9x	0.77		X	6.05		x [73.59	x		0.5	x	0.7	=	107.99	(80)
West	0.9x	0.77		X	6.05		x [45.59	x		0.5	X	0.7	=	66.9	(80)
West	0.9x	0.77		X	6.05		x [24.49	X		0.5	X	0.7	=	35.94	(80)
West	0.9x	0.77		X	6.05		x [16.15	X		0.5	X	0.7	=	23.7	(80)
` `				$\overline{}$	for each mo			0.40 0.47.04	<u> </u>	-	m(74)m		1 00 05	07.00	7	(02)
(83)m=	80.96	148.07	224.1			9.47 3\m 4		3.12 347.61 3)m , watts	306	.97	252.67	169.99	98.95	67.92		(83)
Ţ	470.39	535.51	599.0	_	·	3.93		77.9 649.57	614	62	570.62	508.27	460.58	446.98	1	(84)
` ' L				_				7.0 040.07		.02	070.02	000.21	1 400.00	1 440.00		(= 1)
					heating sea			roa from Tak	olo O	Th1	(°C)				24	(95)
•		•		•			-	area from Tal ee Table 9a))IE 9	, 1111	(0)				21	(85)
	Jan	Feb	Ma	$\overline{}$		/lay		Jun Jul	ΙΑ	ug	Sep	Oct	Nov	Dec]	
(86)m=	0.96	0.94	0.9	\rightarrow		72		.58 0.44	0.4		0.68	0.86	0.94	0.96	-	(86)
L		ļļ			!			<u> </u>			Ļ		1		_	• •
(87)m=	18.98	19.24	19.6	-		.58		v steps 3 to 7	20.	-	9C) 20.74	20.2	19.51	18.94	1	(87)
(-1)	21.20		. 3.3								'		1		_	` '

lomr	oroturo	during h	neating p	oriode ir	roct of	dwalling	from To	hlo O T	h2 (°C)					
(88)m=	20.06	20.07	20.07	20.08	20.09	20.1	20.1	20.1	20.09	20.09	20.08	20.07		(88)
		<u>!</u>	<u>!</u>						20.00	20.00	20.00	20.07		()
(89)m=	0.95	0.93	ains for i	0.81	0.68	0.51	0.36	9a) 0.4	0.62	0.84	0.93	0.96		(89)
		<u> </u>	<u> </u>					<u> </u>	<u> </u>		0.00	0.00		(3.2)
	17.36	1 temper	ature in	the rest	of dwelli	ng 12 (fo	ollow ste	20.05	/ In Tabl	e 9c)	18.13	17.21		(90)
(90)m=	17.30	17.73	10.32	19.05	19.01	19.96	20.06	20.05	<u> </u>	LA = Livin	<u> </u>	17.31	0.20	一 ` ′
									'	LA - LIVIII	y area + (-	+) -	0.38	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	17.98	18.31	18.83	19.48	19.98	20.3	20.4	20.39	20.18	19.53	18.66	17.93		(92)
			he mean		· ·					·		1		
(93)m=	17.98	18.31	18.83	19.48	19.98	20.3	20.4	20.39	20.18	19.53	18.66	17.93		(93)
			uirement											
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
uie u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilis			ains, hm		iviay	Juli	Jul	Aug	ССР	001	1100	Dec		
(94)m=	0.93	0.91	0.86	0.79	0.68	0.53	0.39	0.43	0.63	0.82	0.91	0.94		(94)
	∟ ul gains.	hmGm	, W = (9 ²	1)m x (84	4)m			l		l	l			
(95)m=		486.02	517.83	520.07	470.46	358.57	254.12	262.55	358.91	415.37	417.66	420		(95)
Mont	hly aver	age exte	rnal tem	perature	e from Ta	able 8	<u> </u>		<u> </u>	<u> </u>	<u>l</u>	<u> </u>		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	-[(39)m :	x [(93)m	– (96)m	1	ļ	<u> </u>		
	1000.68	1	896.22	756.27	590.03	399.45	266.52	278.77	429.06	636.37	829.44	991.71		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Mh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=		330.41	281.52	170.07	88.96	0	0	0	0	164.43	296.48	425.35		
		!						Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2175.35	(98)
Snac	a haatin	a requir	ement in	k\Mh/m²	!/vear							ŕ	30.46	(99)
·		•			/yeai								30.40	(33)
		- J	quiremen											
Calcu		ĭ	July and	- U										
Heet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(100)m=		e Lm (ca	lculated 0	using 2		659.03	518.81	531.06	emarten 0	nperatur 0	0	able 10)		(100)
, ,				U	U	659.05	310.01	551.06	0	U		U		(100)
(101)m=		tor for lo	0	0	0	0.83	0.89	0.87	0	0	0	0		(101)
, ,		<u> </u>	/atts) = (0.89	0.07	0	U		U		(101)
USeit	וו ווטסס, ו	IIII∟III (V	vaus) = (א ווונטטו	. (10 1)111									
(102)m-	0	·			<u> </u>	1	450.33	461.27		٥	Ι ο	0		(102)
(102)m=		0	0	0	0	549.61	459.33	461.27	0	0	0	0		(102)
Gains	s (solar	0 gains ca	0 lculated	0 for appli	o cable we	549.61 eather re	egion, se	e Table	10)		<u> </u>			
Gains (103)m=	s (solar o	0 gains ca	0 lculated	0 for appli	0 cable we	549.61 eather re 866.26	egion, se 831.72	e Table 791.94	10)	0	0	0	v (41)m	(102)
Gains (103)m=	s (solar o	gains ca 0 g require	0 lculated 0 ement fo	for appli 0 r month,	cable we	549.61 eather re 866.26	egion, se 831.72	e Table 791.94	10)	0	0	0	x (41)m	
Gains (103)m=	s (solar o o e cooling 04)m to	gains ca 0 g require	0 lculated	for appli 0 r month,	cable we	549.61 eather re 866.26	egion, se 831.72	e Table 791.94	10)	0	0	0	x (41)m	
Gains (103)m= Spac set (1	s (solar o o e cooling 04)m to	gains ca 0 g require zero if (0 lculated 0 ement for (104)m <	o for appli o r month, 3 × (98	o cable we o whole o	549.61 eather re 866.26 dwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ 0 & (h) = 0.0 \end{array} $	0 24 x [(10	0 03) <i>m</i> – (0 102)m] x	x (41)m 751.07	
Gains (103)m= Spac set (1 (104)m=	s (solar o o e cooling 04)m to	gains ca 0 g require zero if (0 lculated 0 ement for (104)m <	o for appli o r month, 3 × (98	o cable we o whole o	549.61 eather re 866.26 dwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ Total	0 24 x [(10	0 03)m – (0 1,0,4)	0 102)m]		(103)
Gains (103)m= Spac set (1 (104)m=	s (solar of the cooling of the cooli	gains ca 0 grequire zero if (0 lculated 0 ement for (104)m <	0 for appli 0 r month, 3 x (98	o cable we o whole o	549.61 eather re 866.26 dwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ Total	0 24 x [(10 0 = Sum(0 03)m – (0 1,0,4)	0 102)m]	751.07	(103)
Gains (103)m= Spac set (1 (104)m=	s (solar of the cooling of the cooli	gains ca 0 grequire zero if (0 lculated 0 ement fo (104)m <	0 for appli 0 r month, 3 x (98	o cable we o whole o	549.61 eather re 866.26 dwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ Total	0 24 x [(10 0 = Sum(0 03)m – (0 1,0,4)	0 102)m]	751.07	(103)
Gains (103)m= Spac set (1 (104)m= Cooled Interm	s (solar of the cooling of the cooli	gains ca 0 g require zero if (0 n actor (Ta	0 lculated 0 ement for 104)m < 0	0 for appli 0 r month, 3 × (98	o cable we o whole o)m	549.61 eather re 866.26 dwelling, 227.99	egion, se 831.72 continuo 277.06	ee Table 791.94 ous (kW 246.02	10) 0 /h) = 0.0 Total f C =	0 24 x [(10 0 = Sum(cooled a	0 03)m - (0 104) area ÷ (4	0 102)m] 3 0 = 4) =	751.07	(103)

				<u> </u>	× (105)	× (106)r				T			
(107)m= 0	0	0	0	0	41.95	50.98	45.27	0 Total	0 = Sum	(107)	= 0	138.21	(107)
Space cooling	require	ment in I	دWh/m²/y	/ear) ÷ (4) =		L [1.94	(108)
9b. Energy red	quiremer	nts – Co	mmunity	heating	scheme	;					L		
This part is use										nunity so	heme.		7(204)
			•	• •	,	Ū	(Table I	1) 0 11 11	one		Ĺ	0	(301)
Fraction of spa The community so			•	•	,	,	allows for	CUD and	un to four	other her	ut sources: th	1 o latter	(302)
includes boilers, h		-							ир то тойг	outer flea	ii sources, irr	e lallel	_
Fraction of hea	at from (Commun	ity boiler	S								1	(303
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(;	302) x (30	3a) =	1	(304
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distribution los	ss factor	(Table	12c) for (commun	ity heati	ng syste	m					1.05	(306)
Space heating	_										г	kWh/yea	r
Annual space	ŭ	•									Ĺ	2175.35	╡.
Space heat fro		•								05) x (306)) = [2284.12	(307
Efficiency of s			•	_	•	,				,	Ĺ	0	(308)
Space heating	require	ment fro	m secon	dary/su _l	oplemen	tary sys	tem	(98) x (30	01) x 100	÷ (308) =		0	(309
Water heating Annual water l		requirem	nent								Γ	1926.82	7
f DHW from c Water heat fro		-						(64) x (30	03a) x (30	05) x (306))= [2023.16	(310
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e)	+ (310a)	.(310e)] =	43.07	(313
Cooling Syster	m Energ	y Efficie	ncy Rati	0							Ī	6.59	(314
Space cooling	(if there	is a fixe	ed cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		Ī	20.98	(315
Electricity for p							outside				_ 	161.41	
warm air heati	ng syste	em fans										0	(330
oump for solar												0	<u> </u>
Total electricity		Ū	kWh/yea	r				=(330a) -	+ (330b) -	+ (330g) =	_ 	161.41	 (331
Energy for ligh			•									321.76	(332
12b. CO2 Emi	ssions -	- Commı	unity hea	ting sch	eme						L		
				<u> </u>			Ene kW	ergy h/year		missio g CO2/		Emissions kg CO2/year	
CO2 from othe Efficiency of h				water he			g two fuels	repeat (3	63) to (36	66) for the	second fuel	93.5	(367
CO2 associate	ed with h	neat soul	rce 1			[(307b)+	-(310b)] x 1	00 ÷ (367	'b) х Г	0.22	=	995.05	(367
		eat distri					[(313) x			0.52			 (372

Total CO2 associated with community s	systems	(363)(366) + (368)(372)		=	1017.41	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	=	0	(374)
CO2 associated with water from immer	sion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			1017.41	(376)
CO2 associated with space cooling		(315) x	0.52	=	10.89	(377)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	83.77	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	=	166.99	(379)
Total CO2, kg/year	sum of (376)(382) =				1279.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				17.91	(384)
El rating (section 14)					85.28	(385)

			l loor D) otoilo:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20		User D	Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address	Flat 24					
Address: 1. Overall dwelling dim		ion Road	1, 300 10) IIVV						
1. Overall awelling aim	C11310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.85	(2a) =	203.55	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 7	71.42	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	203.55	(5)
2. Ventilation rate:										
		econdar heating	у 	other	_	total			m³ per hou	ır —
Number of chimneys	0 +	0] + [0] = [0	X	40 =	0	(6a)
Number of open flues	0 +	0	│ +	0	=	0	x :	20 =	0	(6b)
Number of intermittent fa	ans				, E	3	x	10 =	30	(7a)
Number of passive vent	S				F	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	x	40 =	0	(7c)
. vazor er naereee gae	00				L					(, o)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	a)+(7b)+((7c) =	Γ	30		÷ (5) =	0.15	(8)
If a pressurisation test has	been carried out or is intend	ded, proceed	d to (17), (otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	ruction			0	(11)
deducting areas of open	present, use the value corre nings); if equal user 0.35	sportaing to	ine great	ler wall are	a (ailei					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
J	vs and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2			(45)		0	(15)
Infiltration rate	250	h:		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeab	$_{1}$, q50, expressed in cultivity value, then $(18) = 10$		•	•	•	etre or e	envelope	area	5	(17)
·	ies if a pressurisation test ha					is beina u	sed		0.4	(18)
Number of sides shelter			`	,	,	Ü			1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.37	(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	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	1	
		1 5.55							j	

Adjusted infilti	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43]		
Calculate effe		•	rate for t	he appli	cable ca	se	•	•		•	•			٦,,,,,,
If mechanic If exhaust air h			endix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N	VS)) othe	rwise (23h) = (23a)				0	(23a
If balanced wit) = (23a)				0	(23b
a) If balance		-	-	_					2h\m + (23P) ^ [∙	1 _ (23c)		0	(230
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]]		(24a
b) If balance	ed mech:	anical ve	ntilation	without	heat rec	covery (N	/\\/) (24h	l = (2)	2b)m + (23h)		j		•
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(24b
c) If whole h	nouse ex	tract ven	tilation o	or positiv	e input v	ventilatio	n from o	utside		ļ		1		
,	m < 0.5 ×			•	•				5 × (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(240
d) If natural if (22b)	ventilation m = 1, the				•				0.5]	-				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59]		(240
Effective air	r change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		•		-		
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59			(25)
3. Heat losse	es and he	eat loss r	paramete	er:										
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²·		A X kJ/	
Doors Type 1					2.68	x	1		2.68	$\dot{\Box}$				(26)
Doors Type 2					2.74	x	1	₹ - i	2.74	=				(26)
Windows Type	e 1				3.96	x1,	/[1/(1.4)+	0.04] =	5.25	=				(27)
Windows Type	e 2				5.76	x1,	/[1/(1.4)+	0.04] =	7.64	=				(27)
Windows Type	e 3				2.71	x1,	/[1/(1.4)+	0.04] =	3.59	=				(27)
Floor					71.42	2 x	0.13	=	9.28459	9 [(28)
Walls Type1	79.9)1	17.8	5	62.06	3 x	0.18		11.17	F i		=		– (29)
Walls Type2	18.4	1	0		18.41	X	0.18	-	3.31	F i		=		一 (29)
Total area of e	elements	, m²			169.7	4								(31)
* for windows and ** include the are						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	n 3.2		
Fabric heat lo	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				45	5.67	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	898	82.78	(34)
Thermal mass	s parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		2	250	(35)
For design asses can be used inste				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f			_
Thermal bridg	jes : S (L	x Y) cal	culated i	using Ap	pendix ł	<						1	0.1	(36)
if details of therm Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			55	5.77	(37)
Ventilation he	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 40.96	40.68	40.39	39.08	38.83	37.68	37.68	37.47	38.12	38.83	39.33	39.85]		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (38)m		_		
(39)m= 96.73	96.44	96.16	94.84	94.6	93.45	93.45	93.23	93.89	94.6	95.09	95.62			_
Stroma FSAP 20	12 Version:	1.0.5.9 (S	AP 9.92)	http://ww	w.stroma.d	com			Average =	Sum(39) ₁	12 /12=	94	4.8 ≱ age 2	<u>₂ ∮{3</u> 49)

leat lo	ss para	meter (F	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
10)m=	1.35	1.35	1.35	1.33	1.32	1.31	1.31	1.31	1.31	1.32	1.33	1.34		
umbe	r of dov	o in moi	oth (Toh	lo 1o\					,	Average =	Sum(40) ₁	12 /12=	1.33	(40
lullibe	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
,	l									<u> </u>				•
4 Wa	ter heat	ing ener	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 (⁻	TFA -13		28		(4
			ater usaç									.35		(4
		_	hot water person per			_	-	to achieve	a water us	se target o	of			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate			day for ea		,			_	ОСР	000	1407			
l4)m=	97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
	!										m(44) ₁₁₂ =		1060.23	(4
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		_
instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1390.13	(4
l6)m=	21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(4
,	storage		19.51	17.01	10.52	14.00	13.03	14.30	13.10	17.00	19.20	20.34		(.
torag	e volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
	•	-	ind no ta		-			' '						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
	storage anufact		eclared I	oss facto	or is kno	wn (kWh	n/day).					55		(4
•			m Table) 10 KHO	(1	"aay).					54		(4
-			storage		ear			(48) x (49)) =			84		(5
٠.			eclared o			or is not		· / · /				01		(0
		•	factor fr		e 2 (kW	h/litre/da	ıy)					0		(5
	-	eating s from Tal	ee secti	on 4.3										(5
			m Table	2h								0		(5 (5
•			storage		ar			(47) x (51)) x (52) x (53) =		0		(5
		54) in (5	_	, 100011/90	Jui			() (0.)	/	<i>-</i>	-	84		(5
/ater	storage	loss cal	culated t	or each	month			((56)m = (55) × (41):	m				
56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(5
-												m Append	ix H	•
57)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(5
rimar		loss (an	nual) fro	m Table	3 3		!	!	!			0		(5
		,	culated			59)m = ((58) ÷ 36	65 × (41)	m			-		(3
	•		rom Tab		,		. ,	, ,		r thermo	stat)			
9)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		(5

Combi loss o	alculated	for oach	month ((61)m –	(60) · 3	65 v (11	/m						
$\begin{array}{c c} \text{Combinoss c} \\ \text{(61)m=} & 0 \end{array}$	0 0	0	0	0	0 - 3	05 x (41	0	0	0	0	0	1	(61)
			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>. </u>	<u> </u>	<u> </u>		ļ	J · (59)m + (61)m	
(62)m= 193.37		179.32	161.06	158.06	141.55	136.25	149.0		166.99	176.19	188.82]	(62)
Solar DHW inpu	t calculated	using App	endix G o	r Appendix	H (negat	ive quantity	y) (enter	'0' if no sola	ır contribut	tion to wate	er heating)	,	
(add addition	al lines if	FGHRS	and/or \	NWHRS	applies	s, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 193.37	7 170.53	179.32	161.06	158.06	141.55	136.25	149.0	9 148.69	166.99	176.19	188.82		_
							0	utput from w	ater heate	r (annual)	112	1969.92	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61	m] + 0.8	x [(46)m	+ (57)m	+ (59)m	<u>.</u>]	
(65)m= 87.32	77.49	82.64	75.83	75.57	69.34	68.32	72.59	71.72	78.55	80.86	85.8]	(65)
include (57	m in calc	culation (of (65)m	only if c	ylinder	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec		
(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_	
(67)m= 18.37	16.31	13.27	10.04	7.51	6.34	6.85	8.9	11.95	15.17	17.71	18.88		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ble 5				
(68)m= 200.59	9 202.67	197.42	186.26	172.16	158.91	150.06	147.9	3 153.23	164.39	178.49	191.74		(68)
Cooking gair	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5				
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and f	ans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heatin	g gains (T	able 5)										_	
(72)m= 117.36	115.32	111.08	105.32	101.58	96.31	91.83	97.57	99.61	105.57	112.31	115.33		(72)
Total interna	al gains =				(66)m + (67)m	n + (68)r	n + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 396.52	394.5	381.97	361.82	341.45	321.77	308.95	314.6	324.99	345.34	368.71	386.14		(73)
6. Solar gai													
Solar gains are		•				•	ations to	convert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
- <i>.</i>							, –						1
East 0.9x		X	3.9	96	X	19.64]	0.63	x	0.7	=	23.77	(76)
East 0.9x		X	3.9		-	38.42] X	0.63	x	0.7	=	46.5	[(76)
East 0.9x		X	3.9		-	63.27]	0.63	x	0.7	=	76.57	[(76)
East 0.9x		X	3.9		=	92.28]	0.63	x	0.7	=	111.68	(76)
East 0.9x	0.77	X	3.9	96	X 1	13.09	X	0.63	х	0.7	=	136.87	(76)

East	٥۲			1		٦			1 1			г		_			7(70)
East	0.9x	0.77	႕	X	3.96] X		15.77	X	0.63	==	ΧL	0.7	╡ ╸		40.11	(76)
	0.9x	0.77		X	3.96	J X	—	10.22	X	0.63		X	0.7	╡ =		33.39	(76)
East	0.9x	0.77		X	3.96	J X		4.68	X	0.63		X	0.7	_ =		14.58	(76)
East	0.9x	0.77		X	3.96	X	7	3.59	X	0.63		X	0.7	=	8	9.06	(76)
East -	0.9x	0.77		X	3.96	X	4	5.59	X	0.63		X	0.7	=	5	5.17	(76)
East	0.9x	0.77		X	3.96	X	2	4.49	X	0.63		X	0.7	=	2	9.64	(76)
East	0.9x	0.77		X	3.96	X	1	6.15	X	0.63		X	0.7	=	1	9.55	(76)
South	0.9x	0.77		X	2.71	X	4	6.75	X	0.63		X	0.7	=	3	8.72	(78)
South	0.9x	0.77		X	2.71	X	7	6.57	X	0.63		X	0.7	=	6	3.41	(78)
South	0.9x	0.77		X	2.71	X	9	7.53	X	0.63		X	0.7	=	8	0.78	(78)
South	0.9x	0.77		X	2.71	X	1	10.23	X	0.63		X	0.7	=	(91.3	(78)
South	0.9x	0.77		x	2.71	X	1	14.87	X	0.63	1	x	0.7	=	9	5.14	(78)
South	0.9x	0.77		x	2.71	X	1	10.55	X	0.63		x	0.7	=	9	1.56	(78)
South	0.9x	0.77		x	2.71	x	1	08.01	X	0.63		x	0.7	=	8	9.46	(78)
South	0.9x	0.77		x	2.71	X	1	04.89	X	0.63	1	x	0.7	=	8	6.87	(78)
South	0.9x	0.77		x	2.71	x	1	01.89	x	0.63	;	х	0.7	=	8	4.38	(78)
South	0.9x	0.77		x	2.71	x	8	2.59	x	0.63		х	0.7	_ =	(88.4	(78)
South	0.9x	0.77		x	2.71	x	5	5.42	x	0.63		x	0.7	=	4	15.9	(78)
South	0.9x	0.77		x	2.71	x		40.4	x	0.63		х	0.7	=	3	3.46	(78)
West	0.9x	0.77		x	5.76	x	1	9.64	x	0.63		х	0.7		3	4.57	(80)
West	0.9x	0.77	一	x	5.76	x	3	8.42	x	0.63		х	0.7	=	6	7.63	(80)
West	0.9x	0.77	一	x	5.76	X	6	3.27	x	0.63	;	х	0.7		1	11.38	(80)
West	0.9x	0.77		x	5.76	j x	9	2.28	x	0.63		х	0.7	_ =	16	62.44	(80)
West	0.9x	0.77		x	5.76	j x	1	13.09	x	0.63		х	0.7	╡ -	19	99.08	(80)
West	0.9x	0.77		x	5.76	j x	1	15.77	X	0.63		х	0.7	╡ -	20	03.79	(80)
West	0.9x	0.77		x	5.76	X	1	10.22	X	0.63		х	0.7	= =	19	94.02	(80)
West	0.9x	0.77		x	5.76	X	9	4.68	X	0.63		х	0.7	-	16	66.66	(80)
West	0.9x	0.77		x	5.76	X	7	3.59	X	0.63		х	0.7	= =	12	29.54	(80)
West	0.9x	0.77	=	x	5.76	X		5.59	X	0.63		χ「	0.7	_ =		0.25	(80)
West	0.9x	0.77		x	5.76] x		4.49	X	0.63	==	χ「	0.7	_ =		3.11	(80)
West	0.9x	0.77		x	5.76] x		6.15	X	0.63	==	χ「	0.7	╡ -		8.43	(80)
	L					_			ı			L					
Solar ga	ains in	watts, ca	alcula	ted	for each mon	ıth			(83)m	ı = Sum(74	l)m(8	32)m					
(83)m=	97.06	177.54	268.		365.42 431.0	-	35.46	416.87	368	.11 302.	.98 2	03.82	118.64	81.44	7		(83)
Total ga	ins – ir	nternal a	nd so	olar	(84)m = (73) r	n + (83)m	, watts					-				
(84)m=	493.58	572.05	650.	71	727.24 772.5	64 7	57.23	725.82	682	.77 627.	.97 5	49.16	487.35	467.58			(84)
7. Mea	ın inter	nal temp	eratu	ıre (heating seas	on)											
Tempe	rature	during h	eatin	g pe	eriods in the I	iving	area	from Tal	ole 9,	Th1 (°C	;)					21	(85)
Utilisat	ion fac	tor for ga	ains f	or li	ving area, h1	,m (s	ee Ta	ble 9a)									
Γ	Jan	Feb	Ma	ar	Apr Ma	y	Jun	Jul	A	ug Se	ер	Oct	Nov	Dec	7		
(86)m=	1	0.99	0.98	В	0.95 0.87		0.71	0.55	0.0	6 0.8	3 (0.97	0.99	1			(86)
Mean i	nterna	l temper	ature	in li	ving area T1	(follo	w ste	ns 3 to 7	 7 in T	able 9c)					_		
(87)m=	19.58	19.75	20.0	_	20.42 20.73		20.92	20.98	20.		-	20.42	19.93	19.55	7		(87)
· · ·						_			<u> </u>				<u> </u>		_		

Tomp	oratura	durina h	ooting n	oriode ir	roct of	dwolling	ı from To	blo 0 T	h2 (°C)					
(88)m=	19.8	19.8	19.8	19.82	19.82	19.83	from Ta 19.83	19.84	19.83	19.82	19.82	19.81	1	(88)
` ′	L					<u>!</u>	ee Table		19.03	19.02	19.02	19.01	l	(00)
(89)m=	1	0.99	0.97	0.93	0.82	0.61	0.41	0.46	0.75	0.95	0.99	1		(89)
Mean	internal	temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)	<u>I</u>			
(90)m=	17.93	18.18	18.61	19.15	19.56	19.79	19.83	19.83	19.7	19.17	18.46	17.9		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.38	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) x T2					_
(92)m=	18.56	18.78	19.16	19.63	20.01	20.22	20.27	20.27	20.14	19.65	19.03	18.53		(92)
	!					ature fro	m Table	L	ere appro	L opriate	<u> </u>		I	
(93)m=	18.56	18.78	19.16	19.63	20.01	20.22	20.27	20.27	20.14	19.65	19.03	18.53		(93)
	ace heat	tina real	uirement											
Set Ti	i to the r	nean int	ernal ter			ned at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	:ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac					1 5311	1 001	, . <u></u>	_ 				ı	
(94)m=	0.99	0.99	0.97	0.92	0.83	0.65	0.46	0.51	0.77	0.95	0.99	0.99		(94)
	ıl gains.	hmGm .	. W = (94	1)m x (84	4)m			l		l .	<u> </u>		I	
(95)m=		564.39	631.26	672.7	637.47	490.1	336.88	350.85	486.56	519.84	480.95	465.02		(95)
		age exte	rnal tem	perature	from Ta	ı able 8		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	I	
(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 I	loss rate	for mea	an intern	al tempe	erature,	Lm,W:	=[(39)m :	x [(93)m	– (96)m	1	<u> </u>	ļ	I	
1	1379.25			1018.04	786.28	525.37	343	360.46	567.08	855.95	1134.06	1370.39		(97)
Space	e heating	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	l	I	
(98)m=		520.55	435.79	248.65	110.71	0	0	0	0	250.07	470.24	673.59		
!								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3371.06	(98)
Space	e heating	g require	ement in	kWh/m²	/year								47.2	(99)
9a. En	ergy req	uiremer	nts – Ind	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatin	ıg:												
Fracti	on of sp	ace hea	it from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of tot	al heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	econda	ry/suppl	ementar	y heatin	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heating	g require	ement (c	alculate	d above))	•					•		
	661.47	520.55	435.79	248.65	110.71	0	0	0	0	250.07	470.24	673.59		
(211)m	$1 = \{[(98)]$	m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	707.45	556.74	466.08	265.94	118.41	0	0	0	0	267.45	502.93	720.42		
'	!							Tota	l (kWh/yea	ar) =Sum(2	211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	=	3605.41	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month									_
•)m x (20	•		• , .										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
						-	_	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
														<u> </u>

Water heating								
Output from water heater (calculated above) 193.37 170.53 179.32 161.06 158.06 1	41.55 136.25	149.09	148.69	166.99	176.19	188.82	1	
Efficiency of water heater							79.8	(216)
(217)m= 87.84 87.6 87.1 85.97 83.89	79.8 79.8	79.8	79.8	85.89	87.31	87.92		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•						•	
` '	77.38 170.74	186.83	186.33	194.43	201.8	214.77]	
	•	Total	= Sum(2	19a) ₁₁₂ =		•	2328.74	(219)
Annual totals				k\	Wh/yeaı	•	kWh/year	- -
Space heating fuel used, main system 1							3605.41	<u> </u>
Water heating fuel used							2328.74	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30]	(230c)
boiler with a fan-assisted flue						45]	(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							324.37	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	778.77	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	503.01	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1281.78	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	168.35	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1489.05	(272)

TER =

(273)

20.85

			User_I	Details:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20)12		Strom Softwa					0035000 on: 1.0.5.9	
			i i	Address	: Flat 33					
Address :	The Alders, Aldrin	gton Road	d, SW16	3 1TW						
1. Overall dwelling dime	ensions:		Λ	a/m²\		Av. Ha	! or lo 4 / roo \		Value a/m	1
Ground floor				a(m²) 49.68	(1a) x		ight(m) 2.75	(2a) =	Volume(m 3 136.62	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	1e)+(1r	n)	49.68	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	136.62	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	′y □ +	other 0	7 = [total 0	x	40 =	m³ per hou	(6a)
Number of open flues	0 +	0	┪╻┝	0	」	0	x	20 =	0	(6b)
Number of intermittent fa	0	U			J			10 =		= `
					Ļ	0			0	(7a)
Number of passive vents						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	7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has					continue fr	_		÷ (3) =	0	(0)
Number of storeys in t		,	, ,,			, ,	, ,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	ruction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre ings): if equal user 0.35	esponding to	the grea	ter wall are	a (after					
If suspended wooden	• / /	aled) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0)							0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value			•	•	•	etre of e	envelope	area	3	(17)
If based on air permeab	· ·								0.15	(18)
Air permeability value appli Number of sides shelter		ias been dor	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	Cu			(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	iting shelter factor			(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spec	ed								 `
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind s						•	•	•	_	
(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 $(22a)m = (2a)m =$	'	1 25-							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 infiltr	ation rat	e (allowi	ng for sl	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 effe If mechanic		_	rate for t	he appli	cable ca	se	-		-	-			
If exhaust air h			andiv N (2	13h) - (23a	a) v Emy (e	aguation (N5N othe	nvice (23h) = (232)			0.5	(2:
		0 11		, ,	,	. ,	,, .	`) = (23a)			0.5	(2:
If balanced with		-	-	_					21.) (001) [4 (00.)	76.5	(2:
a) If balance	1			.		- `	- 	``	– `		' ' '	÷ 100] I	(2
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
b) If balance				ı —			r ´`	í ·	 	– ´ –	Ι .	1	(2)
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h					-		on from c c) = (22 b		5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r							on from I 0.5 + [(2		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 (24b	o) or (24	c) or (24	ld) in box	(25)				•	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
3. Heat losse	s and he	at loss i	naramet	or.									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		A X k kJ/K
oors		()		-	2.12		1		2.12				(2
Vindows Type	e 1				3.16	_	/[1/(1.3)+		3.9	=			(2
Vindows Type					8.72	=	/[1/(1.3)+		10.78	=			(2
Valls Type1		<u> </u>		_		=		—, ¦		╡ ,		–	`
	40.8		14	_	26.81	=	0.15	=	4.02	믁 ¦			(2
Valls Type2	10.	_	0	_	10.2	X	0.14	=	1.44	닠 ¦		╡	(2
Valls Type3	7.5	6	0		7.56	X	0.13	_ =	1	ᆜ !		-	(2
loof	49.6		0		49.68	3 X	0.11	=	5.46				(3
otal area of e	elements	, m²			108.2	5							(3
arty wall					18.97	X	0	=	0				(3
for windows and include the are						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
abric heat lo				is anu pan	uuoris		(26)(30)	+ (32) =				20.72	(3
leat capacity		,	0)				(20)(00)		(30) + (32	2) ± (32a)	(32e) -	28.72	==
hermal mass		,	2 – Cm	· TE/\ ir	n k I/m2k				tive Value	, , ,	(326) =	1450.5	(3
or design asses	•	,		,			recisely the				able 1f	100	(3
an be used inste				00770174101			00.00.9	a.oaare	74.4000				
hermal bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						10.06	(3
details of therm		are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he								(33) +	(36) =			38.78	(3
entilation hea		i	·	<u> </u>		T	1		= 0.33 × (ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 12.63	12.48	12.34	11.62	11.48	10.76	10.76	10.61	11.05	11.48	11.76	12.05		(3
leat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
		T											

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.03	1.03	1.03	1.01	1.01	1	1	0.99	1	1.01	1.02	1.02		
						ı	ı	,	Average =	Sum(40) ₁ .	12 /12=	1.01	(40)
Number of day	1	nth (Tab	le 1a)					ı					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		68		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.12		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 81.53	78.56	75.6	72.63	69.67	66.7	66.7	69.67	72.63	75.6	78.56	81.53		
						_	- /			m(44) ₁₁₂ =	L	889.39	(44)
Energy content of													
(45)m= 120.9	105.74	109.12	95.13	91.28	78.77	72.99	83.76	84.76	98.78	107.82	117.09		
If instantaneous w	vater heati	ng at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	- [1166.14	(45)
(46)m= 18.14	15.86	16.37	14.27	13.69	11.82	10.95	12.56	12.71	14.82	16.17	17.56		(46)
Water storage	l	10.07		10.00	11.02	10.00	12.00	12.7	1 1.02	10.17	11.00		(- /
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		oclarod I	occ fact	or ie kna	wn (k\//k	2/d2v/):					•		(40)
•				JI IS KIIO	WII (KVVI	i/uay).					.2		(48)
Temperature f Energy lost fro				oor			(48) x (49)	\ _			.6		(49)
b) If manufact		_	-		or is not		(40) X (49)	, –		0.	72		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor Temperature f			2h								0		(52)
·							(47) v (54)) v (EQ) v (E0)		0		(53)
Energy lost fro Enter (50) or		_	, KVVII/y	al			(47) X (31)) x (52) x (55) =	-	0 72		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = ((55) × (41)	m	0.	12		(00)
	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
(56)m= 22.32 If cylinder contains												ix H	(50)
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
` '	!			Į	21.0	22.02	22.02	21.0	22.02				, ,
Primary circuit	•	,			50\m = 4	(EQ) + 26	S5 ~ (44)	ım			0		(58)
Primary circuit (modified by				,		` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
			<u> </u>	<u> </u>	L	L	L	L	<u> </u>	L			

Combi loss	ralculated	for each	month ((61)m =	(60) ± 3	865 v (41)m							
(61)m= 0	0	0	0	0 0	0	0))	0	0	T 0	0]	(61)
	auired for	water h	eating ca	Lalculated	L I for eac	 ch month	(62)	—— m =	0.85 × (′45)m +		(57)m +	ı · (59)m + (61)m	
(62)m= 166.4		154.7	139.24	136.86	122.88		129	_	128.87	144.36	151.93	162.67]	(62)
Solar DHW inp	ut calculated	using App	endix G o	r Appendix	H (nega	 tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	.	
(add additio												•		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(63)
Output from	water hea	ter				•	•				•	•	•	
(64)m= 166.4	19 146.91	154.7	139.24	136.86	122.88	118.57	129	.34	128.87	144.36	151.93	162.67]	
	•	•				•		Outp	out from wa	ater heate	er (annual)	112	1702.83	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n]	
(65)m= 76.6	7 68.1	72.75	66.92	66.82	61.48	60.74	64.	32	63.47	69.31	71.14	75.4]	(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	n Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
(66)m= 84.0	3 84.03	84.03	84.03	84.03	84.03	84.03	84.	03	84.03	84.03	84.03	84.03		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				_	
(67)m= 13.0	5 11.59	9.43	7.14	5.34	4.5	4.87	6.3	33	8.49	10.78	12.58	13.41]	(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a),	also	see Tal	ble 5		_	_	
(68)m= 146.	4 147.92	144.09	135.94	125.66	115.99	109.53	108	.01	111.84	119.99	130.27	139.94]	(68)
Cooking gai	ns (calcula	ted in A	opendix	L, equat	ion L15	or L15a), als	o se	e Table	5		-	-	
(69)m= 31.4	31.4	31.4	31.4	31.4	31.4	31.4	31	.4	31.4	31.4	31.4	31.4]	(69)
Pumps and	fans gains	(Table 5	āa)											
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	ive valu	es) (Tab	le 5)									
(71)m= -67.2	3 -67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67	.23	-67.23	-67.23	-67.23	-67.23]	(71)
Water heating	ng gains (T	able 5)		-	_	-					-		_	
(72)m= 103.0)5 101.33	97.78	92.95	89.81	85.39	81.63	86.	45	88.15	93.16	98.81	101.34]	(72)
Total intern	al gains =	•		-	(60	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m		
(73)m= 310.7	71 309.06	299.51	284.24	269.01	254.09	244.24	248	.99	256.69	272.14	289.87	302.91]	(73)
6. Solar ga	ins:												_	
Solar gains a		•					ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		_	g_ able 6b	7	FF able 6c		Gains (W)	
							,		able ob	_ '	able oc		(۷۷)	-
East 0.9		X	3.1	16	X	19.64	X		0.5	x	0.7	=	15.05	(76)
East 0.9			3.1		x	38.42	X		0.5	x	0.7	=	29.45	 (76) −
East 0.9		X	3.1		x	63.27	X		0.5	x	0.7	=	48.5	<u> </u> (76)
East 0.9		X	3.1	16	x	92.28	X	<u></u>	0.5	x	0.7	=	70.73	(76)
East 0.9	x 0.77	X	3.1	16	X	113.09	X		0.5	X	0.7	=	86.68	(76)

	-								,			_			_		_
East	0.9x	0.77	X	3.	6	X	1	15.77	X		0.5	×	0.7	•		88.73	(76)
East	0.9x	0.77	X	3.	6	X	1	10.22	X		0.5	X	0.7	-		84.48	(76)
East	0.9x	0.77	X	3.	6	X	9	94.68	X		0.5	X	0.7	=		72.57	(76)
East	0.9x	0.77	X	3.	6	X	7	73.59	X		0.5	X	0.7	-	-	56.4	(76)
East	0.9x	0.77	X	3.′	6	X	4	5.59	X		0.5	X	0.7	=	=	34.94	(76)
East	0.9x	0.77	X	3.	6	X	2	24.49	x		0.5	X	0.7	=	-	18.77	(76)
East	0.9x	0.77	X	3.	6	x	1	6.15	X		0.5	X	0.7	-	-	12.38	(76)
West	0.9x	0.77	X	8.7	′2	X	1	9.64	X		0.5	X	0.7	-	=	41.54	(80)
West	0.9x	0.77	X	8.7	'2	X	3	88.42	x		0.5	x	0.7	-	-	81.26	(80)
West	0.9x	0.77	X	8.7	'2	X	6	3.27	x		0.5	X	0.7	-	=	133.82	(80)
West	0.9x	0.77	X	8.7	′2	X	9	2.28	x		0.5	x	0.7		-	195.18	(80)
West	0.9x	0.77	X	8.7	' 2	X	1	13.09	x		0.5	x	0.7		- 🔚	239.2	(80)
West	0.9x	0.77	x	8.7	' 2	X	1	15.77	x		0.5	x	0.7		- 🗀	244.86	(80)
West	0.9x	0.77	x	8.7	<u>'</u> 2	X	1	10.22	х		0.5	x	0.7	<u> </u>	-	233.12	(80)
West	0.9x	0.77	X	8.7	<u>'2</u>	X	9	94.68	x		0.5	x	0.7		-	200.24	(80)
West	0.9x	0.77	X	8.7	<u>'2</u>	X	7	' 3.59	x		0.5	×	0.7		-	155.64	(80)
West	0.9x	0.77	X	8.7	' 2	X	4	15.59	x		0.5	×	0.7		-	96.42	(80)
West	0.9x	0.77	X	8.7	' 2	X	2	24.49	x		0.5	×	0.7		-	51.8	(80)
West	0.9x	0.77	x	8.7	' 2	X	1	6.15	x		0.5	= x	0.7	一 .	-	34.16	(80)
	L																
Solar o	ains in	watts, ca	lculated	for eac	h month	1			(83)m	n = Su	ım(74)m .	(82)m					
(83)m=	56.59	110.71	182.32	265.9	325.88	33	33.59	317.59	272	.81	212.05	131.3	6 70.57	46.54	ı		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts									
(84)m=	367.3	419.77	481.83	550.14	594.88	58	87.68	561.83	521	1.8	468.74	403.5	360.44	349.4	5		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)											
Temp	erature	during h	eating p	eriods ii	the liv	ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for ga	ains for l	iving are	ea, h1,n	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	С		
(86)m=	0.94	0.92	0.87	0.78	0.64	(0.49	0.37	0.4	41	0.62	0.83	0.92	0.95			(86)
Mean	interna	l tempera	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)			-			
(87)m=	19.08	19.35	19.79	20.31	20.68	т —	20.9	20.97	20.		20.79	20.28	19.6	19.04	ı		(87)
Tamn	erature	during h	eating n	arinde i	rest of	: dw	مااام	from Ta	عاما	a Th	2 (°C)						
(88)m=	20.05	20.06	20.06	20.07	20.07	_	20.09	20.09	20.		20.08	20.07	20.07	20.06	5		(88)
								<u> </u>					1				, ,
Ultilisa	ation fac	tor for ga	0.85			_	•	T	T	, T	0.56	0.0	0.01	1 0 04	\neg		(89)
	0.04	1 004 1	บ.ชอ	0.75	0.6	Т,	0.43	0.3	0.3	34	0.56	8.0	0.91	0.94			(69)
(89)m=	0.94	0.91					T-0 //			to 7	in Tabl	a 0c)					
(89)m= Mean	interna	l tempera	ature in		1	Ť		i	i 	-			1	1	_		100
(89)m=				the rest 19.23	of dwel 19.73	Ť	12 (fo 9.99	20.06	20.	-	19.88	19.22		17.44			(90)
(89)m= Mean	interna	l tempera	ature in		1	Ť		i	i 	-	19.88	19.22	18.26 ving area ÷ (1	0.58	(90) (91)
(89)m= Mean (90)m=	interna 17.5	l tempera	ature in 18.51	19.23	19.73	1	9.99	20.06	20.	06	19.88 f	19.22			1	0.58	 ` ′
(89)m= Mean (90)m=	interna 17.5	l tempera	ature in 18.51	19.23	19.73	1 1	9.99	20.06	20.	06 - fL/	19.88 f	19.22	ving area ÷ (0.58	 ` ′

(93)m=	18.42	18.74	19.25	19.86	20.28	20.52	20.59	20.58	20.41	19.84	19.04	18.37		(93)
,			uirement	L	20.20	20.52	20.55	20.56	20.41	19.04	19.04	10.57		(00)
•		·			ro obtoir	and at st	on 11 of	Table 9	o co tha	t Ti m_(76)m an	d ro colo	ulato	
			or gains	•		ieu ai sii	ър птог	Table 91	J, 50 IIIa	t 11,111=(rojili ali	u re-caic	uiale	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g	ains, hm	<u> </u>	· · · · ·				•		l			
(94)m=	0.92	0.89	0.84	0.74	0.61	0.46	0.34	0.38	0.58	0.79	0.89	0.93		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	337.94	373.96	402.87	407.09	363.89	271.47	190.91	197.28	272.08	318.08	320.98	324.26		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	725.79	709.33	651.92	552.22	431.28	293.07	197.48	206.28	314.41	464.22	603.33	720.1		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	288.56	225.37	185.29	104.49	50.14	0	0	0	0	108.73	203.29	294.51		
			I	I		I		Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1460.38	(98)
Snace	a haatin	a requir	ement in	k\/\/h/m2	2/vear								20.4	(99)
·		• •			7y c ai								29.4	
		- J	quiremer											
Calcu			July and	Ĭ	l .	Ĭ					·			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
					1	 		and exte		<u> </u>				(400)
(100)m=		0	0	0	0	465.69	366.61	375.42	0	0	0	0		(100)
	ation fac				I -					_	I -			(404)
(101)m=		0	0	0	0	0.88	0.92	0.9	0	0	0	0		(101)
			Vatts) = (ì ´	<u> </u>	ĭ		1			1			(400)
(102)m=		0	0	0	0	410.48	337.41	339.42	0	0	0	0		(102)
			T					e Table		_	ı .	_		(400)
(103)m=		0	0	0	0	740.05	708.86	662.71	0	0	0	0		(103)
•			<i>ement to</i> (104)m <			dwelling,	continue	ous (kW	h') = 0.02	24 x [(10)3)m – (102)m [:	x (41)m	
(104)m=		0	0	0	0	237.3	276.37	240.53	0	0	0	0		
(104)111=						207.0	210.01	240.00		= Sum(<u> </u>	=	754.19	(104)
Cooled	d fraction	1								,	area ÷ (4		0.83	(104)
			able 10b)					10-	ooolea .	arca . (-	-, –	0.03	(100)
(106)m=		0	0	O	0	0.25	0.25	0.25	0	0	0	0		
			l	l		l		l	Total	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n		(-00			` ′
(107)m=		0	0	0	0	49.21	57.31	49.88	0	0	0	0		
			ļ.	Į.		Į.		ļ.	Total	= Sum(107)	=	156.4	(107)
Space	cooling	requirer	ment in k	«Mh/m²/ν	/ear					· · + (4) =	,		3.15	(108)
		-				coborne			(101)	, . (.) –			5.15	
			nts – Cor											
								ting prov (Table 1			uriity SCf	ieme.	0	(301)
	-			•		-	_	(1 abio 1	., 5 11 11	0110				믁
Fractio	n of spa	ce heat	from co	mmunity	system	1 – (301	1) =						1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the lincludes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		7(2020)
Fraction of heat from Community boilers Fraction of total space heat from Community boilers (302) × (303a) =	1	(303a) (304a)
	1	` ∃
Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 13s) for community heating system	1](305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating Annual space heating requirement	kWh/year	7
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1533.4	(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	1702.83	-]
If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) =	1787.97	(310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =	33.21	(313)
Cooling System Energy Efficiency Ratio	6.59	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =	23.74	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	108.34	(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) =	108.34	(331)
Energy for lighting (calculated in Appendix L)	230.5	(332)
12b. CO2 Emissions – Community heating scheme		
Energy Emission factor En kWh/year kg CO2/kWh kg	nissions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel	93.5	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22 =	767.29	(367)
Electrical energy for heat distribution [(313) x 0.52 =	17.24	(372)
Total CO2 associated with community systems (363)(366) + (368)(372) =	784.53	(373)
CO2 associated with space heating (secondary) (309) x [309] x	0	(374)
CO2 associated with space heating (secondary) (309) x 0 = [CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 =	0	(374) (375)
		_
CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 =	0	(375)
CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.22 = $ Total CO2 associated with space and water heating $(373) + (374) + (375) = $	0 784.53	(375) (376)

 Total CO2, kg/year
 sum of (376)...(382) = 972.71 (383)

 Dwelling CO2 Emission Rate
 $(383) \div (4) =$ 19.58 (384)

 El rating (section 14)
 86.23 (385)

			lloor D) otoilo:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20		User D	Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address	Flat 33					
1. Overall dwelling dime	-	Jion Roac	ı, 300 10	, 11 VV						
1. Overall awelling all the	, , , , , , , , , , , , , , , , , , ,		Are	a(m²)		Av. He	ight(m)		Volume(m³	3)
Ground floor					(1a) x		2.75	(2a) =	136.62	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	19.68	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	136.62	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hou	r
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	T + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				Ī	2	x -	10 =	20	(7a)
Number of passive vents	S				Ē	0	x	10 =	0	(7b)
Number of flueless gas f	ires				F	0	x 4	40 =	0	(7c)
_										`
								Air ch	nanges per ho	our
Infiltration due to chimne	•					20		÷ (5) =	0.15	(8)
If a pressurisation test has b		ded, procee	d to (17),	otherwise (continue fr	om (9) to	(16)			٦
Number of storeys in the Additional infiltration	ne aweiling (ns)						[(0)	-1]x0.1 =	0	(9)
Structural infiltration: 0	25 for steel or timber	frame or	. 0 35 fo	r maconi	v conetr	ruction	[(9)	-1]XU.1 =	0	(10)
	resent, use the value corre				•	uction			0	(''')
deducting areas of opening	• / .	-ll\ 0	4 /	l\ -l						
If suspended wooden t	,	alea) or U	.1 (seale	ea), eise	enter 0				0	(12)
If no draught lobby, en Percentage of window		stripped							0	(13)
Window infiltration	s and doors draught s	stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
Air permeability value,	a50. expressed in cu	bic metre	s per ho	our per s	guare m	etre of e	envelope	area	5	(17)
If based on air permeabi	• • •		•	•	•		•		0.4	(18)
Air permeability value applie	es if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed			(22)					2	(19)
Shelter factor				(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18) x (20) =				0.34	(21)
Infiltration rate modified f	 	1		T .		<u> </u>	T		1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1		0.0	0.7		1 40	1 45	4 7	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	
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]	

Adjusted infiltration rate (allowing for shelter a	and wind speed) =	= (21a) x (22a\m					
0.43	0.32 0.32	0.31	0.34	0.36	0.38	0.4		
Calculate effective air change rate for the app		1 0.0 1	0.0 .	0.00	0.00			
If mechanical ventilation:							0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (2	3a) × Fmv (equation (N5)), otherv	wise (23b)	= (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing	g for in-use factor (from	m Table 4h)	=				0	(23c)
a) If balanced mechanical ventilation with h	eat recovery (MV	HR) (24a)	m = (22)	(b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation withou	ut heat recovery (MV) (24b)	m = (22	b)m + (2	23b)	,	•	
(24b)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positif $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$	•			5 × (23b	o)			
(24c)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house posi if (22b)m = 1, then (24d)m = (22b)m oth	•			0.5]			•	
(24d)m= 0.59 0.59 0.57 0.57	0.55 0.55	0.55	0.56	0.57	0.57	0.58		(24d)
Effective air change rate - enter (24a) or (2-	4b) or (24c) or (24	4d) in box	(25)		•	•	•	
(25)m= 0.59 0.59 0.59 0.57 0.57	0.55 0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. Heat losses and heat loss parameter:			·					
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-valu W/m2k		A X U (W/I	()	k-value kJ/m²-l		X k I/K
Doors	2.12 X	1	` `	2.12	, 	NO/III I	· ·	(26)
Windows Type 1		' 1/[1/(1.4)+ (-	3.63	=			(27)
Windows Type 2		1/[1/(1.4)+ (_		╡			, ,
···			—,	10.02	북 ,			(27)
	28.39 X	0.18	_ = - -	5.11				(29)
Walls Type2 10.2 0	10.2 X	0.18	<u> </u>	1.84	닠 ¦			(29)
Walls Type3 7.56 0	7.56 X	0.18	┩╹	1.36	닠 ¦		_	(29)
Roof 49.68 0	49.68 ×	0.13	= [6.46				(30)
Total area of elements, m ²	108.25							(31)
Party wall	18.97 ×	0	= [0				(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and p		g formula 1/[[(1/U-value	e)+0.04] a	is given in	paragraph	1 3.2	
Fabric heat loss, W/K = S (A x U)		(26)(30)	+ (32) =				30.54	(33)
Heat capacity Cm = S(A x k)			((28)	.(30) + (32	2) + (32a).	(32e) =	1472.62	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K		Indicat	ive Value:	: Medium		250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.		recisely the	indicative	values of	TMP in Ta	able 1f		_ ` ′
Thermal bridges: S (L x Y) calculated using A	Appendix K						12.65	(36)
if details of thermal bridging are not known (36) = $0.05 x$	(31)							_
Total fabric heat loss			(33) +	(36) =			43.19	(37)
Ventilation heat loss calculated monthly			(38)m	= 0.33 × (25)m x (5)) Ī	1	
Jan Feb Mar Apr May	+ +	Aug	Sep	Oct	Nov	Dec		
(38)m= 26.7 26.54 26.38 25.64 25.5	24.85 24.85	24.73	25.1	25.5	25.78	26.08		(38)
Heat transfer coefficient, W/K			(39)m	= (37) + (3	38)m		1	
(39)m= 69.89 69.73 69.57 68.83 68.69	68.04 68.04	67.92	68.29	68.69	68.97	69.27		_
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) - http://w	ww.stroma.com		A	verage =	Sum(39) ₁	12 /12=	68.8 <mark>β</mark> age	2 (3 9)

Heat loss para	meter (l	-II P) W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.41	1.4	1.4	1.39	1.38	1.37	1.37	1.37	1.37	1.38	1.39	1.39		
()										Sum(40) ₁ .		1.39	(40)
Number of day	s in mo	nth (Tabl	le 1a)							(),			``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					<u> </u>	<u> </u>	<u> </u>	l			<u> </u>		
4 \\/											1-10/1- /		
4. Water heat	ing ene	rgy 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		68		(42)
Annual average	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.12		(43)
not more that 125	litres per	person per	day (all w	ater use, I	not and co	la) 							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres per	r day for ea	ch month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
(44)m= 81.53	78.56	75.6	72.63	69.67	66.7	66.7	69.67	72.63	75.6	78.56	81.53		
							- /			m(44) ₁₁₂ =		889.39	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 120.9	105.74	109.12	95.13	91.28	78.77	72.99	83.76	84.76	98.78	107.82	117.09		
<i>((</i>) (-1		()		h (40		Total = Su	ım(45) ₁₁₂ =	=	1166.14	(45)
If instantaneous w	ater neati	ng at point	of use (no	not water	storage),	enter 0 in	boxes (46)) to (61)					
(46)m= 18.14	15.86	16.37	14.27	13.69	11.82	10.95	12.56	12.71	14.82	16.17	17.56		(46)
Water storage		مائلم بالمصاد		. lo o \ \	WALLES		م منطقتین		امما				(>
Storage volum	` '		-			•		ame ves	sei		150		(47)
If community h	•			•			` '	oral anto	or 'O' in /	(47)			
Otherwise if no Water storage		not wate	er (uns ir	iciudes i	nstantar	ieous co	ווסם ומוזונ	ers) erite	er O III ((47)			
a) If manufacti		eclared lo	oss facto	or is kno	wn (kWł	n/dav):				1	55		(48)
Temperature fa				J. 10 1410	(., uu, , .							(49)
Energy lost from				oor			(48) x (49)	\ _			54		. ,
b) If manufacti		•			or is not		(40) X (49)	, –		0.	84		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee sectio	on 4.3										
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (5	55)								0.	84		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5 ⁻	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Camb:	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m=	0	0 0	or eac	n month	$\frac{(61)m = 0}{10}$	(60) ÷ 3	0 × (41)m 0		0	0	0	0	1	(61)
L		ļ				<u> </u>		<u> </u>			<u> </u>	<u> </u>	<u> </u>	(F0)m + (61)m	(01)
(62)m=	170.15		158.36		140.52	126.42		13:		132.41	148.02	155.48	166.33	(59)m + (61)m]	(62)
L		calculated			ļ			<u> </u>						J	(02)
		al lines if									i continuu	ion to wate	er neating)		
(63)m=	0	0	0	0	0	0	0	0		0	0	0	0]	(63)
L	from w	/ater hea	ter	ļ		<u> </u>					<u> </u>	<u> </u>	<u> </u>	J	
(64)m=	170.15		158.36	142.79	140.52	126.42	122.23	13	3	132.41	148.02	155.48	166.33]	
` ' L		1		ı	1		.1		Outp	out from w	ı ater heate	<u>I</u> r (annual)₁	l12	1745.93	(64)
Heat ga	ains fro	m water	heating	ı, kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	 .]	-
(65)m=	79.59	70.74	75.68	69.75	69.74	64.31	63.66	67.2	_	66.31	72.24	73.97	78.33	ĺ	(65)
inclu	de (57)	m in calc	culation	of (65)m	only if c	vlinder	is in the	dwell	ing	or hot w	ater is f	om com	munity h	ı neating	
		ains (see				,			<u> </u>				• •		
		ns (Table			,										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m=	84.03	84.03	84.03	84.03	84.03	84.03	84.03	84.0	03	84.03	84.03	84.03	84.03	1	(66)
Lighting	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5		•	•	•	
(67)m=	13.1	11.64	9.46	7.16	5.36	4.52	4.89	6.3	5	8.52	10.82	12.63	13.46		(67)
Applian	ices ga	ains (calc	ulated i	n Appen	dix L, eq	uation I	_13 or L1	3a), a	also	see Ta	ble 5	•	•	-	
(68)m=	146.4	147.92	144.09	135.94	125.66	115.99	109.53	108.	.01	111.84	119.99	130.27	139.94]	(68)
Cookin	g gains	s (calcula	ted in A	Appendix	L, equat	ion L15	or L15a), als	0 SE	e Table	5			•	
(69)m=	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.	4	31.4	31.4	31.4	31.4]	(69)
Pumps	and fa	ıns gains	(Table	5a)											
(70)m=	3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses	e.g. e	vaporatio	n (nega	ative valu	ies) (Tab	le 5)								_	
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.	23	-67.23	-67.23	-67.23	-67.23		(71)
Water h	neating	gains (T	able 5)											_	
(72)m=	106.98	105.27	101.71	96.88	93.74	89.32	85.57	90.3	38	92.09	97.09	102.74	105.28		(72)
Total in	nterna	l gains =				(60	6)m + (67)n	n + (68	8)m +	+ (69)m +	(70)m + (7	(1)m + (72))m	_	
(73)m=	317.7	316.04	306.48	291.2	275.96	261.04	251.19	255.	.95	263.66	279.11	296.86	309.89		(73)
	ar gain														
•	Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.														
Orienta		Access F Table 6d	actor	Area m²	l		ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
Coat								1 1						. ,	7,
East	0.9x	0.77			74	X	19.64	X		0.63	╡ [×] ╞	0.7	=	16.45	(76)
East	0.9x	0.77	===		74	x	38.42	X]		0.63	×	0.7	=	32.17	[(76)
East	0.9x	0.77			74	x	63.27	X		0.63	x	0.7	=	52.98	[(76)
East	0.9x	0.77			74	-	92.28	X		0.63	_ ×	0.7	=	77.27	(76)
East	0.9x	0.77)	2.	74	X	113.09	X		0.63	Х	0.7	=	94.7	(76)

	_								_						
East	0.9x	0.77	X	2.7	' 4	X	1	15.77	X	0.63	X	0.7	=	96.94	(76)
East	0.9x	0.77	X	2.7	' 4	X	1	10.22	X	0.63	X	0.7	=	92.29	(76)
East	0.9x	0.77	X	2.7	' 4	X	9	94.68	x	0.63	X	0.7	=	79.28	(76)
East	0.9x	0.77	X	2.7	' 4	X	7	'3.59	x	0.63	X	0.7	=	61.62	(76)
East	0.9x	0.77	Х	2.7	' 4	X	4	15.59	X	0.63	X	0.7	=	38.18	(76)
East	0.9x	0.77	Х	2.7	'4	X	2	24.49	X	0.63	X	0.7	=	20.51	(76)
East	0.9x	0.77	Х	2.7	' 4	X	1	6.15	X	0.63	X	0.7	=	13.52	(76)
West	0.9x	0.77	X	7.5	56	X	1	9.64	X	0.63	X	0.7	=	45.38	(80)
West	0.9x	0.77	x	7.5	56	x	3	88.42	x	0.63	X	0.7	=	88.77	(80)
West	0.9x	0.77	х	7.5	56	X	6	3.27	x	0.63	X	0.7	=	146.19	(80)
West	0.9x	0.77	x	7.5	56	X	9	2.28	x	0.63	x	0.7	_ =	213.21	(80)
West	0.9x	0.77	x	7.5	56	X	1	13.09	x	0.63	х	0.7	=	261.29	(80)
West	0.9x	0.77	х	7.5	56	X	1	15.77	x	0.63	x	0.7	=	267.48	(80)
West	0.9x	0.77	x	7.5	56	X	1	10.22	x	0.63	x	0.7	=	254.65	(80)
West	0.9x	0.77	X	7.5	56	X	9	94.68	x	0.63	х	0.7	=	218.74	(80)
West	0.9x	0.77	X	7.5	56	x	7	73.59	x	0.63	x	0.7	=	170.02	(80)
West	0.9x	0.77	х	7.5	56	x	4	l5.59	x	0.63	x	0.7	=	105.33	(80)
West	0.9x	0.77	х	7.5	56	x	2	24.49	x	0.63	x	0.7	=	56.58	(80)
West	0.9x	0.77	Х	7.5	56	X	1	6.15	x	0.63	x	0.7	=	37.32	(80)
Solar g	ains in 61.82	watts, ca	alculated	for eac 290.48	n month 355.99	$\overline{}$	64.42	346.95	(83)m 298	n = Sum(74)m .02 231.65	<mark>(82)m</mark> 143.5		50.84]	(83)
Total ga	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts		•		•		4	
(84)m=	379.52	436.98	505.65	581.68	631.96	6	25.47	598.14	553	.97 495.3	422.6	2 373.94	360.74]	(84)
7. Mea	an inter	nal temp	erature	(heating	seasor	า)									
				`			area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for ga	ains for I	iving are	ea, h1,n	n (s	ee Ta	ıble 9a)							_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.93	0.82		0.65	0.49	0.5	0.79	0.96	0.99	1		(86)
Mean	interna	l tempera	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)			-		
(87)m=	19.57	19.75	20.07	20.47	20.78	2	20.94	20.99	20.	98 20.86	20.44	19.93	19.54]	(87)
Tempe	erature	durina h	eating p	eriods ir	rest of	· dw	/elling	from Ta	able 9	9, Th2 (°C)				4	
(88)m=	19.76	19.76	19.76	19.77	19.78	_	19.79	19.79	19.	· · · · ·	19.78	19.77	19.77]	(88)
L	tion for	tor for ga	nine for i	ract of d	wolling	h2	m (cc	no Tablo	.00/			-1	ļ.	J	
(89)m=	0.99	0.99	0.96	0.9	0.76	_	0.54	0.36	0.4	1 0.7	0.93	0.99	0.99	1	(89)
L		<u> </u>						<u> </u>		<u> </u>		1 0.00	0.00	J	()
Г					1	Ť	•	i	r i —	to 7 in Tab	i – –	10.40	17.00	1	(90)
(90)m=	17.9	18.16	18.61	19.18	19.57	1	19.75	19.78	19.		19.15	18.43 ving area ÷ (17.86 4) =	0.50	_ ``
												nny arta + (-) –	0.58	(91)
Г						$\overline{}$			_	– fLA) × T2				1	
(92)m=	18.87	19.08	19.46	19.92	20.27	1	20.44	20.48	20.		19.9	19.3	18.84		(92)
Apply	adjustr	nent to th	ne mean	interna	tempe	ratu	ire fro	m Table	4e,	where appr	opriate	:			

_													
(93)m= 18.87	19.08	19.46	19.92	20.27	20.44	20.48	20.48	20.36	19.9	19.3	18.84		(93)
8. Space hea	ating requ	uirement											
Set Ti to the					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa			<u> </u>	iviay	Juli	Jui	L	Seb	Oct	INOV	Dec		
(94)m= 0.99	0.98	0.96	0.9	0.78	0.6	0.43	0.49	0.75	0.94	0.98	0.99		(94)
Useful gains	, hmGm	, W = (94	1)m x (84	4)m			<u> </u>			l	<u>!</u>		
(95)m= 376.05	1	486.33	525.22	494.96	375.74	259.92	270.08	371.26	395.94	367.69	358.05		(95)
Monthly ave	rage exte	rnal tem	perature	from Ta	able 8					!	!	l	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1018.33	989.02	901.36	758.82	588.84	397.55	264.07	276.85	427.65	638.63	841.65	1013.85		(97)
Space heating	Ť	1			Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4		,	I	
(98)m= 477.86	375.94	308.78	168.2	69.84	0	0	0	0	180.56	341.25	487.92		_
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2410.35	(98)
Space heating	ng require	ement in	kWh/m²	?/year								48.52	(99)
9a. Energy re	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					_
Space heati	ng:							·					
Fraction of s	pace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of s	pace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	otal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	-				a svsten	າ. %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒` ar
Space heating	1		•			<u> </u>	Aug	ОСР	001	1101	_ D00	KVVII/yO	ai.
· -	375.94	308.78	168.2	69.84	0	0	0	0	180.56	341.25	487.92		
(211)m = {[(98	3)m x (20		00 ÷ (20)6)	<u> </u>	ļ.	ļ	<u> </u>		<u>!</u>			(211)
511.08	í `	330.25	179.89	74.7	0	0	0	0	193.11	364.97	521.84		(= : :)
		ļ					Tota	l I (kWh/yea	ar) =Sum(2	L 211) _{15,1012}	<u>. </u>	2577.91	(211)
Space heating	na fuel (s	econdar	v). kWh/	month									_
$= \{[(98) \text{m x } (2)\}$	•		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
	•					•	Tota	l (kWh/yea	ar) =Sum(2	215),5,1012		0	(215)
Water heatin	g												_
Output from v	vater hea	ter (calc	ulated a	oove)			,				,		
170.15		158.36	142.79	140.52	126.42	122.23	133	132.41	148.02	155.48	166.33		_
Efficiency of v	vater hea	iter										79.8	(216)
(217)m= 87.42	87.16	86.57	85.25	83.06	79.8	79.8	79.8	79.8	85.34	86.85	87.52		(217)
Fuel for water	•												
(219)m = (64) (219)m = 194.63) ÷ (217) 182.94	m 167.49	169.18	158.42	153.17	166.67	165.93	173.44	179.01	190.06		
, ,,,,,,	1		, v	,		L		I = Sum(2		I	L	2073.27	(219)
Annual totals	5							,		Wh/year	•	kWh/year	⊣ ` `
Space heating		ed, main	system	1						<i></i>		2577.91	7
													_

Motor booting fuel used				0070.07	7
Water heating fuel used				2073.27	
Electricity for pumps, fans and electric keep-hot				_	
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230	oa)(230g) =		75	(231)
Electricity for lighting				231.36	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	556.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	447.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1004.66	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	120.07	(268)
Total CO2, kg/year	sur	m of (265)(271) =		1163.65	(272)

TER =

(273)

23.42

			User D	Notaile:						
			USELL					0.70.0	22522	
Assessor Name:	Lindsey Arı			Strom					035000	
Software Name:	Stroma FS		_	Softwa				versic	n: 1.0.5.9	
			Property		Flat 34					
Address :		Aldrington Roa	ad, SW16	1TW						
1. Overall dwelling dime	ensions:									
			Are	a(m²)		Av. He	eight(m)	_	Volume(m	<u>-</u>
Ground floor				71.42	(1a) x	2	2.75	(2a) =	196.4	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	In) 7	71.42	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	196.4	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0	+ 0	_ + _	0	Ī - Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive vents	3				Ė	0	x	10 =	0	(7b)
Number of flueless gas f	0	(7c)								
					L					
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = $(6a)+(6b)+$	(7a)+(7b)+((7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has t			ed to (17),	otherwise o	ontinue fr	rom (9) to	(16)			_
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0					•	ruction			0	(11)
if both types of wall are p deducting areas of openi			to the grea	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dra	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic metr	es per ho	our per s	quare m	etre of e	envelope	e area	3	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20] +$	-(8), otherw	rise (18) = (16)				0.15	(18)
Air permeability value applie	es if a pressurisation	on test has been de	one or a de	gree air pe	rmeability	is being u	ised			
Number of sides sheltered	ed								1	(19)
Shelter factor				(20) = 1 -	[0.0 75 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	x (20) =				0.14	(21)
Infiltration rate modified	for monthly win	d speed							_	
Jan Feb	Mar Apr	May Jun	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 (22a)m = (2	2)m ÷ 1									
(000)	<u>- / </u>	1.00 0.05	0.05	1 0 00		1 00	1 446	T 440	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 infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16]	
Calculate effect		_	rate for t	he appli	cable ca	se	!		!				— ,
If mechanica			andiv N. (2	2h) _ (22a) v Emy (c	nauation (N	VEVV otho	nuico (22h) - (232)			0.5	(23a
If balanced with) = (23a)			0.5	(23b
		•		_					2l-\ /	005) [4 (00-)	76.5	(23c
a) If balance (24a)m= 0.29	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	20)m + (0.27	230) × [0.27	0.28) ÷ 100]]	(24a
` '	<u> </u>	<u> </u>				<u> </u>	ļ	<u>!</u>	<u> </u>	<u>Į</u>	0.20	J	(214
b) If balance (24b)m= 0		o 0	0	0 Without	0	overy (i	0	0	0	0	0	1	(24b
c) If whole h				,								J	(=
if (22b)n				•	-				5 × (23b	o)		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c
d) If natural if (22b)n				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.29	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k
Doors		()			2.12		1		2.12	$\stackrel{\prime}{\Box}$			(26)
Windows Type	e 1				5.74	x ₁ ,	/[1/(1.3)+	0.04] =	7.09	Ħ			(27)
Windows Type					14.71	ऱ .	/[1/(1.3)+	0.04] =	18.18	=			(27)
Windows Type					2.85	ऱ .	/[1/(1.3)+	0.04] =	3.52	=			(27)
Walls Type1	77.1	1	23.3		53.81	_	0.15		8.07	=		–	(29)
Walls Type2	10.2	_	2.12	=	8.08	_	0.14	_	1.14	=		-	(29)
Walls Type3	7.50	_	0		7.56		0.13	_	1	<u> </u>		╡ ├─	(29)
Roof	71.4		0	=	71.42	_	0.11	_	7.86	=		╡┝	(30)
Total area of e					166.2	=	0.11		7.00				(31)
* for windows and	l roof wind	ows, use e			alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	(01)
Fabric heat los				o ana pan	idorio		(26)(30)) + (32) =				48.98	(33)
Heat capacity	•	`	-,					((28).	(30) + (32	2) + (32a).	(32e) =	1615.08	(34)
Thermal mass			P = Cm ÷	- TFA) ir	ı kJ/m²K				tive Value	, , ,	,	100	(35)
For design assess	sments wh	ere the de	tails of the				ecisely the	e indicative	values of	TMP in T	able 1f		` ′
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix ł	<						16.45	(36)
if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he	at loss							(33) +	(36) =			65.43	(37)
Ventilation hea	at loss ca		monthly	/		ı			= 0.33 × ((25)m x (5)) Ī	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 19.08	18.86	18.63	17.51	17.28	16.16	16.16	15.93	16.61	17.28	17.73	18.18]	(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 84.51	84.29	84.06	82.94	82.72	81.59	81.59	81.37	82.04	82.72	83.17	83.62		
Stroma FSAP 201	2 Version:	: 1.0.5.9 (S	AP 9.92)	http://ww	w.stroma.d	com			Average =	Sum(39) ₁	12 /12=	82.8 β ag	e 2 of 369)

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.18	1.18	1.18	1.16	1.16	1.14	1.14	1.14	1.15	1.16	1.16	1.17		
				I.		ı	ı	,	Average =	Sum(40) ₁ .	12 /12=	1.16	(40)
Number of day	1	nth (Tab	le 1a)					ı		i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		()
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
	<u>!</u>	!	<u> </u>	<u> </u>		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1060.23	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
If instantaneous u	votor boot	'na at naint	of upo /pa	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	-	1390.13	(45)
If instantaneous w			·		,.		, ,	, , , I		1	i I		(40)
(46)m= 21.62 Water storage	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1	.2		(48)
Temperature f										0	.6		(49)
Energy lost from b) If manufact		_	-		or ic not		(48) x (49)) =		0.	72		(50)
Hot water stor			-								0		(51)
If community h	•			•		,							, ,
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	72		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss o	Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$ $\begin{array}{c ccccccccccccccccccccccccccccccccccc$													
$\begin{array}{c c} \text{(61)m=} & 0 \end{array}$	0	0	0	0 0	00) + 3	0 7 (41)	0	0	0	0	0]	(61)	
	uired for	water h	eating ca	ıalculated	l for eac	h month	(62)m	= 0.85 ×	 (45)m +	(46)m +	(57)m +	ı · (59)m + (61)m		
(62)m= 189.7°	`	175.66	157.52	154.4	138.01	132.59	145.4		163.33	172.65	185.16]	(62)	
Solar DHW inpu	t calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	y) (entei	'0' if no sola	r contribut	tion to wate	er heating)	,		
(add addition	al lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix	(G)						
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)	
Output from	water hea	ter												
(64)m= 189.7°	167.23	175.66	157.52	154.4	138.01	132.59	145.4	3 145.15	163.33	172.65	185.16		_	
							0	utput from w	ater heate	er (annual)	112	1926.82	(64)	
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	<u>.</u>]		
(65)m= 84.39	74.85	79.72	73	72.65	66.51	65.4	69.66	68.88	75.62	78.03	82.88]	(65)	
include (57)m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwellir	ig or hot w	ater is f	rom com	munity h	neating		
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	5), Wat	ts									_		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec			
(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)	
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_		
(67)m= 17.88	15.88	12.92	9.78	7.31	6.17	6.67	8.67	11.63	14.77	17.24	18.38		(67)	
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5					
(68)m= 200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.9	8 153.23	164.39	178.49	191.74		(68)	
Cooking gain	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5					
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)	
Pumps and fa	ans gains	(Table 5	5a)									-		
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)	
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)							_		
(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)	
Water heatin	g gains (T	able 5)										_		
(72)m= 113.42	111.38	107.15	101.38	97.64	92.38	87.9	93.64	95.67	101.64	108.37	111.39]	(72)	
Total interna	ıl gains =	:			(66))m + (67)m	า + (68)เ	m + (69)m +	(70)m + (7	71)m + (72))m	_		
(73)m= 389.1	387.14	374.69	354.62	334.32	314.66	301.83	307.4	9 317.74	338	361.3	378.71		(73)	
6. Solar gai														
Solar gains are		_					itions to		ne applical		tion.			
Orientation:	Access F Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)		
Foot							, ,				_		1	
East 0.9x		X	5.7		-	19.64]	0.5	x	0.7	=	27.34	(76)	
East 0.9x		X	5.7			38.42]	0.5	x	0.7	=	53.49	[(76)	
East 0.9x		X	5.7		-	63.27]	0.5	×	0.7	=	88.09	[(76)	
East 0.9x		X	5.7		-	92.28]	0.5		0.7	=	128.48	(76)	
East 0.9x	0.77	X	5.7	74	x 1	13.09	X	0.5	X	0.7	=	157.45	(76)	

East	0.9x	0.77		x	5.74	7 x		15.77] x		0.5	7 x l	0.7		161.18	(76)
East	0.9x	0.77		X	5.74] ×		10.22] x		0.5		0.7		153.45	(76)
East	0.9x	0.77		x	5.74	⊒ ק ×		94.68]]	H	0.5	_	0.7	= =	131.81	(76)
East	0.9x	0.77		x	5.74	」 」×		3.59]]		0.5	_	0.7		102.45	(76)
East	0.9x	0.77	\equiv	x	5.74	┙ ╴ ×		15.59]]		0.5	_	0.7	= =	63.47	(76)
East	0.9x	0.77		x	5.74	╣		24.49]]		0.5	_	0.7	= =	34.09	(76)
East	0.9x	0.77		x	5.74	۱ ×		6.15]] x		0.5	_	0.7		22.49	(76)
South	0.9x	0.77		x	2.85	۲ ×		6.75)] x		0.5	×	0.7		32.32	(78)
South	0.9x	0.77		x	2.85	i x	7	'6.57	X		0.5	×	0.7	=	52.93	(78)
South	0.9x	0.77		x	2.85	i x	9	7.53	X		0.5	×	0.7		67.42	(78)
South	0.9x	0.77		x	2.85	i x	1	10.23	X		0.5	×	0.7	=	76.2	(78)
South	0.9x	0.77		x	2.85	i x	1	14.87	x		0.5	×	0.7		79.41	(78)
South	0.9x	0.77		x	2.85	i x	1	10.55	X		0.5	T x	0.7	=	76.42	(78)
South	0.9x	0.77		x	2.85	i x	1	08.01	x		0.5	×	0.7		74.67	(78)
South	0.9x	0.77		x	2.85	i x	1	04.89	x		0.5	×	0.7	=	72.51	(78)
South	0.9x	0.77		x	2.85	i x	1	01.89	X		0.5	×	0.7		70.43	(78)
South	0.9x	0.77		x	2.85	i x	8	32.59	X		0.5	×	0.7	=	57.09	(78)
South	0.9x	0.77		x	2.85	i x	5	55.42	x		0.5	×	0.7	=	38.31	(78)
South	0.9x	0.77		x	2.85	i ×		40.4	x		0.5	×	0.7	=	27.93	(78)
West	0.9x	0.77		x	14.71	T x	1	9.64	x		0.5	x	0.7	=	70.07	(80)
West	0.9x	0.77		x	14.71	×	3	88.42	x		0.5	x	0.7	=	137.08	(80)
West	0.9x	0.77		x	14.71	Īx	6	3.27	x		0.5	×	0.7		225.75	(80)
West	0.9x	0.77		x	14.71	×	9	2.28	x		0.5	x	0.7	=	329.25	(80)
West	0.9x	0.77		x	14.71	×	1	13.09	X		0.5	x	0.7	=	403.5	(80)
West	0.9x	0.77		x	14.71	×	1	15.77	x		0.5	x	0.7	=	413.06	(80)
West	0.9x	0.77		x	14.71	×	1	10.22	x		0.5	x	0.7	=	393.25	(80)
West	0.9x	0.77		x	14.71	×	9	94.68	X		0.5	x	0.7	=	337.79	(80)
West	0.9x	0.77		x	14.71	×	7	'3.59	X		0.5	x	0.7	=	262.56	(80)
West	0.9x	0.77		X	14.71	X		5.59	X		0.5	x	0.7	=	162.66	(80)
West	0.9x	0.77		X	14.71	×	2	24.49	X		0.5	x	0.7	=	87.37	(80)
West	0.9x	0.77		X	14.71	×	1	6.15	X		0.5	x	0.7	=	57.63	(80)
_					for each mor				ř		m(74)m		_	1	7	(2.2)
(83)m=	129.74	243.5	381.		533.92 640.3		650.66	621.36	542	.12	435.44	283.22	159.78	108.04		(83)
_				_	$\frac{(84)m = (73)}{200.55}$	_	` '		046	<u> </u>	750 40	604.00	504.00	100.75	7	(84)
(84)m=	518.83	630.64	755.		888.55 974.6		965.32	923.2	849	9.6	753.18	621.22	521.08	486.75		(04)
					heating seas					 4	(0.0)					
•		•		•	eriods in the l	-			ole 9	, Ih1	(°C)				21	(85)
Utilisa		Ť		$\overline{}$	ving area, h1	T			Ι ,		Can	O a t	Nev	Daa	7	
(86)m=	Jan 0.95	Feb 0.92	0.80	\rightarrow	Apr Ma	- +	Jun 0.49	Jul 0.37	0.4	ug 11	Sep 0.61	Oct 0.83	0.93	Dec 0.96	_	(86)
					I			<u>!</u>				0.03	0.83	0.90	_	(00)
		· · ·			ving area T1	÷т		i	_			20.44	40.00	40.07	7	/07\
(87)m=	18.73	19.08	19.0	О	20.19 20.6		20.87	20.95	20.	94	20.74	20.14	19.32	18.67	_	(87)

T		ما بمصابديات		مان مام اس		م منالم بيام	from To	hia O T	LO (0C)					
	19.93	19.94	neating p	19.95	19.95	19.97	19.97	19.97	19.96	19.95	19.95	10.04		(88)
(88)m=		ļ	<u>!</u>						19.96	19.95	19.95	19.94		(00)
			ains for i			<u> </u>								
(89)m=	0.94	0.91	0.85	0.73	0.59	0.42	0.29	0.33	0.55	0.8	0.91	0.95		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	16.92	17.42	18.16	18.98	19.54	19.85	19.94	19.93	19.72	18.93	17.79	16.84		(90)
		=					=		f	LA = Livin	g area ÷ (4	4) =	0.5	(91)
Mear	interna	l temner	ature (fo	r the wh	ole dwel	lling) – fl	Δ ν Τ1	+ (1 – fl	A) × T2			•		
(92)m=	17.83	18.26	18.88	19.59	20.09	20.36	20.45	20.44	20.23	19.54	18.56	17.76		(92)
			he mean								10.00			, ,
(93)m=	17.83	18.26	18.88	19.59	20.09	20.36	20.45	20.44	20.23	19.54	18.56	17.76		(93)
		l	uirement											
			ternal ter		re obtain	ed at ste	en 11 of	Table 9	h so tha	t Ti m=(76)m an	d re-calc	ulate	
			or gains	•		iou at ott	SP 11 01	Table 5	o, 50 tria	(11,111—(<i>i</i> 0)111 a11	a ro oaio	diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	-									
(94)m=	0.92	0.89	0.82	0.72	0.59	0.45	0.33	0.37	0.57	0.78	0.89	0.93		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	479.13	558.99	622.6	640.74	576.62	430.6	301.51	311.2	427.22	485.65	465.29	453.86		(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	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1143.66	1125.71	1041.12	886.83	693.65	470.11	314.03	328.34	503.12	739.5	953.34	1133.89		(97)
_							000	0_0.0.	000.12		000.0.			
Spac	e heatin	g require	ement fo	r each n	nonth, k\									, ,
Spac (98)m=	e heatin 494.41	g require	ement fo	r each n 177.19	nonth, k\ 87.07							505.94		, ,
-						Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻ 188.86	1)m 351.4	505.94	2497.08	(98)
(98)m=	494.41	380.84	311.38	177.19	87.07	Wh/mon	th = 0.02	24 x [(97)m — (95 0)m] x (4 ⁻ 188.86	1)m 351.4	505.94		(98)
(98)m=	494.41 e heatin	380.84 g require	311.38 ement in	177.19 kWh/m²	87.07	Wh/mon	th = 0.02	24 x [(97)m — (95 0)m] x (4 ⁻ 188.86	1)m 351.4	505.94	2497.08 34.96	_
(98)m= Spac 8c. S	e heatin	380.84 g require	311.38 ement in quiremen	177.19 kWh/m²	87.07 ² /year	Wh/mon	th = 0.02	24 x [(97)m — (95 0)m] x (4 ⁻ 188.86	1)m 351.4	505.94		(98)
(98)m= Spac 8c. S	e heatin	380.84 g require	311.38 ement in quirement July and	t August.	87.07 ² /year See Tab	Wh/mont 0	th = 0.02	24 x [(97 0)m – (95 0)m] x (4 188.86 (kWh/year	1)m 351.4 r) = Sum(9	505.94		(98)
(98)m= Spac 8c. S Calcu	e heatin pace coulated fo Jan	g require	and	kWh/m² t August. Apr	87.07 E/year See Tab May	Wh/mont 0 ole 10b Jun	th = 0.02 0	24 x [(97 0 Tota)m – (95 0 Il per year)m] x (4** 188.86 (kWh/year	1)m 351.4) = Sum(9	505.94 8) _{15,912} =		(98)
(98)m= Spac 8c. S Calcu	e heatin pace co	g require oling rec r June, Feb	and	kWh/m² t August. Apr using 28	87.07 E/year See Tak May 5°C inter	Wh/mont 0 ole 10b Jun	th = 0.02 0 Jul	24 x [(97 0 Tota Aug and exte)m – (95 0 Il per year Sep)m] x (4* 188.86 (kWh/year	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec		(98)
(98)m= Spac 8c. S Calcu Heat (100)m=	e heatin pace coulated fo Jan loss rate	g require coling rec r June, c Feb e Lm (ca	and	kWh/m² t August. Apr	87.07 E/year See Tab May	Wh/mont 0 ole 10b Jun	th = 0.02 0	24 x [(97 0 Tota)m – (95 0 Il per year)m] x (4 188.86 (kWh/year	1)m 351.4) = Sum(9	505.94 8) _{15,912} =		(98)
Spac Sc. S Calcu Heat (100)m= Utilisa	e heatin pace co plated fo Jan loss rate o ation face	g require oling rec r June, Feb e Lm (ca	and	kWh/m² t August. Apr using 25	87.07 See Tat May 5°C inter 0	ole 10b Jun rnal temp	th = 0.02 0 Jul perature 603.78	Aug and exte)m – (95 0 Il per year Sep ernal ten	oct operatur	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec Table 10)		(98) (99) (100)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m=	e heatin pace coulated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca	and	kWh/m² t August. Apr using 25	87.07 See Tat May 5°C inter 0	ole 10b Jun rnal temp 766.96	th = 0.02 0 Jul	24 x [(97 0 Tota Aug and exte)m – (95 0 Il per year Sep)m] x (4* 188.86 (kWh/year	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec		(98)
Spac Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin pace co plated fo Jan loss rate o ation face	g require coling rec r June, c Feb e Lm (ca 0 ctor for lo	and	kWh/m² t August. Apr using 25 0 100)m x	87.07 See Tat May 5°C inter 0	ole 10b Jun rnal temp 766.96	Jul perature 603.78	Aug and exte	Sep ernal ten	Oct nperatur 0	1)m 351.4 2) = Sum(9 Nov e from T 0	505.94 8) _{15,912} = Dec Table 10) 0		(98) (99) (100) (101)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace coulated fo Jan loss rate 0 ation face ul loss, h	g require r June, v Feb e Lm (ca 0 etor for lo	and	kWh/m² t August. Apr using 25 0 100)m x	87.07 See Tate May 5°C inter 0 0 (101)m	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78	Aug and exte 618.39	Sep ernal ten 0	oct operatur	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec able 10)		(98) (99) (100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin pace couldated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar o	g require coling rec r June, v Feb e Lm (ca 0 ttor for lo mLm (V 0 gains ca	and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	See Tab May 5°C inter 0 (101)m 0 cable we	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re	Jul perature 603.78 0.9 545.24 egion, se	Aug and extended a	Sep ernal ten 0	Oct nperatur 0	1)m 351.4 2) = Sum(9 Nov e from T 0	505.94 8) _{15,912} = Dec Table 10) 0		(98) (99) (100) (101) (102)
Spac Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace coulated fo Jan loss rate 0 ation face ul loss, heating of the coulated for the coulated	g require r June, v Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca	and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	87.07 See Tat May 5°C inter 0 (101)m 0 cable we	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78 0.9 545.24 egion, se 1151.38	Aug and exte 618.39 0.88 546.25 e Table	Sepernal ten 0 10) 0 0 0 0	Oct o o o	1)m 351.4) = Sum(9 Nov e from T 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0	34.96	(98) (99) (100) (101)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ation face (solar of the cooling of the coolin	g require r June, . Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0	and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tate May 5°C inter 0 (101)m 0 cable we 0 whole of	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78 0.9 545.24 egion, se 1151.38	Aug and exte 618.39 0.88 546.25 e Table	Sepernal ten 0 10) 0 0 0 0	Oct o o o	1)m 351.4) = Sum(9 Nov e from T 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0	34.96	(98) (99) (100) (101) (102)
Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar (0 0)) e coolin(04)m to	g require r June, . Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0	and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tate May 5°C inter 0 (101)m 0 cable we 0 whole co	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78 0.9 545.24 egion, se 1151.38	Aug and exte 618.39 0.88 546.25 e Table	Sepernal ten 0 10) 0 0 0 0	Oct o o o	1)m 351.4) = Sum(9 Nov e from T 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0	34.96	(98) (99) (100) (101) (102)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar (0 0)) e coolin(04)m to	g require coling recovery r June, very Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require zero if (and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 × (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and extended and extended a	Sep O O O O O O O O O	Oct Oct 0 0 24 x [(10)	1)m 351.4) = Sum(9 Nov e from T 0 0 0 0 0 0 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m]	34.96 « (41)m	(100) (101) (102) (103)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar (0 0)) e coolin(04)m to	g require r June, Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0 g require zero if (and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 × (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and extended and extended a	Sep Sep O O O O O O O O Total	Oct Oct Oct 0 0 24 x [(10) 0 = Sum(1)m 351.4) = Sum(9 Nov e from T 0 0 0 0 0 0 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] >	34.96	(98) (99) (100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 1 0 ation face 0 s (solar (0 0 e cooling 0 0 d fraction	g require r June, v Feb e Lm (ca 0 etor for lo 0 mLm (W 0 gains ca 0 g require zero if (and	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98) 0	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and extended and extended a	Sep Sep O O O O O O O O Total	Oct Oct Oct 0 0 24 x [(10) 0 = Sum(1)m 351.4 1) = Sum(9 Nov e from T 0 0 0 0 10.4)	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] >	34.96 	(100) (101) (102) (103)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face 0 color (o) color (o) de cooling 04)m to de fraction ittency face	g require r June, v Feb e Lm (ca 0 etor for lo 0 mLm (W 0 gains ca 0 g require zero if (and	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98) 0	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and extended and extended a	Sep Sep O O O O O O O O Total	Oct Oct Oct 0 0 24 x [(10) 0 = Sum(1)m 351.4 1) = Sum(9 Nov e from T 0 0 0 0 10.4)	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] >	34.96 	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Interm	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face 0 color (o) color (o) de cooling 04)m to de fraction ittency face	g require coling rec r June, c Feb e Lm (ca 0 entor for lo mum (V 0 gains ca 0 g require zero if (0 n actor (Ta	and	kWh/m² kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	87.07 See Tak May 5°C inter 0 (101)m 0 cable we 0 whole o m 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul Derature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and extended a	New Year Sep Sep	Oct Oct Oct 0 0 24 x [(10) cooled a	1)m 351.4) = Sum(9 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] x	34.96 	(100) (101) (102) (103)

Space ((107)m=	0	0	0	0	0	84.15	97.34	83.52	0	0	0	0		
_									_	= Sum	(1,0,7)	=	265.01	(107
Space o	cooling	require	ment in I	kWh/m²/չ	/ear				(107)) ÷ (4) =		ļ	3.71	(108
9b. Ene	ergy rec	quiremer	nts – Co	mmunity	heating	scheme)							
						_		ting prov (Table 1 <i>°</i>	•		unity so	heme.	0	(301
	•			mmunity		•	•	`	,			L	1	(302
	•			•	•	,	,	allows for	CHP and เ	up to four	other hea	L at sources; th	e latter	
			-	<i>mal and wa</i> nity boile		from powe	r stations.	See Apper	ndix C.			Г	1	(303
				m Comn		oilers				(3	302) x (30	а) = Г	1	(304
		·			•		r commi	unity hea	tina svs	•		/ Г	1	(305
				12c) for (,	. ,,		•	9 0,0			L T	1.05	(306
Space I			(,		,						L	kWh/yea	
-		-	requiren	nent									2497.08	
Space h	neat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306)) =	2621.93	(307
Efficien	cy of se	econdar	y/supple	ementary	heating	system	in % (fro	om Table	4a or A	.ppendix	(E)	Ī	0	(308
Space h	neating	require	ment fro	m secon	dary/su	pplemen	tary sys	tem	(98) x (30	01) x 100	÷ (308) =	Ī	0	(309
Water h	_		requirem	oont								Г	1926.82	\neg
		_	ty schen									L	1920.02	
			munity b						(64) x (30	03a) x (30	5) x (306)) =	2023.16	(310
Electrici	ity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) -	+ (310a)	.(310e)] =	46.45	(313
Cooling	Syste	m Energ	y Efficie	ncy Rati	0								6.59	(314
Space o	cooling	(if there	is a fixe	ed coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			40.23	(315
				within dv				outside				Г	155.75	(330
		ng syste		,	·		•					L [0	(330
		water h											0	(330
			•	kWh/yea	ır				=(330a) -	+ (330b) +	- (330g) =		155.75	(331
Energy	for ligh	iting (cal	lculated	in Apper	ndix L)							Ī	315.81	(332
12b. CC	D2 Emi	ssions –	- Commi	unity hea	ting sch	eme						_		
									ergy h/year		missio g CO2/		Emissions cg CO2/year	
			es of spa	ace and v	water he			g two fuels	repeat (3	63) to (36	6) for the	second fuel	93.5	(367
	•		neat sou					-(310b)] x 1			0.22		1073.09	(367
CO2 as	Sociale													

Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	1097.2	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			1097.2	(376)
CO2 associated with space cooling	(315) x	0.52	=	20.88	(377)
CO2 associated with electricity for pumps and fans	within dwelling (331)) x	0.52	=	80.83	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	163.91	(379)
Total CO2, kg/year sum of (376).	(382) =			1362.82	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				19.08	(384)
El rating (section 14)				84.31	(385)

			lloor D) otoilo:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20		User D	Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address:	Flat 34					
1. Overall dwelling dim		torritoac	2, OVV 10							
			Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.75	(2a) =	196.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) 7	71.42	(4)			•		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	196.4	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent f	ans		_			3	x -	10 =	30	(7a)
Number of passive vent	ts				Ī	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	X 4	40 =	0	(7c)
					_			Air cr	nanges per ho	our —
Infiltration due to chimn	· ·					30		÷ (5) =	0.15	(8)
Number of storeys in	been carried out or is intend the dwelling (ns)	iea, procee	a to (17), (otnerwise (continue in	om (9) to	(16)		0	(9)
Additional infiltration	the aweiling (110)						[(9)]	-1]x0.1 =	0	(10)
	0.25 for steel or timber	frame or	0.35 fo	r masoni	v constr	uction	[(0)	· jaco	0	(11)
	present, use the value corre				•	0.01.01.			<u> </u>	(/
• .	nings); if equal user 0.35	L - 1\ 0	4 / 1	1\	0					_
•	floor, enter 0.2 (unsea	ilea) or 0.	.1 (seale	ea), eise	enter U				0	(12)
•	nter 0.05, else enter 0 ws and doors draught s	tripped							0	(13)
Window infiltration	ws and doors draught s	uipped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
	e, q50, expressed in cu	hic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	5	(17)
If based on air permeab	• • • •		•	•	•	01.0 0. 0	лиоюро	u.ou	0.4	(18)
·	lies if a pressurisation test ha					is being u	sed		0.1	()
Number of sides shelter	red								1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18) x (20) =				0.37	(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 ÷ 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]	
		1		1		<u> </u>		<u> </u>	J	

If exhaust air heat pump using Appendix N. (22b) = (23a) x Fmv (equation (Ns)), otherwise (23b) = (23a) (23a) (3a)	Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
If nechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (NS)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (NS)), otherwise (23b) = (23a) If balanced whether recovery efficiency in % allowing for in-use factor (from Table 4h) =	•						` 	r `	`	0.4	0.42	0.44]		
## exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) = 5			_	rate for t	he appli	cable ca	se	<u> </u>	<u> </u>	<u> </u>	ļ		J		_
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =								.=						0	(23a
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23d) + 100] [24a]mm) = (23a)				0	(23b
(24a)m			-	-	_									0	(230
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						·	- ` ` 	- ^ ` ` - 	ŕ	- 	` 	1 ` '	i ÷ 100] i		(0.4
(24b)m-0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0												0			(24a
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b). (24d)m= 0	· ·	1				i			í `	 	- 		1		(= 1)
(24c)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) (24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				_		<u> </u>				0	0	0]		(24b
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 = 0.61	•				•					.5 × (23k	o)				
If (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(240
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.61 0.61 0.6 0.58 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 3. Heat losses and heat loss parameter. ELEMENT Gross area (m²) Openings area (parity) Openings (parity) Open	,									0.5]					
25 me 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.56 0.57 0.58 0.59 0.6 (25)	(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(240
3. Heat losses and heat loss parameter: ELEMENT Gross Openings A,m² V/m2K (W/K) kJ/m²-K kJ/K Doors 2.12 x 1 = 2.12 (26) Windows Type 1 3.88 x1/1/(1.4) +0.04 = 5.14 (27) Windows Type 2 9.93 x1/1/(1.4) +0.04 = 5.14 (27) Windows Type 3 1.92 x1/1/(1.4) +0.04 = 2.55 (27) Walls Type 1 77.11 15.73 61.38 x 0.18 = 11.05 (29) Walls Type 2 10.2 2.12 8.08 x 0.18 = 11.05 (29) Walls Type 2 10.2 2.12 8.08 x 0.18 = 1.45 (29) Walls Type 3 7.56 0 7.56 x 0.18 = 1.36 (29) Walls Type 3 7.56 0 7.56 x 0.18 = 1.36 (29) Walls Type 3 7.56 (30) 7.56 x 0.18 = 1.36 (30) Total area of elements, m² (30) Total area of of 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) = (25) (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K (35)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (36)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Walls Type 1 77.11	Effective air	change	rate - en	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	-		
Doors	(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(25)
Doors	3 Heat losse	s and he	eat loss r	naramete	ōt.										
Doors	ELEMENT	Gros	SS	Openin	gs										
Windows Type 1 3.88	Daara	area	(m²)	m	l ²		_		_	•	K)	KJ/m²-	K	KJ/	
Windows Type 2 9.93 x1/[1/(1.4) + 0.04] = 13.16 (27) Windows Type 3 1.92 x1/[1/(1.4) + 0.04] = 2.55 (27) Walls Type1 77.11 15.73 61.38 x 0.18 11.05 (29) Walls Type2 10.2 2.12 8.08 x 0.18 1.45 (29) Walls Type3 7.56 0 7.56 x 0.18 1.36 (29) Roof 71.42 0 71.42 x 0.13 166.29 (31) Total area of elements, m² 166.29 (31) **for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) = 46.12 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) **For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Wentilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Wentilation heat loss calculated monthly (39)m = (37) + (38)m (39)m = (37) + (38)m (30)m = (38)m = (38							_				_				
Windows Type 3 1.92 x1/[1/(1.4) + 0.04] = 2.55 (27)						3.88	_			5.14	_				(27)
Walls Type1						9.93	_			13.16	_				(27)
Walls Type2 10.2 2.12 8.08 x 0.18 = 1.45 (29) Walls Type3 7.56 0 7.56 x 0.18 = 1.36 (29) Roof 71.42 0 71.42 x 0.13 = 9.28 (30) Total area of elements, m² 166.29 (31) *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (21.1 (36)) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.37 (37) + (38)m Heat transfer coefficient, W/K (39)m = (37) + (38)m 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84		3 				1.92	x1.	/[1/(1.4)+	0.04] =	2.55	ᆗ .				(27)
Walls Type3	• •	77.1	1	15.73	3	61.38	3 X	0.18	=	11.05			<u> </u>		(29)
Roof T1.42 0	Walls Type2	10.:	2	2.12		8.08	Х	0.18	=	1.45			[(29)
Total area of elements, m²	Walls Type3	7.5	6	0		7.56	Х	0.18	=	1.36					(29)
* 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) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (21.1 (36)) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Unique (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 (39.43 (39.16) (37.85 (37.6) (36.47 (36.47 (36.47 (36.47 (36.26) (36.9) (37.6) (38.1) (38.1) (38.1) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39.16)	Roof	71.4	2	0		71.42	<u>x</u>	0.13		9.28			\Box [(30)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (21.1 (36)) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.85 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	Total area of e	lements	, m²			166.2	9								(31)
Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) ((28)(30) + (32) = (28)(32) + (32a)(32e) = (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84							ated using	formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragraph	3.2		
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84					s and pan	itions		(26)(30)) + (32) =				16	: 12	7(33)
Thermal mass parameter (TMP = Cm ÷ 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. Thermal bridges: S (L x Y) calculated using Appendix K 21.1 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84			,	• ,				, , , ,		(30) + (3	2) + (32a).	(32e) =			=
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 21.1 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	. ,		,) = Cm ÷	- TFA) ir	n kJ/m²K				, , ,	, , ,	(= = 7			=
Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	For design assess	sments wh	ere the de	tails of the				ecisely the				able 1f		<u> </u>	_(00)
if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84					usina Ac	pendix l	<						2	1 1	7(36)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84 (39)m = (37) + (38)m	if details of therma	al bridging				-			(33) +	· (36) =					<u> </u>
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84			alculated	monthly	,						(25)m x (5))	07	.22	(01)
(38)m= 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84		r				,lun	.lul	Aua		<u> </u>	1	<u> </u>	1		
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84							-	<u></u>	<u> </u>	†	<u> </u>	†			(38)
(39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	` ′	<u> </u>				L	<u> </u>	L	<u> </u>		ļ		J		. ,
1 0 (0) 40 40 77 (0)				105.07	104.82	103 69	103 69	103 47				105.84	1		
	` '	<u> </u>				<u> </u>		1 .50.47		L	<u> </u>	<u> </u>	10	5. 0 5	2 [3,9)

)m= 1.5	arameter (F	· ·		l ,		Ι,.			= (39)m ÷				
	1.49	1.49	1.47	1.47	1.45	1.45	1.45	1.46	1.47	1.47	1.48		— ,,
mber of c	lays in mo	nth (Tah	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	1.47	(4
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
,													`
. Water he	eating ene	rgy requi	irement:								kWh/yea	ar:	
f TFA > 1	ccupancy, 3.9, N = 1 3.9, N = 1		:[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		28		(4
duce the an	age hot wa nual average 25 litres per l	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.35		(4
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usag	e in litres per	r day for ea	<u> </u>		ctor from T	Table 1c x							
)m= 97.1	9 93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
orgy conton	of hot water	used cal	loulated m	anthly – 1	100 v Vd n	n v nm v [Tm / 2600		Total = Su			1060.23	(4
m= 144.1		130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
144.	3 120.03	130.00	113.4	100.01	93.9	07.01	99.03	<u> </u>	Total = Su	l .	<u> </u>	1390.13	(4
stantaneou	s water heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – ou	111(40)112 -		1000.10	`
)m= 21.6	2 18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(4
ater stora	•							•					
Ū	ume (litres)		•			Ū		ame ves	sei		150		(4
	<pre>/ heating a no stored</pre>			•			` '	ers) ente	er 'O' in <i>(</i>	4 7)			
ater stora		not wate	, (ti 110 11	10144001	riotaritai	10000 00	THE BOIL	oro, orice	51 O III (77)			
If manufa	acturer's d	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	55		(4
mperatur	e factor fro	m Table	2b							0.	54		(4
	from watei	_	-				(48) x (49)) =		0.	84		(5
	acturer's de orage loss		•										/5
	/ heating s			6 Z (KVV	11/11116/08	iy <i>)</i>					0		(5
	or from Ta										0		(5
mperatur	e factor fro	m Table	2b								0		(5
	from water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(5
ergy lost	or (54) in (5	55)								0.	84		(5
		culated f	for each	month			((56)m = (55) × (41)	m				
nter (50) o	ge loss cal							25.14	25.98	25.14	25.98		
nter (50) o		25.98	25.14	25.98	25.14	25.98	25.98	25.14		20.14	25.90		(5
nter (50) o ater storag		25.98	25.14									Н	(5
nter (50) cater storag	8 23.47 ains dedicate	25.98	25.14									Н	
onter (50) onter storage $ \begin{array}{c} \text{ater storage} \\ \text{onter storage} \\ $	8 23.47 ains dedicate	25.98 d solar sto 25.98	25.14 rage, (57)i 25.14	m = (56)m 25.98	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro 25.14	m Appendix	Н	(5 (5

0 111		,	41	(0.4)	(00)	05 (44	`						
Combi loss		r	month	` 	<u> </u>	<u> </u>			Ι ,	Ι ,	Ι ,	1	(61)
` ′	0	0	<u> </u>	0	0	0	(00)	0 05	(45)	(40)	(57)	(50) (64)	(01)
(62)m= 193.3	', 	179.32	161.06	158.06	141.55	136.25	(62)m		(45)m + 166.99	(46)m +	(57)m + 188.82	(59)m + (61)m	(62)
Solar DHW inp		l	L	<u> </u>		ļ				<u> </u>		i	(02)
(add additio									ar contribu	iion io waie	er neaung)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0		(63)
Output from	water hea	ter	<u> </u>	<u> </u>			<u> </u>		<u> </u>		<u> </u>	ł	, ,
(64)m= 193.3		179.32	161.06	158.06	141.55	136.25	149.0	9 148.69	166.99	176.19	188.82		
` ′		l					0	I utput from w	ater heate	. I er (annual)₁	I12	1969.92	(64)
Heat gains f	rom water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	-
(65)m= 87.3		82.64	75.83	75.57	69.34	68.32	72.59	-	78.55	80.86	85.8	ĺ	(65)
	7)m in cal	culation (of (65)m	only if c	vlinder i	s in the	dwellir	a or hot w	/ater is f	rom com	munity h	ı ıeating	
5. Internal	<u> </u>		. ,		,			9			,		
Metabolic ga				, ·									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114	+	114	114	114	114	114	114	114	114	114	114		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso se	e Table 5			•	I	
(67)m= 17.8	9 15.89	12.92	9.78	7.31	6.17	6.67	8.67	11.64	14.78	17.25	18.39		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ıble 5	Į.	!	ı	
(68)m= 200.5	9 202.67	197.42	186.26	172.16	158.91	150.06	147.9	8 153.23	164.39	178.49	191.74		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	÷ 5			ı	
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and	fans gains	(Table 5	5а)					•			•	1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	-		-		-	-		
(71)m= -91.2	2 -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heating	ng gains (1	able 5)	-	-		-		-	-	-	-		
(72)m= 117.3	6 115.32	111.08	105.32	101.58	96.31	91.83	97.57	99.61	105.57	112.31	115.33		(72)
Total intern	al gains =				(66)m + (67)m	า + (68)เ	n + (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 396.0	394.08	381.63	361.56	341.25	321.6	308.77	314.4	3 324.68	344.94	368.24	385.65		(73)
6. Solar ga													
Solar gains a		_					itions to	convert to the	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
5 4							, –					` '	٦
East 0.9	-		3.8		-	19.64]	0.63	×	0.7	=	23.29	(76)
East 0.9		X	3.8		-	38.42	X	0.63	×	0.7	=	45.56	[(76)
East 0.9		X	3.8		-	63.27]	0.63	×	0.7	=	75.03	[(76)
East 0.9		X	3.8		-	92.28]	0.63	×	0.7	=	109.42	(76)
East 0.9	X 0.77	X	3.8	38	x 1	13.09	X	0.63	X	0.7	=	134.1	(76)

East	٥۲			1		٦			1 1		 1 .	. г					7(70)
East	0.9x	0.77		X	3.88	J X	_	15.77	X	0.63	_	× L	0.7	=	=	137.28	 (76)
	0.9x	0.77		X	3.88	J X	_	10.22	X	0.63	_	× L	0.7	=	=	130.69](76)
East	0.9x	0.77		X	3.88	J X	_	4.68	X	0.63	_	× L	0.7	=	=	112.26	」 (76)
East	0.9x	0.77		X	3.88	X	7	3.59	X	0.63	'	× L	0.7	_	=	87.26	<u> </u> (76)
East -	0.9x	0.77		X	3.88	X	4	5.59	X	0.63		× [0.7		=	54.06	(76)
East	0.9x	0.77		X	3.88	X	2	4.49	X	0.63	,	× [0.7		=	29.04	(76)
East	0.9x	0.77		X	3.88	X	1	6.15	X	0.63	,	× [0.7		=	19.15	(76)
South	0.9x	0.77		X	1.92	X	4	6.75	X	0.63	,	× [0.7		=	27.43	(78)
South	0.9x	0.77		X	1.92	X	7	6.57	X	0.63	;	× L	0.7		=	44.93	(78)
South	0.9x	0.77		X	1.92	X	9	7.53	X	0.63	,	× [0.7		=	57.23	(78)
South	0.9x	0.77		X	1.92	X	1	10.23	X	0.63	,	× [0.7		=	64.68	(78)
South	0.9x	0.77		X	1.92	X	1	14.87	X	0.63	,	× [0.7		=	67.4	(78)
South	0.9x	0.77		x	1.92	X	1	10.55	x	0.63	,	× [0.7		=	64.87	(78)
South	0.9x	0.77		X	1.92	x	1	08.01	X	0.63	,	× [0.7		=	63.38	(78)
South	0.9x	0.77		X	1.92	X	1	04.89	X	0.63	,	×	0.7		=	61.55	(78)
South	0.9x	0.77		X	1.92	x	1	01.89	x	0.63	,	×	0.7		=	59.78	(78)
South	0.9x	0.77		X	1.92	x	8	2.59	x	0.63	,	× [0.7		=	48.46	(78)
South	0.9x	0.77		X	1.92	x	5	5.42	x	0.63	<u> </u>	× [0.7		=	32.52	(78)
South	0.9x	0.77		x	1.92	x		40.4	x	0.63	,	× [0.7		=	23.7	(78)
West	0.9x	0.77		X	9.93	x	1	9.64	x	0.63	,	× [0.7		=	59.6	(80)
West	0.9x	0.77		X	9.93	x	3	8.42	x	0.63	,	× [0.7		=	116.6	(80)
West	0.9x	0.77	一	X	9.93	X	6	3.27	x	0.63	 ,	× [0.7		=	192.02	(80)
West	0.9x	0.77		х	9.93	j x	9	2.28	x	0.63		× [0.7		=	280.05	(80)
West	0.9x	0.77		Х	9.93	j x	1	13.09	x	0.63		× [0.7		=	343.21	(80)
West	0.9x	0.77		X	9.93	j x	1	15.77	X	0.63	-	×Γ	0.7	Ħ	=	351.33	(80)
West	0.9x	0.77		X	9.93	X	1	10.22	X	0.63		× [0.7		=	334.48	(80)
West	0.9x	0.77		X	9.93	X	9	4.68	X	0.63		×Γ	0.7		=	287.32	(80)
West	0.9x	0.77		Х	9.93	X	_	3.59	X	0.63		× [0.7	一	=	223.32	(80)
West	0.9x	0.77		Х	9.93	X	_	5.59	X	0.63		× [0.7	Ħ	=	138.35	(80)
West	0.9x	0.77		Х	9.93] x	_	4.49	X	0.63	-	x [0.7	=	=	74.32	(80)
West	0.9x	0.77		х	9.93] x		6.15	X	0.63	-	, [0.7		=	49.01	(80)
						_			ı			_					_
Solar ga	ains in	watts, ca	alcula	ted	for each mon	ıth			(83)m	ı = Sum(74)ı	m(82))m					
(83)m=	110.33	207.08	324.2	28	454.15 544.7	'1 5	53.48	528.56	461	.13 370.3	7 240	.87	135.87	91.8	7		(83)
Total ga	ains – ii	nternal a	nd sc	lar	(84)m = (73) r	n + (83)m	, watts		-							
(84)m=	506.36	601.16	705.	9	815.71 885.9	7 8	75.08	837.33	775	.56 695.0	4 585	.81	504.12	477.5	52		(84)
7. Mea	an inter	nal temp	eratu	re (heating seas	on)											
Tempe	erature	during h	eating	g pe	eriods in the I	iving	area	from Tal	ole 9,	Th1 (°C)						21	(85)
Utilisat	tion fac	tor for ga	ains f	or li	ving area, h1	,m (s	ee Ta	ble 9a)							1		_
	Jan	Feb	Ma	ır	Apr Ma	ıy	Jun	Jul	A	ug Ser	p C	ct	Nov	De	c		
(86)m=	1	0.99	0.98	3	0.94 0.84		0.68	0.52	0.5	0.82	0.9	96	0.99	1			(86)
Mean i	interna	l temper	ature	in li	ving area T1	(follo	w ste	ps 3 to 7	in T	able 9c)	•		•				
(87)m=	19.41	19.61	19.9	_	20.37 20.72		20.92	20.98	20.		1 20.	.35	19.8	19.3	9		(87)
					ļ .	!			<u> </u>					l			

T					ali i i a III a ai		.b.l. 0 T	LO (0 0)					
Temperatur (88)m= 19.69		19.7	19.71	19.71	19.72	19.72	19.73	19.72	19.71	19.71	19.7		(88)
` ′	<u> </u>	!	<u>.</u>		<u> </u>	ļ		19.72	19.71	19.71	19.7		(00)
Utilisation fa		1			```	i	- 	0.70	0.04	0.00		1	(00)
(89)m= 0.99	0.99	0.97	0.91	0.78	0.58	0.38	0.44	0.73	0.94	0.99	1		(89)
Mean intern		1	1		` `	i	<u> </u>	ì	le 9c)			İ	
(90)m= 17.62	17.91	18.39	19	19.45	19.67	19.72	19.71	19.58	18.98	18.2	17.58		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.5	(91)
Mean intern	al tempe	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 18.53	18.77	19.17	19.69	20.09	20.3	20.35	20.35	20.2	19.67	19.01	18.49		(92)
Apply adjus	tment to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.53	18.77	19.17	19.69	20.09	20.3	20.35	20.35	20.2	19.67	19.01	18.49		(93)
8. Space he	eating req	uirement											
Set Ti to the the utilisation			•		ned at sto	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		<u> </u>		Way	Our	J Gai	7149	СОР	001	1101		l	
(94)m= 0.99	0.99	0.97	0.91	0.8	0.63	0.45	0.51	0.77	0.94	0.99	0.99		(94)
Useful gain	s, hmGm	, W = (94	4)m x (84	4)m	I	<u> </u>		I				ı	
(95)m= 502.6	592.17	681.45	744.13	711.33	548.45	380.62	394.79	534.51	553.03	497.12	474.7		(95)
Monthly ave	erage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	ate for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1521.2	1479.13	1348.28	1133.66	879.19	591.1	389.19	408.39	635.46	950.72	1254.15	1512.74		(97)
Space heat		ement fo	r each m	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95		1)m	•	•	
(98)m= 757.9	596.04	496.12	280.46	124.89	0	0	0	0	295.88	545.06	772.3		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3868.65	(98)
Space heat	ing requir	ement in	kWh/m²	/year								54.17	(99)
9a. Energy re	equireme	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heat	•			, .									٦
Fraction of	•				mentary	•						0	(201)
Fraction of	space hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of	total heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency o	f main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency o	f seconda	ry/suppl	ementar	y heatin	g systen	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	_ ar
Space heat	ing requir	ement (c	alculate	d above)								
757.9	596.04	496.12	280.46	124.89	0	0	0	0	295.88	545.06	772.3		
	(00)4)] } x 1	00 ÷ (20	06)									(211)
$(211)m = \{[(9)]$	18)m x (20	/1 /			1	_	0	_	316.45	582.95	825.99		
$(211)m = \{[(9)] \\ 810.55$	- i - ` -	530.61	299.96	133.57	0	0	l ⁰	0	310.45	302.33	025.99	1	
` '	-i `	1	299.96	133.57	0	U		l (kWh/yea				4137.59	(211)
` '	9 637.47	530.61	<u> </u>		0	0						4137.59	(211)
810.5	9 637.47 ing fuel (s	530.61 econdar	y), kWh/		0	0						4137.59	(211)
810.5	9 637.47 ing fuel (s	530.61 econdar	y), kWh/		0	0	Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	= 0	4137.59	_
Space heat = {[(98)m x (2)	637.47 ing fuel (s 201)] } x 1	530.61 econdar 00 ÷ (20	y), kWh/ 08)	month			Tota	I Il (kWh/yea	ar) =Sum(2	211) _{15,1012}	= 0	4137.59	(211)

Water heating Output from water heater (calculated shove)								
Output from water heater (calculated above) 193.37 170.53 179.32 161.06 158.06 1	41.55 136.25	149.09	148.69	166.99	176.19	188.82		
Efficiency of water heater	· · · · · ·						79.8	(216
(217)m= 88.1 87.88 87.39 86.28 84.19	79.8 79.8	79.8	79.8	86.32	87.63	88.18		(217
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
` '	77.38 170.74	186.83	186.33	193.45	201.06	214.14		
	•	Tota	I = Sum(2	19a) ₁₁₂ =		•	2323.07	(219
Annual totals				k'	Wh/year	r	kWh/year	- -
Space heating fuel used, main system 1							4137.59	_
Water heating fuel used							2323.07]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231
Electricity for lighting							315.91	(232
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	893.72	(261
Space heating (secondary)	(215) x			0.5	19	=	0	(263
Water heating	(219) x			0.2	16	=	501.78	(264
Space and water heating	(261) + (262)	+ (263) + (264) =				1395.5	(265
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267
Electricity for lighting	(232) x			0.5	19	=	163.96	(268
Total CO2, kg/year			sum o	of (265)(2	271) =		1598.38	_ (272

TER =

(273)

22.38



APPENDIX 6: BE GREEN MODELLING OUTPUT SHEETS

	l	User Details:			
Assessor Name:	Lindsey Arnott	Stroma Num	nber: S	TRO035000	
Software Name:	Stroma FSAP 2012	Software Ve	rsion: V	ersion: 1.0.5.9	
		perty Address: Townh	nouse 1		
Address :	The Alders, Aldrington Road,	SW16 1TW			
1. Overall dwelling dime	ensions:	A	Ass. Haladatas	V - I (2)	
Ground floor		Area(m²) 39.87 (1a) x	Av. Height(m)	Volume(m³) 107.65	(3a)
First floor		34.85 (1b) x	3 (2b	104.55	(3b)
Second floor		26.2 (1c) x	2.9 (2c)) = 75.98	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	100.92 (4)			
Dwelling volume		(3a)+(3l	o)+(3c)+(3d)+(3e)+(3n)	288.18	(5)
2. Ventilation rate:					_
	main secondary heating heating	other	total	m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ns		0 x 10 =	0	(7a)
Number of passive vents			0 x 10 =	0	(7b)
Number of flueless gas fi	ires		0 x 40 =	0	(7c)
			A	ir changes per hou	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	0 ÷ (5)	= 0	(8)
If a pressurisation test has b	een carried out or is intended, proceed t	to (17), otherwise continue i	from (9) to (16)		_
Number of storeys in the	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0	0.1 = 0	(10)
	.25 for steel or timber frame or 0	•	ruction	0	(11)
if both types of wall are pi deducting areas of openir	resent, use the value corresponding to th nas): if equal user 0.35	he greater wall area (after			
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0			0	(13)
Percentage of windows	s and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + ((12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope are	ea 3	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		0.15	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used		_
Number of sides sheltere	ed			1	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	[19)] =	0.92	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =		0.14	(21)
Infiltration rate modified f	or monthly wind speed				
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov [Dec	
Monthly average wind sp	eed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

M/ - 1 = -1 = - (00	2 - \	(00)	4										
Wind Factor (22 (22a)m= 1.27	2a)m = 1.25	(22)m ÷	4 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
` ′				1,			(04.)	(00.)				J	
Adjusted infiltration	o.17	e (allowii	ng for sr 0.15	0.15	0.13	o.13	(21a) x 0.13	(22a)m 0.14	0.15	0.16	0.16	1	
Calculate effect	-						0.13	0.14	0.13	0.10	0.10	J	
If mechanical	l ventila	ation:										0.5	(23a)
If exhaust air hea	at pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with I	heat reco	overy: effici	ency in %	allowing f	or in-use f	actor (fron	n Table 4h	n) =				75.65	(23c)
a) If balanced						- ` ` 	- ^ `	í `			` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` `) ÷ 100]	
(24a)m= 0.3	0.3	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.28	0.28		(24a)
b) If balanced	d mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho if (22b)m				•	•				.5 × (23t	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural v	entilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from	loft				J	
if (22b)m	= 1, th	en (24d)ı	m = (221))m othe	erwise (2	4d)m =	0.5 + [(2	22b)m² x	0.5]			-	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air c	change	rate - en	ter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)		,	,		
(25)m= 0.3	0.3	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.28	0.28		(25)
3. Heat losses	and he	eat loss p	aramete	er:									
3. Heat losses ELEMENT	and he Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
	Gros	SS	Openin	gs		m²							
ELEMENT	Gros	SS	Openin	gs	A ,r	m² x	W/m2	2K	(W/				kJ/K
ELEMENT Doors Type 1	Gros area	SS	Openin	gs	A ,r	m ²	W/m2	2K = =	(W/ 2.43				kJ/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	gs	A ,r 2.43 2.74	m ²	W/m2 1	2K = = - 0.04] =	(W/ 2.43 2.74				kJ/K (26) (26)
ELEMENT Doors Type 1 Doors Type 2 Windows Type	Gros area 1 2	SS	Openin	gs	A ,r 2.43 2.74 4.88	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+	2K = = = -0.04 = -0.04 =	(W/ 2.43 2.74 6.03				kJ/K (26) (26) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type 2	Gros area 1 2	SS	Openin	gs	A ,r 2.43 2.74 4.88 2.92 13.47	x x x 1.	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	2K = = = -0.04 = -0.04 =	(W/ 2.43 2.74 6.03 3.61 16.65	K)			(26) (26) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Floor	Gros area 1 2 3	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	= = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857	K)			(26) (26) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls	Gros area 1 2 3	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15	2K = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9	K)			(26) (26) (27) (27) (27) (28) (29)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 2 Windows Type 3 Floor Walls Roof	Gros area 1 2 3 172.	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	= = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857	K)			(26) (26) (27) (27) (27) (28) (29) (30)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of electors	Gros area 1 2 3 172.	ss (m²)	Openin m	gs ²	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87	x1.	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)			(26) (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of elements of elements wall * for windows and reference of the second of the sec	Gros area 1 2 3 172. 39.8 ements	41 37 4, m ² ows, use e	Openin m 26.4 0	gs ² andow U-va	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcul	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	k	(26) (26) (27) (27) (27) (28) (29) (30)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of elements of the series of the serie	Gros area 1 2 3 172. 39.8 ements roof winders on both	41 37 37 37 37 39 39 30 30 30 30 30 30 30 30 30 30	26.4-0	gs ² andow U-va	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcul	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1	2K = = -0.04 = -0.04 = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-	K	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of ele Party wall * for windows and re ** include the areas Fabric heat loss	Gros area 1 2 3 172. 39.8 ements roof winders on both so, W/K :	41 37 37 37 37 39 39 39 39 39 39 39 39 39 39	26.4-0	gs ² andow U-va	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calcul	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0	2K = = -0.04 = -0.04 = = = = = = = = = =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39	K)	kJ/m²-l	n 3.2	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of elements Party wall * for windows and restricted the areas Fabric heat loss Heat capacity Commons	Gros area 1 2 3 172. 39.8 ements roof winders on both s, W/K: Cm = S(41 37 37 3, m ² ows, use e sides of in = S (A x (A x k)	26.4d 26.4d 0 ffective with ternal walk U)	gs 2 4 Indow U-va ds and part	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calculatitions	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1	2K =	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39 0 0 0 0 0 10)+0.04] &	K)	kJ/m²-l	62.12 7544.31	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of elements of the series	Gros area 1 2 3 172. 39.8 ements roof winders on both so, W/K: Cm = S(parame	ss (m²) 41 37 ows, use e sides of in = S (A x (A x k) eter (TMF)	Openin m 26.4 26.4 0 ffective winternal walk U) P = Cm -	gs 2 4 ndow U-va ls and part	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calculatitions	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1 (26)(30	2K = = -0.04 = -0.04 = = = = = = = ((28). Indica	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39 0 0 0 0 10)+0.04] at tive Value	K)	kJ/m²-l	n 3.2	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type 2 Windows Type 3 Windows Type 3 Floor Walls Roof Total area of elements Party wall * for windows and restricted the areas Fabric heat loss Heat capacity Commons	Gros area 1 2 3 172. 39.8 ements roof winders on both son bot	41 37 37 3, m ² 3, m ² 3, m ² 3, m ² 3, m ² 3, m ² 4, x k) 4, x k) 4, x k) 4, x k) 4, x k)	26.44 26.44 0 ffective will ternal wall. U) P = Cm ÷ tails of the	gs 2 4 ndow U-va ls and part	A ,r 2.43 2.74 4.88 2.92 13.47 39.87 145.9 39.87 252.1 37.81 alue calculatitions	x x x x x x x x x x x x x x x x x x x	W/m2 1 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.11 0.15 0.11 0 formula 1 (26)(30	2K = = -0.04 = -0.04 = = = = = = = ((28). Indica	(W/ 2.43 2.74 6.03 3.61 16.65 4.3857 21.9 4.39 0 0 0 0 10)+0.04] at tive Value	K)	kJ/m²-l	62.12 7544.31	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32)

	n hoot l	loss	laulatad	monthly	,					$(36) = 0.33 \times ($	25)m v (5)	L	87.77	(37
			lculated			1	T 11	A	` ,					
-		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(2)
3)m=2	28.4 2	28.07	27.74	26.09	25.76	24.11	24.11	23.78	24.77	25.76	26.42	27.08		(3
eat tran	sfer coe	efficien	nt, W/K						(39)m	= (37) + (3	38)m			
9)m= 1	16.18 1	15.85	115.52	113.87	113.54	111.89	111.89	111.56	112.55	113.54	114.2	114.86		_
oot loog	narama	otor (L	ILP), W/	m2k						Average = = (39)m ÷		12 /12=	113.78	(3
	. 	1.15	1.14	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.13	1.14		
	1.10	1.10	1.17	1.10	1.10	'	1	1.1.1		Average =		-	1.13	— (4
umber d	of days i	in mor	nth (Tabl	e 1a)					,	worage =	Cum(40)	127 12-	1.10	`
	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
Water	r heating	n ener	gy requi	rement:								kWh/ye	ar.	
. vvato	rnoami	g crior	gy roqui	TOTTIOTIC.								RVVIII y C	, car.	
	loccupa					/						.75		(4
	> 13.9, [£ 13.9, [+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0)013 x (ΓFA -13.	9)			
	,		iter usac	e in litre	s ner da	av Vd av	erage =	(25 x N)	+ 36		00	0.46		(-
	_		_	•	•	•	designed t	` ,		se target o		9.40		(-
more th	at 125 litre	es per p	erson per	day (all w	ater use, l	hot and co	old)							
Γ.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water u	ısage in lit	res per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
)m= 10	09.41 1	05.43	101.45	97.47	93.49	89.52	89.52	93.49	97.47	101.45	105.43	109.41		
							•			Total - Su	m(44) ₁₁₂ =			\neg
										i Olai – Sui	···(++/)112 -	_	1193.55	(4
ergy con	tent of ho	t water i	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x E	0Tm / 3600			()	L	1193.55	(•
~ -		t water (used - cal	culated mo	onthly = 4. 122.5	190 x Vd,r	97.95	0Tm / 3600 112.4			()	L	1193.55	(
i)m= 16	62.25 1	141.9	146.43	127.66	122.5	105.7	97.95	112.4	113.74	nth (see Ta	144.7	c, 1d)	1193.55	`
i)m= 16	62.25 1	141.9	146.43	127.66	122.5	105.7		112.4	113.74	132.56	144.7	c, 1d)		`
m = 10 $m = 10$ $m = 10$ $m = 10$ $m = 2$	62.25 1 eous wate	141.9 er heatin 21.29	146.43	127.66	122.5	105.7	97.95	112.4	113.74	132.56	144.7	c, 1d)		(4
)m= 10 nstantano)m= 2 ater sto	62.25 1 eous wate 24.34 2 orage los	141.9 er heatin 21.29 SS:	146.43 ng at point 21.96	127.66 of use (no	122.5 hot water 18.37	105.7 r storage),	97.95 enter 0 in	112.4 boxes (46) 16.86	113.74 116 (61) 17.06	132.56 Total = Sur	nbles 1b, 1 144.7 m(45) ₁₁₂ =	c, 1d)		
)m= 10 nstantano)m= 2 ater sto	eous wate 24.34 2 orage los	141.9 er heatin 21.29 SS: (litres)	146.43 ng at point 21.96 includin	127.66 of use (no. 19.15) g any so	122.5 hot water 18.37	105.7 r storage), 15.86	97.95 enter 0 in 14.69 storage	112.4 boxes (46) 16.86 within sa	113.74 116 (61) 17.06	132.56 Total = Sur	144.7 m(45) ₁₁₂ =	c, 1d)		(<i>(</i>
nstantane i)m= 2 ater sto orage v	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 SS: (litres)	146.43 ng at point 21.96 includin nd no ta	127.66 of use (not) 19.15 g any so nk in dw	122.5 hot water 18.37 plar or W relling, e	105.7 r storage), 15.86 /WHRS	97.95 enter 0 in 14.69 storage) litres in	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	144.7 m(45) ₁₁₂ =	c, 1d) 157.13 = 23.57		(<i>(</i>
mstantane mstantane mstantane parter sto commu herwise	eous water 24.34 2 prage los volume (anity hear e if no si	er heating 21.29 SS: (litres) ating a	146.43 ng at point 21.96 includin nd no ta	127.66 of use (not) 19.15 g any so nk in dw	122.5 hot water 18.37 plar or W relling, e	105.7 r storage), 15.86 /WHRS	97.95 enter 0 in 14.69 storage	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	144.7 m(45) ₁₁₂ =	c, 1d) 157.13 = 23.57		(<i>(</i>
nstantano)m= 2 ater sto commu herwise ater sto	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) ating altored l	146.43 ng at point 21.96 includin nd no ta hot wate	127.66 of use (not) 19.15 g any so nk in dw	122.5 hot water 18.37 Dlar or W velling, e	105.7 r storage), 15.86 /WHRS inter 110	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	144.7 m(45) ₁₁₂ = 21.7	c, 1d) 157.13 = 23.57		(4
nstantano nstant	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored l ss: er's de	146.43 og at point 21.96 includin nd no ta hot wate	of use (not) 19.15 g any so nk in dw er (this in)	122.5 hot water 18.37 Dlar or W velling, e	105.7 r storage), 15.86 /WHRS	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74) to (61) 17.06	132.56 Total = Sur 19.88	21.7	c, 1d) 157.13 = 23.57 180		(4
nstantane nater sto	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) ating a tored I ss: er's de	146.43 ag at point 21.96 includin nd no ta hot wate eclared lo	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss factor 2b	122.5 that water 18.37 clar or W relling, e	105.7 r storage), 15.86 /WHRS inter 110	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7	c, 1d) 157.13 = 23.57		(4)
instantano instantano	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored I ss: er's de tor fror water	146.43 ag at point 21.96 including and no tale that water eclared learned learned storage	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye	122.5 hot water 18.37 plar or W relling, e acludes i or is kno	105.7 r storage), 15.86 /WHRS enter 110 nstantar wn (kWh	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46, 16.86 within sa (47)	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7	c, 1d) 157.13 = 23.57 180		
nstantano corage v commu herwise ater sto If man empera	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored I ss: er's de tor from water er's de	146.43 ag at point 21.96 includin nd no ta hot wate eclared lo m Table storage eclared co	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.00	c, 1d) 157.13 = 23.57 180 .2 .6 .72		(4)
nstantane nstantane nstantane nrage v commu herwise ater sto If man hergy lo If man ot water	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) atting attored I ss: er's de tor from water er's de e loss	146.43 ag at point 21.96 including and no tale and the water eclared left at the storage eclared of factor fr	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I om Tabl	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 nstantar wn (kWh	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.00	c, 1d) 157.13 23.57 180 .2		(4)
nstantane)m= 2 ater sto orage v commu herwise ater sto lf man mpera lergy lo If man ot water commu	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 sting a tored I ss: er's de tor from water er's de e loss ating setting setti	146.43 ag at point 21.96 includin nd no ta hot wate eclared le m Table storage eclared of	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I om Tabl	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.	c, 1d) 157.13 = 23.57 180 .2 .6 .72		(4)
mstantane mstantane mstantane mstantane mstantane mage v commu herwise ater sto If man mpera mergy lo If man ot water commu olume fa	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) attored I ss: er's detor from water er's dee loss atting som Tab	146.43 ag at point 21.96 includin nd no ta hot wate eclared le m Table storage eclared of	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I com Tabl con 4.3	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous con h/day):	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vess	132.56 Total = Sur 19.88	21.7 21.7 0 0.	c, 1d) 157.13 = 23.57 180 .2 .6 .72		(4)
astantano commu herwise ater sto lf man empera to lf man ot water commu olume for	eous water 24.34 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	er heating 21.29 ss: (litres) ating a tored I ss: er's de tor from water er's de e loss ating se om Tak tor from	146.43 ag at point 21.96 includin and no ta hot wate eclared le m Table storage eclared of factor fr ee section	127.66 of use (not) 19.15 g any so nk in dw er (this in) coss facto 2b , kWh/ye cylinder I com Tabl con 4.3	122.5 hot water 18.37 plar or W velling, e acludes i or is kno ear oss fact e 2 (kW)	105.7 r storage), 15.86 /WHRS enter 110 enstantar wn (kWhee)	97.95 enter 0 in 14.69 storage 0 litres in neous co h/day): known:	112.4 boxes (46) 16.86 within sa (47) embi boil	113.74 113.74 1 to (61) 17.06 ame vessers) enter	132.56 Total = Sur 19.88 sel er '0' in (21.7 21.7 0 0.	c, 1d) 157.13 = 23.57 180 .2 .6 .72 0		(4 (4 (4 (4) (4) (4)

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	loss (an	nual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	or each	month (59)m = ((58) ÷ 36	55 × (41)	m					
(modified by	factor fi	rom Tab	e H5 if t	here is s	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 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 heat requ	uired for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 207.83	183.08	192.02	171.78	168.08	149.82	143.53	157.98	157.85	178.14	188.81	202.71		(62)
Solar DHW input of	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)	_				
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter											
(64)m= 207.83	183.08	192.02	171.78	168.08	149.82	143.53	157.98	157.85	178.14	188.81	202.71		
		•			-		Outp	out from wa	ater heate	r (annual) ₁	12	2101.62	(64)
Heat gains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	
(65)m= 90.41	80.12	85.15	77.74	77.2	70.44	69.03	73.84	73.11	80.54	00.4	00.71		(65)
			11.17	11.2	'0	09.03	73.04	73.11	60.54	83.4	88.71		(00)
include (57)r	n in calc					<u> </u>		<u> </u>	<u> </u>			eating	(00)
include (57)r		culation o	of (65)m	only if c		<u> </u>		<u> </u>	<u> </u>			eating	(00)
5. Internal ga	ins (see	culation of Table 5	of (65)m and 5a	only if c		<u> </u>		<u> </u>	<u> </u>			eating	(66)
, ,	ins (see	culation of Table 5	of (65)m and 5a	only if c		<u> </u>		<u> </u>	<u> </u>			eating	(00)
5. Internal ga	ins (see s (Table	culation of Table 5	of (65)m and 5a	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. Internal ga Metabolic gain Jan	s (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c): May 137.39	ylinder is Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal ga Metabolic gain Jan (66)m= 137.39	s (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c): May 137.39	ylinder is Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal ga Metabolic gain Jan (66)m= 137.39 Lighting gains	s (Table Feb 137.39 (calcula 20.46	ETable 5 E Table 5 E 5), Wat Mar 137.39 ted in Ap	of (65)m and 5a ts Apr 137.39 ppendix 12.6	only if constraints only if constraints only if constraints on the constraint on the constraints of the constraints on the constraints on the constraint on the constraint on the constraints on the constraint on the constraints of the constraints on the constraint on	Jun 137.39 ion L9 or	Jul 137.39 r L9a), a	Aug 137.39 Iso see	Sep 137.39 Table 5	Oct 137.39	Nov 137.39	Dec	eating	(66)
5. Internal gain Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04	s (Table Feb 137.39 (calcula 20.46	ETable 5 E Table 5 E 5), Wat Mar 137.39 ted in Ap	of (65)m and 5a ts Apr 137.39 ppendix 12.6	only if constraints only if constraints only if constraints on the constraint on the constraints of the constraints on the constraints on the constraint on the constraint on the constraints on the constraint on the constraints of the constraints on the constraint on	Jun 137.39 ion L9 or	Jul 137.39 r L9a), a	Aug 137.39 Iso see	Sep 137.39 Table 5	Oct 137.39	Nov 137.39	Dec	eating	(66)
5. Internal games Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gain (68)m= 257.81	s (Table Feb 137.39 (calcula 20.46 ns (calc	ted in Apulated in 253.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Appendix 239.39	only if construction in the construction in th	Jun 137.39 ion L9 of 7.95 uation L	Jul 137.39 r L9a), a 8.59 13 or L1 192.87	Aug 137.39 Iso see 11.17 3a), also	Sep 137.39 Table 5 14.99 see Tal 196.94	Oct 137.39 19.03 ble 5 211.29	Nov 137.39	Dec 137.39	eating	(66) (67)
5. Internal games Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gain	s (Table Feb 137.39 (calcula 20.46 ns (calc	ted in Apulated in 253.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Appendix 239.39	only if construction in the construction in th	Jun 137.39 ion L9 of 7.95 uation L	Jul 137.39 r L9a), a 8.59 13 or L1 192.87	Aug 137.39 Iso see 11.17 3a), also	Sep 137.39 Table 5 14.99 see Tal 196.94	Oct 137.39 19.03 ble 5 211.29	Nov 137.39	Dec 137.39	eating	(66) (67)
5. Internal gain Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains	s (Table Feb 137.39) (calcular 20.46) ns (calcular 260.48) (calcular 36.74)	Table 5 2 5), Wat Mar 137.39 ted in Ap 16.64 ulated in 253.74 ated in Ap 36.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74	May 137.39 L, equati 9.42 dix L, eq 221.27 L, equat	Jun 137.39 ion L9 or 7.95 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.17 3a), also 190.19	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table	Oct 137.39 19.03 ble 5 211.29 5	Nov 137.39 22.21	Dec 137.39 23.68	eating	(66) (67) (68)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74	s (Table Feb 137.39) (calcular 20.46) ns (calcular 260.48) (calcular 36.74)	Table 5 2 5), Wat Mar 137.39 ted in Ap 16.64 ulated in 253.74 ated in Ap 36.74	of (65)m and 5a ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74	May 137.39 L, equati 9.42 dix L, eq 221.27 L, equat	Jun 137.39 ion L9 or 7.95 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.17 3a), also 190.19	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table	Oct 137.39 19.03 ble 5 211.29 5	Nov 137.39 22.21	Dec 137.39 23.68	eating	(66) (67) (68)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0	s (Table Feb 137.39 (calcula 20.46 ns (calcula 260.48 (calcula 36.74 ns gains	ted in Apulated in	of (65)m and 5a ts Apr 137.39 ppendix 12.6 Appendix 239.39 ppendix 36.74 5a)	May 137.39 L, equati 9.42 dix L, equati 221.27 L, equati 36.74	Jun 137.39 ion L9 of 7.95 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 see Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far	s (Table Feb 137.39 (calcular 20.46 ns (calcular 260.48 (calcular 36.74 ns gains 0	ted in Apulated in	of (65)m and 5a ts Apr 137.39 ppendix 12.6 Appendix 239.39 ppendix 36.74 5a)	May 137.39 L, equati 9.42 dix L, equati 221.27 L, equati 36.74	Jun 137.39 ion L9 of 7.95 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 see Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.92	s (Table Feb 137.39 (calcula 20.46 ns (calc 260.48 (calcula 36.74 ns gains 0 aporatio -109.92	ted in Apulated in	of (65)m and 5a ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74 5a) 0 tive valu	only if construction only if c	Jun 137.39 ion L9 of 7.95 uation L 204.24 ion L15 36.74 0	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43 0	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev	s (Table Feb 137.39 (calcula 20.46 ns (calc 260.48 (calcula 36.74 ns gains 0 aporatio -109.92	ted in Apulated in	of (65)m and 5a ts Apr 137.39 opendix 12.6 Append 239.39 opendix 36.74 5a) 0 tive valu	only if construction only if c	Jun 137.39 ion L9 of 7.95 uation L 204.24 ion L15 36.74 0	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74	Nov 137.39 22.21 229.4	Dec 137.39 23.68 246.43 0	eating	(66) (67) (68) (69)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.92 Water heating	s (Table Feb 137.39 (calcular 20.46 ns (calcular 260.48 (calcular 36.74 ns gains 0 aporatio -109.92 gains (T	culation of the Europe Solution of the Europe Solution of the Europe Solution of the Europe Solution (Table Solution (negation of the Europe Solution of the Eur	of (65)m and 5a ts Apr 137.39 pendix 12.6 Append 239.39 pendix 36.74 5a) 0 tive valu -109.92	only if constructions	Jun 137.39 ion L9 oi 7.95 uation L 204.24 ion L15 36.74 0 ile 5) -109.92	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 o, also se 36.74 0	Sep 137.39 Table 5 14.99 see Tal 196.94 ee Table 36.74	Oct 137.39 19.03 ble 5 211.29 5 36.74 0 -109.92	Nov 137.39 22.21 229.4 36.74 0	Dec 137.39 23.68 246.43 0 -109.92 119.24	eating	(66) (67) (68) (69) (70) (71)
Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.04 Appliances gai (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -109.92 Water heating (72)m= 121.52	s (Table Feb 137.39 (calcular 20.46 ns (calcular 260.48 (calcular 36.74 ns gains 0 aporatio -109.92 gains (T	culation of the Europe Solution of the Europe Solution of the Europe Solution of the Europe Solution (Table Solution (negation of the Europe Solution of the Eur	of (65)m and 5a ts Apr 137.39 pendix 12.6 Append 239.39 pendix 36.74 5a) 0 tive valu -109.92	only if constructions	Jun 137.39 ion L9 oi 7.95 uation L 204.24 ion L15 36.74 0 ile 5) -109.92	Jul 137.39 r L9a), a 8.59 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.17 3a), also 190.19 o, also se 36.74 0	Sep 137.39 Table 5 14.99 See Tal 196.94 ee Table 36.74 0 -109.92	Oct 137.39 19.03 ble 5 211.29 5 36.74 0 -109.92	Nov 137.39 22.21 229.4 36.74 0	Dec 137.39 23.68 246.43 0 -109.92 119.24	eating	(66) (67) (68) (69) (70) (71)

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

Orienta	ation:	Access Facto Table 6d	r	Area m²		Flux Table 6a		Ta	g_ able 6b	-	FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4.88	x	10.63	x		0.5] x [0.7	=	12.59	(74)
North	0.9x	0.77	x	4.88	X	20.32	X		0.5	_ × [0.7		24.05	(74)
North	0.9x	0.77	x	4.88	X	34.53	X		0.5	_ x [0.7	=	40.87	(74)
North	0.9x	0.77	x	4.88	X	55.46	X		0.5	_ x [0.7		65.65	(74)
North	0.9x	0.77	x	4.88	X	74.72	X		0.5	x	0.7	=	88.44	(74)
North	0.9x	0.77	x	4.88	X	79.99	X		0.5	_ x [0.7	=	94.67	(74)
North	0.9x	0.77	X	4.88	X	74.68	X		0.5	x [0.7	=	88.39	(74)
North	0.9x	0.77	x	4.88	X	59.25	X		0.5	x [0.7	=	70.13	(74)
North	0.9x	0.77	x	4.88	x	41.52	X		0.5	_ x [0.7	=	49.14	(74)
North	0.9x	0.77	x	4.88	X	24.19	X		0.5	_ x [0.7	=	28.63	(74)
North	0.9x	0.77	X	4.88	X	13.12	X		0.5	x [0.7	=	15.53	(74)
North	0.9x	0.77	x	4.88	X	8.86	X		0.5] x [0.7	=	10.49	(74)
East	0.9x	0.77	x	2.92	X	19.64	X		0.5	x [0.7	=	13.91	(76)
East	0.9x	0.77	x	2.92	X	38.42	X		0.5	x [0.7	=	27.21	(76)
East	0.9x	0.77	x	2.92	X	63.27	X		0.5] x [0.7	=	44.81	(76)
East	0.9x	0.77	X	2.92	X	92.28	X		0.5	x [0.7	=	65.36	(76)
East	0.9x	0.77	X	2.92	X	113.09	X		0.5	_ x [0.7	=	80.1	(76)
East	0.9x	0.77	x	2.92	X	115.77	X		0.5] x [0.7	=	81.99	(76)
East	0.9x	0.77	x	2.92	X	110.22	X		0.5	x [0.7	=	78.06	(76)
East	0.9x	0.77	X	2.92	X	94.68	X		0.5	_ x [0.7	=	67.05	(76)
East	0.9x	0.77	x	2.92	X	73.59	X		0.5] x [0.7	=	52.12	(76)
East	0.9x	0.77	X	2.92	X	45.59	X		0.5	x [0.7	=	32.29	(76)
East	0.9x	0.77	X	2.92	X	24.49	X		0.5] x [0.7	=	17.34	(76)
East	0.9x	0.77	X	2.92	X	16.15	X		0.5	_ x [0.7	=	11.44	(76)
West	0.9x	0.77	X	13.47	X	19.64	X		0.5	x [0.7	=	64.17	(80)
West	0.9x	0.77	X	13.47	X	38.42	X		0.5	x [0.7	=	125.53	(80)
West	0.9x	0.77	X	13.47	X	63.27	X		0.5	_ x [0.7	=	206.72	(80)
West	0.9x	0.77	X	13.47	X	92.28	X		0.5	x	0.7	=	301.49	(80)
West	0.9x	0.77	X	13.47	X	113.09	X		0.5	_ x [0.7	=	369.49	(80)
West	0.9x	0.77	X	13.47	X	115.77	X		0.5	x [0.7	=	378.24	(80)
West	0.9x	0.77	X	13.47	X	110.22	X		0.5	_ x [0.7	=	360.1	(80)
West	0.9x	0.77	X	13.47	X	94.68	X		0.5	x [0.7	=	309.32	(80)
West	0.9x	0.77	X	13.47	X	73.59	X		0.5	_ x [0.7	=	240.43	(80)
West	0.9x	0.77	X	13.47	X	45.59	X		0.5	_ x [0.7	=	148.95	(80)
West	0.9x	0.77	X	13.47	X	24.49	X		0.5] x [0.7	=	80.01	(80)
West	0.9x	0.77	X	13.47	X	16.15	X		0.5	_ x [0.7	=	52.77	(80)
٦		n watts, calcul	$\overline{}$		_				um(74)m				1	
(83)m=	90.66			432.5 538.0		526.55 526.55		6.5	341.69	209.87	112.88	74.7]	(83)
Ĭ		internal and s		` 				, ₀₀ T	740 07 1	040.00	F44.55	F00.07	1	(OA)
(84)m=	557.25	641.18 741	.46	856.68 936.6	р э 8	29.15 885.02	<u> </u>	1.33	719.37	612.66	544.55	528.27	J	(84)

7. Me	an inter	nal temp	perature	(heating	season)								
						ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
		•	•			(see Ta		,	(- /					` ′
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.97	0.96	0.93	0.87	0.77	0.63	0.5	0.55	0.75	0.91	0.96	0.98		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	18.53	18.78	19.25	19.87	20.4	20.76	20.91	20.88	20.58	19.88	19.1	18.49		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.96	19.96	19.96	19.98	19.98	19.99	19.99	20	19.99	19.98	19.98	19.97		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.97	0.95	0.92	0.85	0.73	0.56	0.4	0.45	0.7	0.89	0.95	0.97		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	16.64	17.02	17.69	18.58	19.3	19.77	19.93	19.91	19.56	18.62	17.49	16.59		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.26	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	17.12	17.47	18.09	18.91	19.58	20.02	20.18	20.16	19.82	18.94	17.9	17.07		(92)
Apply	adjustr	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.12	17.47	18.09	18.91	19.58	20.02	20.18	20.16	19.82	18.94	17.9	17.07		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u		factor fo				l .								
1 14:11:4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.95	tor for g	ains, nm 0.89	0.82	0.71	0.56	0.42	0.47	0.60	0.06	0.02	0.06		(94)
(94)m=						0.56	0.42	0.47	0.69	0.86	0.93	0.96		(34)
	<u> </u>	hmGm 596.82	, VV = (94 661.64	701.79	4)m 664.1	521.55	372.67	381.06	493.17	526.74	507.44	504.99		(95)
(95)m=							372.07	361.06	493.17	526.74	507.44	504.99		(93)
(96)m=	4.3	age exte	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		l	<u> </u>		<u> </u>	Lm , W =			ļ	ļ	'.1	4.2		(00)
		1456.13				606.96	400.6	418.99	644.13	946.78	1233.7	1478.68		(97)
						Wh/mont						1470.00		(01)
(98)m=	714.26		504.01	315.2	171.74	0	0	0	0	312.5	522.91	724.43		
, ,		ļ	ļ		ļ	ļ		L Tota	l I per year	l		<u> </u>	3842.52	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/vear				. ,		, ,	,	38.07	(99)
•		oling rec			.,									`
		r June, c			Soo Tal	hla 10h								
Calco	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat		l	l				l		<u> </u>	l		able 10)		
(100)m=		0	0	0	0	1051.75	i	847.84	0	0	0	0		(100)
		tor for lo	ss hm	<u> </u>	I	<u> </u>	!	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>I</u>		
(101)m=		0	0	0	0	0.77	0.83	0.8	0	0	0	0		(101)
				•								•		

Useful loss, hmLm (Watts) = (100)m x (101)m						
$\frac{\text{(102)m=}}{\text{0}} \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1 0	0	0	0	7	(102)
Gains (solar gains calculated for applicable weather region, see Tab	le 10)		<u> </u>	ļ	_	
(103)m= 0 0 0 0 1180.34 1126.78 1042.1	-	0	0	0		(103)
Space cooling requirement for month, whole dwelling, continuous (k set (104)m to zero if (104)m < 3 × (98)m	(Wh) = 0.0)24 x [(1	03)m –	(102)m]	x (41)m	
(104)m= 0 0 0 0 0 268.24 328.24 271.9	4 0	0	0	0		
		I = Sum('	=	868.42	(104)
Cooled fraction Intermittency factor (Table 10b)	f C =	cooled	area ÷ ((4) =	0.6	(105)
(106)m= 0 0 0 0 0 0.25 0.25 0.25	0	0	0	0	7	
	Tota	$I = Sum_0$	(1 <u>04)</u>	=	0	(106)
Space cooling requirement for month = (104)m × (105) × (106)m					_	
(107)m= 0 0 0 0 0 40.03 48.98 40.58	l	0	0	0		_
		I = Sum((107)	=	129.59	(107)
Space cooling requirement in kWh/m²/year	(107) ÷ (4) =			1.28	(108)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating pre- Fraction of space heat from secondary/supplementary heating (Table	•		unity sc	heme.	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 f	or CHP and	un to four	other hea	t sources:		(/
includes boilers, heat pumps, geothermal and waste heat from power stations. See Ap _l		up to rour	outor tiou	t dourdos,		
Fraction of heat from Community heat pump					1	(303a)
Fraction of total space heat from Community heat pump		(3	02) x (30	3a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community h	eating sys	stem			1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating					kWh/yea	<u>r</u>
Annual space heating requirement					3842.52	
Space heat from Community heat pump	(98) x (3	04a) x (30	5) x (306)	=	4034.64	(307a)
Efficiency of secondary/supplementary heating system in % (from Take	ole 4a or A	Appendix	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					2101.62	
If DHW from community scheme: Water heat from Community heat pump	(64) x (3	03a) x (30	5) x (306)	=	2206.7	(310a)
Electricity used for heat distribution 0.	01 × [(307a)	(307e) +	- (310a)	.(310e)] =	62.41	(313)
Cooling System Energy Efficiency Ratio					6.59	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) -	÷ (314) =			19.67	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsic	de				263.68	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
parity to cold water floating						(300g)

				_		_
Total electricity for the above, kWh/year		=(330a) + (330l	o) + (330g) =		263.68	(331)
Energy for lighting (calculated in Append	dix L)				406.91	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)				-482.91	(333)
Electricity generated by wind turbine (Ap	ppendix M) (negative q	uantity)			0	(334)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission factoring the kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		ng two fuels repeat (363) to	(366) for the second	d fuel	289	(367a)
CO2 associated with heat source 1	[(307b)	+(310b)] x 100 ÷ (367b) x	0.52	=	1120.85	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	32.39	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	=	1153.24	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instantan	eous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1153.24	(376)
CO2 associated with space cooling		(315) x	0.52	=	10.21	(377)
CO2 associated with electricity for pump	os and fans within dwel	ling (331)) x	0.52	=	136.85	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	211.19	(379)
Energy saving/generation technologies Item 1	(333) to (334) as applic	cable	0.52 × 0.0	1 =	-250.63	(380)
Total CO2, kg/year	sum of (376)(382) =				1260.86	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.49	(384)

El rating (section 14)

88.42

(385)

		User D	etails:					
Assessor Name:	Lindsey Arnott		Stroma	Num	ber:	STRO	035000	
Software Name:	Stroma FSAP 2012		Softwar	e Ver	sion:	Versio	n: 1.0.5.9	
		Property A	Address: 7	Townho	ouse 1			
Address :	The Alders, Aldrington F	Road, SW16	1TW					
1. Overall dwelling dime	nsions:							
Ground floor			a(m²) _{9.87} (1	la) x	Av. Height	(m) (2a) = [Volume(m³	(3a)
First floor				lb) x	3	(2b) =	104.55	(3b)
Second floor		2	26.2 (1	lc) x	2.9	(2c) =	75.98	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 10	00.92 (4	1)				
Dwelling volume			((3a)+(3b)	+(3c)+(3d)+(3e	e)+(3n) =	288.18	(5)
2. Ventilation rate:						_		
	main secor heating heati		other		total		m³ per hou	r
Number of chimneys	0 + 0		0	=	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fa	ns				4	x 10 =	40	(7a)
Number of passive vents					0	x 10 =	0	(7b)
Number of flueless gas fi	res				0	x 40 =	0	(7c)
						Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6a)$	b)+(7a)+(7b)+(7	7c) =		40	÷ (5) =	0.14	(8)
	een carried out or is intended, pro	oceed to (17), c	otherwise co	ntinue fr	om (9) to (16)	_		
Number of storeys in the	ne dwelling (ns)						0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber fram resent, use the value correspond		•		uction		0	(11)
deducting areas of openir		ng to the great	or wan area	(anoi				
If suspended wooden f	loor, enter 0.2 (unsealed)	or 0.1 (seale	ed), else e	nter 0			0	(12)
If no draught lobby, en	ter 0.05, else enter 0						0	(13)
Percentage of windows	s and doors draught strippe	ed				Ī	0	(14)
Window infiltration			0.25 - [0.2 x	(14) ÷ 1	00] =		0	(15)
Infiltration rate			(8) + (10) +	(11) + (1	2) + (13) + (15))=	0	(16)
Air permeability value,	q50, expressed in cubic m	etres per ho	ur per squ	uare m	etre of enve	ope area	5	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 2]$	20]+(8), otherwi	se (18) = (16	6)		Ī	0.39	(18)
Air permeability value applie	s if a pressurisation test has bee	n done or a deg	gree air perm	neability i	is being used	-		_
Number of sides sheltere	d						1	(19)
Shelter factor			(20) = 1 - [0]	.075 x (1	9)] =		0.92	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x	(20) =			0.36	(21)
Infiltration rate modified for	or monthly wind speed				-			
Jan Feb	Mar Apr May J	un Jul	Aug	Sep	Oct N	lov Dec		
Monthly average wind sp	eed from Table 7							

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

	of therma	ii briagirig	are not kn	own (36) =	= 0.05 x (3	1)						_		
	abric he								(33) +	(36) =			95.37	(37)
Ventila	ation hea	it loss ca	alculated	monthly	/				` ,	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	57.55	57.16	56.78	54.99	54.66	53.1	53.1	52.81	53.7	54.66	55.33	56.04		(38)
Heat tr	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	152.92	152.53	152.15	150.36	150.02	148.47	148.47	148.18	149.07	150.02	150.7	151.41		
Heat lo	oss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	` '	12 /12=	150.36	(39)
(40)m=	1.52	1.51	1.51	1.49	1.49	1.47	1.47	1.47	1.48	1.49	1.49	1.5		
									,	Average =	Sum(40) ₁	12 /12=	1.49	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)								,		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	gy requi	rement:								kWh/ye	ar:	
	_	_												
	ned occu			[1 0)(0	(0 0003	40 v /TE	-A 12 O)2)] + 0.0	0012 v /	ΓΕΛ 12		75		(42)
	A > 13.9 A £ 13.9		+ 1.76 X	[т - ехр	(-0.0003	49 X (1F	-A -13.9)2)] + 0.0)013 X (IFA -13.	9)			
		•	ater usac	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		99	.46		(43)
Reduce	the annua	ıl average	hot water	usage by	5% if the a	welling is	designed t	o achieve		se target o				(- /
not more	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	109.41	105.43	101.45	97.47	93.49	89.52	89.52	93.49	97.47	101.45	105.43	109.41		
Energy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600		Total = Sui th (see Ta	. ,	L	1193.55	(44)
(45)m=	162.25	141.9	146.43	127.66	122.5	105.7	97.95	112.4	113.74	132.56	144.7	157.13		
											m(4E) -			7
If instan	taneous w	ator hoatin								Fotal = Su	11(45)112 =	-	1564.93	(45)
ii iiiotaii		alei Healli	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,		Γotal = Su	11(43)112 =	- L	1564.93	(45)
	24.34	21.29	21.96	of use (no 19.15	hot water 18.37	storage),	enter 0 in 14.69	boxes (46)		Total = Sui 19.88	21.7	23.57	1564.93	(45) (46)
(46)m= Water	storage	21.29 loss:	21.96	19.15	18.37	15.86	14.69	16.86	17.06	19.88		· ·	1564.93	
(46)m= Water	storage	21.29 loss:	21.96	19.15	18.37	15.86	14.69		17.06	19.88	21.7	· ·	1564.93	
(46)m= Water Storag	storage le volum munity h	21.29 loss: e (litres) eating a	21.96 includin	19.15 g any so	18.37 Dlar or W	15.86 /WHRS nter 110	14.69 storage	16.86 within sa (47)	17.06 ame ves	19.88 Sel	21.7	23.57	1564.93	(46)
(46)m= Water Storag If comi	storage le volum munity h vise if no	21.29 loss: e (litres) eating a	21.96 includin	19.15 g any so	18.37 Dlar or W	15.86 /WHRS nter 110	14.69 storage	16.86 within sa	17.06 ame ves	19.88 Sel	21.7	23.57	1564.93	(46)
(46)m= Water Storag If comi Otherv Water	storage je volum munity h vise if no storage	21.29 loss: e (litres) eating a o stored loss:	21.96 includin nd no ta hot wate	19.15 ng any so nk in dw er (this in	18.37 Dlar or W relling, e	15.86 /WHRS nter 110	14.69 storage litres in neous co	16.86 within sa (47)	17.06 ame ves	19.88 Sel	21.7	23.57	1564.93	(46) (47)
(46)m= Water Storag If comi Otherv Water a) If m	storage le volum munity h vise if no storage nanufact	21.29 loss: e (litres) eating a o stored loss: urer's de	21.96 including nd no tathet water	19.15 ng any so nk in dw er (this in	18.37 Dlar or W relling, e	15.86 /WHRS nter 110	14.69 storage litres in neous co	16.86 within sa (47)	17.06 ame ves	19.88 Sel	21.7	23.57 150 55	1564.93	(46) (47) (48)
(46)m= Water Storag If comi Otherv Water a) If m	storage per volume munity havise if no storage manufacter ature for the storage per storag	21.29 loss: e (litres) eating a stored loss: urer's de	21.96 including nd no tathot water eclared logical metals.	19.15 Ig any so nk in dw r (this in oss factor 2b	18.37 plar or Warelling, eacludes it is known in the control of t	15.86 /WHRS nter 110	storage litres in neous co n/day):	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7	23.57	1564.93	(46) (47)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy	storage per volume munity havise if no storage manufact per ature for your lost from the storage per s	21.29 loss: e (litres) eating a o stored loss: urer's de actor from	21.96 including nd no tale hot water eclared lem Table storage	19.15 ng any so nk in dw er (this in coss facto 2b , kWh/ye	18.37 plar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar	storage litres in neous co n/day):	16.86 within sa (47)	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47)	23.57 150 55	1564.93	(46) (47) (48)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa	storage ye volume munity he vise if no storage manufacter ature for anufacter storage manufacter storage manufacter storage storage storage storage storage with the storage s	21.29 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de	21.96 including nd no talend water the clared left storage eclared of factor fr	19.15 Ig any so nk in dw r (this in oss facto 2b, kWh/ye cylinder lom Tabl	18.37 Dlar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47) 1. 0.	23.57 150 55 54	1564.93	(46) (47) (48) (49)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa	storage per volume munity havise if no storage manufact per ature from anufact per storage munity have storage munity have storage munity have storage	21.29 loss: e (litres) eating a o stored loss: urer's de actor from m water urer's de age loss eating s	21.96 including nd no tale hot water eclared less storage eclared of factor free sections.	19.15 Ig any so nk in dw r (this in oss facto 2b, kWh/ye cylinder lom Tabl	18.37 Dlar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47) 1. 0.	23.57 150 55 54 84	1564.93	(46) (47) (48) (49) (50) (51)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa If comi	storage per volume munity havise if no storage manufact perature for anufact parature storage munity have factor	21.29 loss: e (litres) eating a o stored loss: urer's de actor froi urer's de age loss eating s from Tal	including and no tale to the clared lead of the colored colored factor from the colored colore	19.15 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	18.37 Dlar or Warelling, eacludes in the control of the control o	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vess ers) ente	19.88 Sel	21.7 47) 1. 0.	23.57 150 55 54 84 0	1564.93	(46) (47) (48) (49) (50) (51) (52)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa If comi Volum Tempe	storage ge volume munity havise if no storage manufact erature fater storage munity have factor erature fater storage munity have factor erature fater storage erature eratu	21.29 loss: e (litres) eating a o stored loss: urer's de actor from urer's de age loss eating s from Tal actor from	including and no tale to the clared lead of the colored colored factor from the colored colored and the colored colored colored and the colored colore	19.15 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	olar or Welling, encludes in the control of the con	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) ombi boild (48) x (49)	17.06 17.06 ame vessers) ente	19.88 sel er 'O' in (21.7 47) 1. 0.	23.57 150 55 54 84	1564.93	(46) (47) (48) (49) (50) (51) (52) (53)
(46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m Hot wa If comi Volum Tempe Energy	storage per volume munity havise if no storage manufact perature for anufact parature storage munity have factor	21.29 loss: e (litres) eating a o stored loss: urer's de actor froi urer's de age loss eating s from Tal actor froi m water	including and no tale to the clared lead of the color of	19.15 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	olar or Welling, encludes in the control of the con	15.86 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	16.86 within sa (47) embi boild	17.06 17.06 ame vessers) ente	19.88 sel er 'O' in (21.7 47) 1. 0.	23.57 150 55 54 84 0	1564.93	(46) (47) (48) (49) (50) (51) (52)

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(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 Append	ix H	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	55 × (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= 23.26	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	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.49	186.38	195.68	175.32	171.74	153.36	147.19	161.64	161.4	181.8	192.35	206.37		(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	I 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 from w	ater hea	ter			-	-			-	-	-		
(64)m= 211.49	186.38	195.68	175.32	171.74	153.36	147.19	161.64	161.4	181.8	192.35	206.37		
	•						Outp	out from wa	ater heate	r (annual)₁	12	2144.72	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	_
(65)m= 93.34	82.77	88.08	80.57	80.12	73.27	71.96	76.77	75.94	83.47	06.00	91.64	<u> </u>	(65)
			00.07	00.12	1 10.21	11.30	10.11	75.94	03.47	86.23	91.04		(00)
include (57)	m in cal				<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(00)
include (57) 5. Internal ga		culation o	of (65)m	only if c	<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(00)
5. Internal ga	ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(66)
5. Internal gair	ains (see	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	(55)
5. Internal ga	ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>			<u> </u>	<u> </u>		eating	(66)
5. Internal games 5. Internal games 5. Internal games 5. Internal games 6. Internal	rs (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c : : : : : : : : : : : : : : : : : : :	Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal games Metabolic gair Jan	rs (Table Feb 137.39	E Table 5 5), Wat Mar 137.39	of (65)m and 5a ts Apr 137.39	only if c : : : : : : : : : : : : : : : : : : :	Jun 137.39	Jul 137.39	Aug 137.39	or hot w Sep 137.39	ater is fr	om com	munity h	eating	
5. Internal gain Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.16	realins (see last (Table Feb 137.39 (calcula 20.57	ETable 5 E Table 5 E 5), Wat Mar 137.39 ted in Ap	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67	only if construction in the construction in th	Jun 137.39 ion L9 o	Jul 137.39 r L9a), a	Aug 137.39 Iso see	Sep 137.39 Table 5	Oct 137.39	Nov	Dec	eating	(66)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games	res (Table Feb 137.39 (calcula 20.57	Example 5 ted in Apulated in Apulated in Apulated in Apulated in	of (65)m and 5a ts Apr 137.39 opendix 12.67	May 137.39 L, equati 9.47 dix L, eq	Jun 137.39 ion L9 o 7.99 uation L	Jul 137.39 r L9a), a 8.64 13 or L1	Aug 137.39 Iso see 11.23 3a), also	Sep 137.39 Table 5 15.07 see Tal	Oct 137.39 19.13 ble 5	Nov 137.39	Dec 137.39	eating	(66)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games (68)m= 257.81	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48	ted in Apulated in 253.74	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Appendix 239.39	only if construction in the construction is constructed by the construction in the construction in the construction in the construction is constructed by the construction in the construc	Jun 137.39 ion L9 o 7.99 uation L 204.24	Jul 137.39 r L9a), a 8.64 13 or L1 192.87	Aug 137.39 Iso see 11.23 3a), also	Sep 137.39 Table 5 15.07 see Tal 196.94	Oct 137.39 19.13 ble 5 211.29	Nov	Dec	eating	(66) (67)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48	ted in Apulated in 253.74	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Appendix 239.39	only if construction in the construction is constructed by the construction in the construction in the construction in the construction is constructed by the construction in the construc	Jun 137.39 ion L9 o 7.99 uation L 204.24	Jul 137.39 r L9a), a 8.64 13 or L1 192.87	Aug 137.39 Iso see 11.23 3a), also	Sep 137.39 Table 5 15.07 see Tal 196.94	Oct 137.39 19.13 ble 5 211.29	Nov 137.39	Dec 137.39	eating	(66) (67)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48 (calcula 36.74	ted in Apulated in	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74	May 137.39 L, equati 9.47 dix L, equate 221.27 L, equat	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.23 3a), also 190.19	Sep 137.39 Table 5 15.07 See Tal 196.94 ee Table	Oct 137.39 19.13 ble 5 211.29 5	Nov 137.39 22.33	Dec 137.39 23.81	eating	(66) (67) (68)
5. Internal gains Metabolic gain Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances gains (68)m= 257.81 Cooking gains	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48 (calcula 36.74	ted in Apulated in	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74	May 137.39 L, equati 9.47 dix L, equate 221.27 L, equat	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a)	Aug 137.39 Iso see 11.23 3a), also 190.19	Sep 137.39 Table 5 15.07 See Tal 196.94 ee Table	Oct 137.39 19.13 ble 5 211.29 5	Nov 137.39 22.33	Dec 137.39 23.81	eating	(66) (67) (68)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3	res (Table Feb 137.39 (calcula 20.57 ins (calcula 260.48 (calcula 36.74 ins gains 3	ted in Aputed in	of (65)m and 5a ts Apr 137.39 ppendix 12.67 Appendix 239.39 ppendix 36.74 5a)	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43	eating	(66) (67) (68) (69)
5. Internal games Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances games (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fames	res (Table Feb 137.39 (calcula 20.57 ins (calcula 36.74 ins gains 3 vaporatio	ted in Aputed in	of (65)m and 5a ts Apr 137.39 ppendix 12.67 Appendix 239.39 ppendix 36.74 5a)	only if constructions: May 137.39 L, equati 9.47 dix L, equati 221.27 L, equati 36.74	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43	eating	(66) (67) (68) (69)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -109.92	reportion (see land) (ted in Apulated in	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43 36.74	eating	(66) (67) (68) (69)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev	reportion (see land) (ted in Apulated in	of (65)m s and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if construction only if c	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74	Nov 137.39 22.33 229.4	Dec 137.39 23.81 246.43 36.74	eating	(66) (67) (68) (69)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -109.92 Water heating (72)m= 125.46	res (Table Feb 137.39 (calcula 20.57 ins (calcula 36.74 ins gains 3 vaporatio gains (Table 123.16	ted in Apulated in 253.74 (Table 5 3 on (negation) 2 able 5) 118.39	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if constructions	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74 3 le 5) -109.92	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74 3	Sep 137.39 Table 5 15.07 see Tal 196.94 ee Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74 3 -109.92	Nov 137.39 22.33 229.4 36.74 3	Dec 137.39 23.81 246.43 3 -109.92 123.17	eating	(66) (67) (68) (69) (70) (71)
Metabolic gair Jan (66)m= 137.39 Lighting gains (67)m= 23.16 Appliances ga (68)m= 257.81 Cooking gains (69)m= 36.74 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -109.92 Water heating	res (Table Feb 137.39 (calcula 20.57 ins (calcula 36.74 ins gains 3 vaporatio gains (Table 123.16	ted in Apulated in 253.74 (Table 5 3 on (negation) 2 able 5) 118.39	of (65)m 5 and 5a ts Apr 137.39 opendix 12.67 Append 239.39 opendix 36.74 5a) 3 tive valu	only if constructions	Jun 137.39 ion L9 of 7.99 uation L 204.24 ion L15 36.74 3 le 5) -109.92	Jul 137.39 r L9a), a 8.64 13 or L1 192.87 or L15a) 36.74	Aug 137.39 Iso see 11.23 3a), also 190.19 , also se 36.74 3	Sep 137.39 Table 5 15.07 See Tal 196.94 See Table 36.74	Oct 137.39 19.13 ble 5 211.29 5 36.74 3 -109.92	Nov 137.39 22.33 229.4 36.74 3	Dec 137.39 23.81 246.43 3 -109.92 123.17	eating	(66) (67) (68) (69) (70) (71)

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

Orienta		Access Fact Table 6d	or	Area m²			Flux Table 6a		g_ Table 6b	-	FF Table 6c		Gains (W)	
North	0.9x	0.77	X	4.6		X	10.63	x	0.63	x	0.7	=	14.95	(74)
North	0.9x	0.77	x	4.6		X	20.32	x	0.63	x	0.7	<u> </u>	28.57	(74)
North	0.9x	0.77	X	4.6		X	34.53	x	0.63	x	0.7	<u> </u>	48.54	(74)
North	0.9x	0.77	X	4.6		X	55.46	x	0.63	x	0.7	_ = [77.97	(74)
North	0.9x	0.77	X	4.6		X	74.72	x	0.63	x	0.7	_ =	105.04	(74)
North	0.9x	0.77	X	4.6		X	79.99	x	0.63	x	0.7	=	112.44	(74)
North	0.9x	0.77	X	4.6		X	74.68	x	0.63	x	0.7	=	104.98	(74)
North	0.9x	0.77	X	4.6		X	59.25	x	0.63	x	0.7	=	83.29	(74)
North	0.9x	0.77	X	4.6		X	41.52	x	0.63	x	0.7	=	58.36	(74)
North	0.9x	0.77	X	4.6		X	24.19	x	0.63	x	0.7	= [34.01	(74)
North	0.9x	0.77	X	4.6		X	13.12	x	0.63	x	0.7	=	18.44	(74)
North	0.9x	0.77	X	4.6		X	8.86	x	0.63	x	0.7	= [12.46	(74)
East	0.9x	0.77	X	2.75		X	19.64	x	0.63	x	0.7	= [16.51	(76)
East	0.9x	0.77	X	2.75		X	38.42	x	0.63	x	0.7	=	32.29	(76)
East	0.9x	0.77	X	2.75		X	63.27	x	0.63	x	0.7	= [53.18	(76)
East	0.9x	0.77	X	2.75		X	92.28	x	0.63	x	0.7	= [77.56	(76)
East	0.9x	0.77	X	2.75		X	113.09	x	0.63	x	0.7	= [95.05	(76)
East	0.9x	0.77	X	2.75		X	115.77	x	0.63	x	0.7	= [97.3	(76)
East	0.9x	0.77	X	2.75		X	110.22	x	0.63	x	0.7	=	92.63	(76)
East	0.9x	0.77	X	2.75		X	94.68	X	0.63	x	0.7	= [79.57	(76)
East	0.9x	0.77	X	2.75		X	73.59	x	0.63	x	0.7	= [61.85	(76)
East	0.9x	0.77	X	2.75		X	45.59	x	0.63	x	0.7	= [38.31	(76)
East	0.9x	0.77	X	2.75		X	24.49	X	0.63	x	0.7	=	20.58	(76)
East	0.9x	0.77	X	2.75		X	16.15	x	0.63	x	0.7	= [13.57	(76)
West	0.9x	0.77	X	12.7		X	19.64	X	0.63	X	0.7	=	76.23	(80)
West	0.9x	0.77	X	12.7		X	38.42	x	0.63	x	0.7	=	149.12	(80)
West	0.9x	0.77	X	12.7		X	63.27	x	0.63	x	0.7	=	245.58	(80)
West	0.9x	0.77	X	12.7		X	92.28	X	0.63	х	0.7	=	358.17	(80)
West	0.9x	0.77	X	12.7		X	113.09	X	0.63	x	0.7	= [438.95	(80)
West	0.9x	0.77	X	12.7		X	115.77	X	0.63	x	0.7	=	449.34	(80)
West	0.9x	0.77	X	12.7		X	110.22	X	0.63	x	0.7	= [427.79	(80)
West	0.9x	0.77	X	12.7		X	94.68	X	0.63	x	0.7	= [367.46	(80)
West	0.9x	0.77	X	12.7		X	73.59	x	0.63	x	0.7	=	285.62	(80)
West	0.9x	0.77	X	12.7		X	45.59	X	0.63	X	0.7	=	176.94	(80)
West	0.9x	0.77	X	12.7		X	24.49	X	0.63	x	0.7	= [95.05	(80)
West	0.9x	0.77	X	12.7		X	16.15	x	0.63	x	0.7	=	62.69	(80)
٦		watts, calcu	_			_		_	n = Sum(74)m .					(00)
(83)m=			7.3		639.03		59.08 625.4	530	.32 405.83	249.27	134.07	88.72		(83)
Ĭ	581.33	internal and 6 681.41 80	3.38	<u>`</u>	(73)m 044.68	Ť		000	14 700 50	650.00	F70.0	540.25		(84)
(84)m=	561.33	0 001.41 80	ა.პඊ	944.8/	044.68	1 10	040.3 990.85	902	.14 790.53	659.09	572.8	549.35		(04)

7. Me	ean inter	nal temp	perature	(heating	season)								
						•	from Tal	ole 9, Th	1 (°C)				21	(85)
-		_			ea, h1,m	_								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.9	0.77	0.61	0.68	0.89	0.98	1	1		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.28	19.45	19.77	20.21	20.6	20.87	20.96	20.94	20.72	20.2	19.67	19.25		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.68	19.68	19.68	19.7	19.7	19.71	19.71	19.71	19.7	19.7	19.69	19.69		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m=	1	0.99	0.99	0.95	0.86	0.66	0.46	0.52	0.83	0.97	0.99	1		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	le 9c)				
(90)m=	17.41	17.66	18.13	18.77	19.3	19.62	19.7	19.69	19.47	18.77	17.99	17.39		(90)
							•	•		fLA = Livin	g area ÷ (4	1) =	0.26	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=		18.12	18.55	19.13	19.64	19.94	20.02	20.01	19.79	19.13	18.42	17.86		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appr	opriate				
(93)m=	17.89	18.12	18.55	19.13	19.64	19.94	20.02	20.01	19.79	19.13	18.42	17.86		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains	•		ed at st	ep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm):		Į.			! <u>'</u>		ļ.			
(94)m=	1	0.99	0.98	0.94	0.85	0.68	0.5	0.56	0.83	0.97	0.99	1		(94)
Usefu		hmGm	, W = (94	4)m x (8	4)m	•								
(95)m=	578.94	675.89	787.43	891.21	891.34	711.46	491.55	507.91	658.05	637.55	568.44	547.56		(95)
					from Ta		i	i		i				(0.0)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern 1832.81		1190.56		=[(39)m : 507.5	x [(93)m 534.46	- (96)m 848.03	1280.28	1705 44	2068.56		(97)
, ,										j)m] x (4 ⁻		2000.30		(37)
	1115.18		777.77	466.15	222.62	0	0.02	0	0	478.19	818.64	1131.63		
(00)										(kWh/year			5910.84	(98)
Snac	a haatin	a requir	ement in	k\/\/h/m2	2/ve≥r				. ,		, ,	,	58.57	(99)
•		• ,			•		1 12)				36.57	
			nts — Ind	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					
•	e heatir ion of sp	_	at from s	econdar	y/supple	mentary	system						0	(201)
-												!		_
	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fract	•		at from m ng from	•	, ,			(202) = 1 $(204) = (2$, ,	(203)] =			1	(202)
Fract Fract	ion of to	tal heati		main sys	stem 1				, ,	(203)] =				= ' '
Fract Fract Efficie	ion of to	tal heati main spa	ng from ace heat	main sys	stem 1	g systen			, ,	(203)] =			1	(204)

Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above	i —							Ī	
1115.18 900.66 777.77 466.15 222.62	0	0	0	0	478.19	818.64	1131.63		
(211) m = {[(98)m x (204)] } x 100 ÷ (206)	1		1				ı	1	(211)
1192.71 963.27 831.84 498.56 238.1	0	0	O Tota	0 L (k\\/b\/vor	511.44	875.55	1210.29		7(044)
Occasion for the later and the National Inc.			TOLA	i (Kvvii/yea	ar) =Sum(2	2 1 1) _{15,1012}	2=	6321.75	(211)
Space heating fuel (secondary), kWh/month = $\{[(98)\text{m x }(201)]\} \times 100 \div (208)$									
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	0	0	0	0	0	0		
			Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	 	0	(215)
Water heating									_
Output from water heater (calculated above)	_						1	1	
211.49 186.38 195.68 175.32 171.74	153.36	147.19	161.64	161.4	181.8	192.35	206.37		٦
Efficiency of water heater	1							79.8	(216)
(217)m= 88.61 88.47 88.12 87.3 85.51	79.8	79.8	79.8	79.8	87.28	88.25	88.67		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 238.69 210.68 222.04 200.82 200.85	192.18	184.45	202.56	202.25	208.3	217.96	232.75		
			Tota	I = Sum(2	19a) ₁₁₂ =			2513.54	(219)
Annual totals					k\	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1								6321.75	_
Water heating fuel used								2513.54	
Electricity for pumps, fans and electric keep-ho	ot								
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								409.05	(232)
12a. CO2 emissions – Individual heating syst	tems inclu	uding mi	cro-CHF						_
	Fn	ergy			Fmiss	ion fac	tor	Emissions	
		/h/year			kg CO		.01	kg CO2/yea	ar
Space heating (main system 1)	(21	1) x			0.2	16	=	1365.5	(261)
Space heating (secondary)	(21	5) x			0.5	19	=	0	(263)
Water heating	(219	9) x			0.2	16	=	542.93	(264)
Space and water heating	(26	1) + (262)	+ (263) + (264) =				1908.42	(265)
Electricity for pumps, fans and electric keep-ho	ot (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232	2) x			0.5	19	=	212.3	(268)
Total CO2, kg/year				sum o	of (265)(2	271) =		2159.64	(272)
									-
TER =								31.8	(273)

			User D	etails:						
Assessor Name:	Lindsey Arnott	t		Strom	a Num	ber:		STRO	035000	
Software Name:	Stroma FSAP	2012		Softwa	are Ve	rsion:		Versic	n: 1.0.5.9	
		Р	roperty.	Address	Flat 05					
Address :	The Alders, Ald	rington Road	d, SW16	1TW						
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	7	Volume(m	<u> </u>
Ground floor			7	1.42	(1a) x	2	2.85	(2a) =	203.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	n) 7	1.42	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	203.55	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0	=	0	X	40 =	0	(6a)
Number of open flues	0	+ 0	<u> </u>	0	Ī = Ē	0	X	20 =	0	(6b)
Number of intermittent fa	ans				' F	0	x	10 =	0	(7a)
Number of passive vents	5				F	0	X	10 =	0	 (7b)
Number of flueless gas f					L	0	X	40 =	0	(7c)
Training of magical gas					L				Ů	(, o)
								Air ch	anges per h	our
Infiltration due to chimne	eys, flues and fans	= (6a)+(6b)+(7a)	a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has		tended, procee	d to (17), (otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	uction			0	(11)
if both types of wall are p deducting areas of open			the great	ter wall are	a (after					
If suspended wooden			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else ente	r O							0	(13)
Percentage of window	s and doors draug	ht stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value	q50, expressed in	cubic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then (18)	$= [(17) \div 20] + (8)$	8), otherw	ise (18) = (16)				0.15	(18)
Air permeability value appli	es if a pressurisation te	st has been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	l9)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified	 	 							1	
Jan Feb	Mar Apr N	/lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								1	
(22)m= 5.1 5	4.9 4.4 4	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m <i>∸</i> 4									
(00-)		00 005	0.05	0.00		1 4 00	T 440	1.40	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

0.16	0.16	e (allowi	0.14	0.14	0.12	0.12	(21a) x	(22a)m _{0.13}	0.14	0.14	0.15		
Calculate effe			-	_	l -	_	0.12	0.13	0.14	0.14	0.15		
If mechanic	al ventila	ition:										0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				76.5	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b	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)r		tract ven < (23b), t		•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or when (24d)		•	•				0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		•		•	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25
3. Heat losse	e and he	at loss r	aramete	or.									
ELEMENT	Gros	•	Openin		Net Ar	6 2	U-valı	IA.	AXU		k-value	Δ Δ	λΧk
ELEIVIEINI	area		m		A,r		W/m2		(W/I	K)	kJ/m²-k		J/K
Doors					2.68	Х	1	= [2.68				(26)
Windows Type) 1				5.74	x1,	/[1/(1.3)+	0.04] =	7.09				(27
Windows Type	€2				6.05	x1,	/[1/(1.3)+	0.04] =	7.48				(27
Floor					71.42	<u>x</u>	0.11		7.8562				(28
Walls Type1	60.2	25	14.4	7	45.78	x	0.15	<u> </u>	6.87				(29
Walls Type2	18.4	12	0		18.42	2 x	0.13	<u> </u>	2.43	T i			(29
Total area of e	lements	, m²			150.0	9							 (31
Party wall					19.66	x	0		0	\neg			(32
* for windows and	l roof wind	ows, use e	ffective wi	ndow U-va				L /[(1/U-valu		ו ו ns given in	paragraph	 1 3.2	`
** include the are	as on both	sides of in	ternal wal	ls and pan	titions								
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				34.41	(33
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	9148.2	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Low		100	(35
For design asses: can be used inste				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated i	using Ap	pendix ł	<						11.24	(36
if details of therm		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			45.65	(37
l otal fabric he	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		
			Δ	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	Feb	Mar	Apr	iviay									
Total fabric he Ventilation hea Jan (38)m= 18.81		Mar 18.38	17.31	17.1	16.03	16.03	15.81	16.46	17.1	17.53	17.96		(38
Ventilation hea	Feb 18.6	18.38	·		16.03	16.03	15.81	<u> </u>	17.1 = (37) + (37)	l	17.96		(38
Ventilation hea Jan (38)m= 18.81	Feb 18.6	18.38	·		16.03 61.67	16.03 61.67	15.81 61.46	<u> </u>	<u> </u>	l	17.96		38)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.9	0.9	0.9	0.88	0.88	0.86	0.86	0.86	0.87	0.88	0.88	0.89		
				•		•	•	•	Average =	Sum(40) ₁ .	12 /12=	0.88	(40)
Number of day	<u> </u>	<u> </u>				l				T			
Jan 34	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/	c										1.10/1./		
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i										1			
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
_										m(44) ₁₁₂ =	<u> </u>	1060.23	(44)
Energy content of) kWh/mor			c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
If instantaneous v	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	<u> </u>	1390.13	(45)
(46)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Water storage				<u> </u>		<u> </u>	<u> </u>						
Storage volum	ne (litres)) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	-			_			, ,		(01.1/				
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):				1	.2		(48)
Temperature f	actor fro	m Table	2b							0	.6		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)) =		0.	72		(50)
b) If manufact			-										
Hot water stor If community h	-			ie 2 (KVV	n/litre/da	ay)					0		(51)
Volume factor	•		511 4.5								0		(52)
Temperature f	actor fro	m Table	2b							—	0		(53)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	72		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)	 -		
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61)m = (60) + 365 x (41)m = (60) + 365 x (41)m = (61)m = (60) + 365 x (41)m = (62)m = 0
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 189.71 167.23 175.86 157.52 154.4 138.01 132.59 145.43 145.15 163.33 172.65 185.16 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter 0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Column 189.71 167.23 175.66 157.52 154.4 138.01 132.59 145.43 145.15 163.33 172.65 185.16 (62)
Solar DHW linput 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)ms
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater (64)m=
189.71 167.23 175.66 157.52 154.4 138.01 132.59 145.43 145.15 163.33 172.65 185.16 Output from water heater (annual)
Couput from water heater (annual) Lie
Heat gains from water heating, kWh/month 0.25 ' [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m 84.39
(65)m= 84.39 74.85 79.72 73 72.65 66.51 65.4 69.66 68.88 75.62 78.03 82.88 (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
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
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
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 114
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m= 114 114 114 114 114 114 114 114 114 11
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 18.54
(67)m=
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 200.59 202.67 197.42 186.26 172.16 158.91 150.06 147.98 153.23 164.39 178.49 191.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.
(68)m= 200.59 202.67 197.42 186.26 172.16 158.91 150.06 147.98 153.23 164.39 178.49 191.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34
(69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Losses e.g. evaporation (negative values) (Table 5) $ (71)m = \begin{array}{c ccccccccccccccccccccccccccccccccccc$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Water heating gains (Table 5) (72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
g
(73)III= 369.76 367.73 375.17 334.96 334.99 314.09 302.06 307.61 316.17 336.55 361.94 379.39
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 6d m ² Table 6a Table 6b Table 6c (W)
East 0.9x 0.77 x 5.74 x 19.64 x 0.5 x 0.7 = 27.34 (76)
East 0.9x 0.77 x 5.74 x 38.42 x 0.5 x 0.7 = 53.49 (76)
East 0.9x 0.77 x 5.74 x 63.27 x 0.5 x 0.7 = 88.09 (76)
East 0.9x 0.77 x 5.74 x 92.28 x 0.5 x 0.7 = 128.48 (76)
East 0.9x 0.77 x 5.74 x 113.09 x 0.5 x 0.7 = 157.45 (76)

	-											_					_
East	0.9x	0.77	X	5.7	' 4	X	1	15.77	Х		0.5	X	0.7		=	161.18	(76)
East	0.9x	0.77	X	5.7	' 4	X	1	10.22	X		0.5	X	0.7		=	153.45	(76)
East	0.9x	0.77	X	5.7	' 4	X	ć	94.68	X		0.5	X	0.7		=	131.81	(76)
East	0.9x	0.77	X	5.7	' 4	X	7	'3.59	X		0.5	X	0.7		=	102.45	(76)
East	0.9x	0.77	X	5.7	' 4	X	4	5.59	X		0.5	X	0.7		=	63.47	(76)
East	0.9x	0.77	X	5.7	' 4	X	2	24.49	X		0.5	X	0.7		=	34.09	(76)
East	0.9x	0.77	X	5.7	' 4	X	1	6.15	x		0.5	X	0.7		=	22.49	(76)
West	0.9x	0.77	X	6.0)5	X	1	9.64	x		0.5	X	0.7		=	28.82	(80)
West	0.9x	0.77	X	6.0)5	X	3	88.42	x		0.5	X	0.7		=	56.38	(80)
West	0.9x	0.77	X	6.0)5	X	6	3.27	x		0.5	X	0.7		=	92.85	(80)
West	0.9x	0.77	X	6.0)5	X	9	2.28	x		0.5	x	0.7		=	135.41	(80)
West	0.9x	0.77	x	6.0)5	X	1	13.09	x		0.5	x	0.7		=	165.96	(80)
West	0.9x	0.77	x	6.0)5	X	1	15.77	x		0.5	x	0.7		=	169.88	(80)
West	0.9x	0.77	x	6.0)5	X	1	10.22	x		0.5	x	0.7		=	161.74	(80)
West	0.9x	0.77	x	6.0)5	X	9	94.68	x		0.5	x	0.7		=	138.93	(80)
West	0.9x	0.77	x	6.0)5	X	7	73.59	x		0.5	x	0.7		=	107.99	(80)
West	0.9x	0.77	x	6.0)5	X	4	l5.59	х		0.5	x	0.7		=	66.9	(80)
West	0.9x	0.77	x	6.0)5	X	2	24.49	х		0.5	x	0.7		=	35.94	(80)
West	0.9x	0.77	x	6.0)5	X	1	6.15	x		0.5	x	0.7		=	23.7	(80)
Solar g	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																
(83)m=	(83)m= 56.16 109.87 180.94 263.89 323.41 331.06 315.19 270.74 210.44 130.37 70.03 46.19 (83)																
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (8	83)m	, watts									
(84)m=	445.92	497.6	556.11	618.87	657.99	6	45.96	617.27	578	.55	528.61	468.9	2 431.97	425.	.58		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	n)											
Temp	erature	during h	eating p	eriods ir	the livi	ing	area	from Tal	ole 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for g	ains for	living are	ea, h1,n	า (ร	ee Ta	ıble 9a)									_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	D	ес		
(86)m=	0.96	0.94	0.9	0.83	0.71	(0.55	0.42	0.4	16	0.67	0.86	0.94	0.9	6		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)					•	
(87)m=	19.22	19.45	19.83	20.31	20.68	1	20.9	20.97	20.		20.8	20.32	19.7	19.	19		(87)
Temn	erature	during h	eating r	eriods ir	rest of	: dw	elling	from Ta	hle (Th	2 (°C)		<u> </u>	•			
(88)m=	20.17	20.17	20.17	20.18	20.19	1	20.2	20.2	20		20.19	20.19	20.18	20.	18		(88)
Litilica	tion for	tor for g	oine for	roct of d	wolling	h2	m (cc	no Tablo	02) —				-!	<u>. </u>			
(89)m=	0.95	0.93	0.89	0.81	0.67	1	0.5	0.35	0.3	39	0.62	0.84	0.93	0.9	6		(89)
								<u> </u>					0.00	0.0			()
I		l temper		1	1	Ť	•	i	r i					T		Ī	(00)
(90)m=	17.77	18.1	18.65	19.33	19.82		20.1	20.18	20.	17	19.99	19.35	<u> </u>	17.7	/3		(90)
											T	LA = LI\	/ing area ÷ (4) =		0.38	(91)
Mean	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$																
(92)m=	18.33	18.62	19.1	19.71	20.15		20.41	20.48	20.		20.3	19.72		18.2	29		(92)
Annly	adjustr	nent to the	he mear	n interna	tempe	ratu	ire fro	m Table	4e,	wher	e appro	priate					

1			Γ	1	Ι	1	Γ	ı						(00)
(93)m=	18.33	18.62	19.1	19.71	20.15	20.41	20.48	20.47	20.3	19.72	18.94	18.29		(93)
			uirement				44 -4	T-51- 0	41	4 T: (70)	-ll-		
				nperatui using Ta		ied at st	ер 11 от	Table 9	o, so tna	t 11,m=(76)m an	d re-caid	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	<u> </u>				19						
(94)m=	0.94	0.92	0.87	0.79	0.67	0.51	0.38	0.41	0.63	0.83	0.91	0.94		(94)
Usefu	ıl gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	418.21	455.76	485.31	489.31	440.66	330.71	231.64	239.72	331.87	387.31	394.64	401.88		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able 8		•	•		•			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	904.26	881.18	806.93	680.29	530.11	358.04	239.22	250.14	385	572.24	748.04	896.08		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	361.62	285.88	239.29	137.5	66.55	0	0	0	0	137.59	254.45	367.68		
								Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1850.56	(98)
Space	e heating	g require	ement in	kWh/m²	² /year								25.91	(99)
8c Sr	nace cod	olina rec	uiremer	nt	•									
		Ĭ		August.	See Ta	hle 10h								
Odiod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat			<u> </u>	<u> </u>	<u> </u>		<u> </u>	and exte	<u> </u>					
(100)m=		0	0	0	0	579.74	456.39	467.1	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm		<u>I</u>	1	<u>I</u>			<u> </u>				
(101)m=	0	0	0	0	0	0.87	0.92	0.9	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	(101)m						!			
(102)m=	0	0	0	0	0	506.5	418.57	421.04	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		•			
(103)m=	0	0	0	0	0	829.08	794.13	749.99	0	0	0	0		(103)
						dwelling,	continu	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m] :	к (41)m	
,				3 × (98	Í									
(104)m=	0	0	0	0	0	232.26	279.41	244.74	0	0	0	0		_
01	l f !									= Sum(=	756.4	(104)
	d fraction		able 10b	`					1 C =	coolea	area ÷ (4	+) =	0.74	(105)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)	Ů					1 0.20	0.20	0.20		= Sum(=	0	(106)
Space	coolina	reauirer	ment for	month =	: (104)m	× (105)	× (106)r	m	rota	– Garri	1628-17	_		(100)
(107)m=		0	0	0	0	42.74	51.42	45.04	0	0	0	0		
				Į		!		!	 Total	= Sum(107)	=	139.19	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear					· (4) =	,		1.95	(108)
		•			•	scheme			(.07)	(1) =			1.00	
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme.														
								ing prov (Table 1 [,]			urilly SCI	ieilie.	0	(301)
	-			-		-	_	,	,					= ` ` `
riactio	iii oi spa	ice neat	пош со	mmunity	system	1 – (30	1)=						1	(302)

The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community heat pump		our other heat sources; th	e latter 1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commun	nity heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		<u> </u>	1.05	(306)
Space heating		_	kWh/year	
Annual space heating requirement			1850.56	
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1943.09	(307a)
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary syste	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Γ	1926.82	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2023.16	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	39.66	(313)
Cooling System Energy Efficiency Ratio		Ī	(314)	
Space cooling (if there is a fixed cooling system, if not enter 0)	21.13	(315)		
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	outside	[161.41	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	161.41	(331)
Energy for lighting (calculated in Appendix L)			327.49	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		Ī	-482.91	(333)
Electricity generated by wind turbine (Appendix M) (negative qua	ntity)	Ī	0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using to	two fuels repeat (363) to	(366) for the second fuel	289	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0.52	712.28	(367)
Electrical energy for heat distribution [6	313) x	0.52	20.58	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372) =	732.86	(373)
CO2 associated with space heating (secondary) (3	309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating (3	373) + (374) + (375) =		732.86	(376)
CO2 associated with space cooling (3	315) x	0.52	10.97	(377)

CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 83.77 CO2 associated with electricity for lighting (379) (332))) x 0.52 169.97 Energy saving/generation technologies (333) to (334) as applicable x 0.01 = Item 1 (380) -250.63 0.52 sum of (376)...(382) = Total CO2, kg/year (383)746.94 **Dwelling CO2 Emission Rate** $(383) \div (4) =$ (384) 10.46 El rating (section 14) (385)91.4

			User D) otoilo:						
Assessor Name:	Lindsey Arnott			Strom:	o Nium	bor		STDC	0035000	
Software Name:	Stroma FSAP 201	12		Softwa					on: 1.0.5.9	
Continuio italiio:				Address				70,00	7101010	
Address :	The Alders, Aldring		i i							
1. Overall dwelling dime			,							
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			7	1.42	(1a) x	2	.85	(2a) =	203.55	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) 7	1.42	(4)					
Dwelling volume				•	(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	203.55	(5)
2. Ventilation rate:										
		econdar neating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	7 + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	j = F	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				,	3	x ·	10 =	30	(7a)
Number of passive vents						0	x	10 =	0	(7b)
Number of flueless gas fi					L	0	x	40 =	0	(7c)
Number of fideless gas fi	163					0			0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6	6a)+(6b)+(7	'a)+(7b)+(7c) =	Г	30		÷ (5) =	0.15	(8)
If a pressurisation test has b	een carried out or is intend	ed, procee	d to (17), d	otherwise o	ontinue fr	om (9) to				``
Number of storeys in the	ne dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.					•	uction			0	(11)
if both types of wall are pri deducting areas of openir	resent, use the value corres	sponding to	the great	er wall are	a (after					
If suspended wooden f	• / .	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0								0	(13)
Percentage of windows	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	ity value, then (18) = [(1	7) ÷ 20]+(8	3), otherwi	ise (18) = (16)				0.4	(18)
Air permeability value applie		s been dor	ne or a deg	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	n 075 v (1	Q)1 –			2	(19)
Infiltration rate incorporat	ing shelter factor			(21) = (18)		0/] =			0.85	(20)
•		4		(21) - (10)	/ X (20) =				0.34	(21)
Infiltration rate modified for	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	7	
<u> </u>		Juli	Jui	L	Seb	l Oct	INOV	l Dec	_	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	7	
(22)111- 3.1 3	7.0 4.4 4.3] 3.0	3.0	3.7	4	4.5	4.5	4.1	J	
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]	

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	(22a)m _{0.34}	0.36	0.38	0.4]	
	ctive air	change i			cable ca	se				<u> </u>	!]	
If mechanica												0	(23
If exhaust air h		0 11		, ,	,	. `	,, .	•) = (23a)			0	(23
If balanced with		•	•	_								0	(23
a) If balance	1					- ` ` 		<u> </u>	 		- ` ` `) ÷ 100] ī	10.
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	1							<u> </u>	- 	- 	1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h		tract ven ‹ (23b), t		•	-				5 x (23h	<i>)</i>			
$\frac{11(225)1}{24c)m=0}$	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(24
d) If natural]	`
		en (24d)							0.5]				
24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(25
2 Heat lease	o and he	ot loss r	oromot	S#1									
3. Heat losse		·			Not Am		اميدا		A V I I		بريامير با	- Λ	V I
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		X k J/K
Ooors					2.68	x	1		2.68	,			(26
Vindows Type	e 1				5.74	x1,	/[1/(1.4)+	0.041 =	7.61				(27
Vindows Type													(21
	e 2				6.05	x ₁ ,	/[1/(1.4)+	L		=			
Floor	e 2				6.05	=		L	8.02	9 [(27)
loor		25	14.4	7	71.42	2 x	0.13	0.04] = [8.02 9.28459	9 [(27
Toor Valls Type1	60.2		14.4	7	71.42	2 x x x	0.13	0.04] = [8.02 9.28459 8.24	9 [(27)
Floor Valls Type1 Valls Type2	60.2	12	14.4	7	71.42 45.78 18.42	2 x x x x x x	0.13	0.04] = [8.02 9.28459	9 [(27)
Floor Valls Type1 Valls Type2 Fotal area of e	60.2	12		7	71.42 45.78 18.42	2 x 3 x 2 x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32	9 [(27)
Tloor Valls Type1 Valls Type2 Total area of ee Party wall	60.2 18.4 elements	, m²	0		71.42 45.78 18.42 150.0	2 x 3 x 2 x 9 x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32		paragraph		(27)
Floor Valls Type1 Valls Type2 Fotal area of experty wall for windows and	60.2 18.4 elements	, m²	0	ndow U-va	71.42 45.78 18.42 150.0 19.66	2 x 3 x 2 x 9 x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32		paragrapi	h 3.2	(27)
Floor Valls Type1 Valls Type2 Fotal area of earty wall for windows and tinclude the area	60.2 18.4 Elements I roof winder	, m² ows, use e	0 Iffective winternal wall	ndow U-va	71.42 45.78 18.42 150.0 19.66	x x x x y x x y x x y x x y x x y x x y x x y x x x y x	0.13 0.18 0.18	0.04] = [8.02 9.28459 8.24 3.32		paragrapi	h 3.2	(27)
Floor Valls Type1 Valls Type2 Fotal area of experty wall for windows and * include the area Fabric heat los	60.2 18.4 Elements Troof winders on both ss, W/K =	, m ² ows, use e sides of in = S (A x	0 Iffective winternal wall	ndow U-va	71.42 45.78 18.42 150.0 19.66	x x x x y x x y x x y x x y x x y x x y x x y x x x y x	0.13 0.18 0.18 0 formula 1	$0.04] = \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix} /[(1/U-valu) + (32)] = \begin{bmatrix} \\ \\ \end{bmatrix}$	8.02 9.28459 8.24 3.32	as given in			(27 (28 (29 (29 (31 (32
Floor Valls Type1 Valls Type2 Fotal area of exparty wall for windows and * include the area Fabric heat lost Heat capacity	60.2 18.4 elements froof winder as on both as, W/K = Cm = S(ows, use e sides of in = S (A x (A x k)	0 Iffective winternal walk	ndow U-va	71.42 45.78 18.42 150.0 19.66 alue calculatitions	x x x x y x y x x x y x x y x x y x x y x x y x x y x x x y x x x y x x x x y x	0.13 0.18 0.18	0.04] = [0.04] = [0.04	8.02 9.28459 8.24 3.32 0 (e)+0.04] a	as given in 2) + (32a).		39.15	(25) (25) (25) (37) (37) (37) (37)
Floor Valls Type1 Valls Type2 Fotal area of expansion of	60.2 18.4 I roof winder as on both as S, W/K: Cm = S(is parameter symmetry when the symmetry when	ows, use e sides of in = S (A x (A x k) ster (TMF	offective winternal walk U) P = Cm ÷	ndow U-va Is and part	71.42 45.78 18.42 150.0 19.66 alue calculatitions	x x x y x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2	(27) (28) (29) (32) (32) (32) (32)
Floor Valls Type1 Valls Type2 Fotal area of every wall for windows and the include the area fabric heat loss the area capacity. Thermal mass for design assess an be used inste	60.2 18.4 Plements I roof winder as on both ss, W/K = Cm = S(a parame asments wheread of a decease.	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu	offective winternal wall U) P = Cm - tails of the culation.	ndow U-ve ls and part - TFA) ir constructi	71.42 45.78 18.42 150.0 19.66 alue calculatitions	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x y x x x x y x x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2 250	(27) (28) (29) (32) (32) (32) (32) (32)
Floor Valls Type1 Valls Type2 Fotal area of experiments For windows and the include the area Fabric heat loss deat capacity Thermal mass for design assess an be used inste	60.2 18.4 I roof winder as on both as S, W/K: Cm = S(a parame as sments where ad of a decrease is S (L	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	offective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x y x x x x y x x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2	(27 (28 (29 (31) (32)
Floor Valls Type1 Valls Type2 Fotal area of exparty wall for windows and include the area fabric heat los fleat capacity fleat mass for design assess an be used inste fleatals of thermal	60.2 18.4 I roof winder as on both as on both ss, W/K: Cm = S(s parame sments whead of a decrease is S (L. al bridging)	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	offective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x y x x x x y x x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 re)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	39.15 9148.2 250 8.02	(27) (28) (29) (32) (32) (32) (34)
Valls Type1 Valls Type2 Total area of every wall for windows and invited the area Tabric heat loss deat capacity Thermal mass for design assess an be used instevential bridge details of thermal fotal fabric he	60.2 18.4 Pelements I roof winder as on both as, W/K: Cm = S(a parame and of a december is S (L al bridging at loss	ows, use e sides of in S (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	offective winternal walk U) P = Cm : tails of the ulation. culated to own (36) =	ndow U-vals and part - TFA) ir constructi using Ap	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x y x x x x y x x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 (a) + (a) 4 3.32 1.(30) + (a) 4 2.(30) + (a) 4 3.32 1.(30) + (a) 4 3.(30) + (a) 4 3.(as given in 2) + (32a). : Medium TMP in Ta	(32e) =	39.15 9148.2 250	(27 (28 (29 (31 (32 (32 (32 (34 (36)
Valls Type1 Valls Type2 Total area of every wall for windows and the include the area Fabric heat loss and the capacity Thermal mass for design assess and be used instermal bridge the thermal bridge of details of thermal fotal fabric hermal	60.2 18.4 Plements I roof winder as on both as, W/K = Cm = S(aparame and of a december is S (L al bridging at loss at loss ca	ows, use e sides of in = S (A x k) eter (TMF) ere the de tailed calculated are not kn	offective winternal walk U) P = Cm : tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir constructi using Ap	71.42 45.78 18.42 150.0 19.66 alue calculatitions h kJ/m²K ion are not opendix k	x x x y x x y x x y x x y x x y x x x y x x x y x x x x x y x x x x x x x x y x	0.13 0.18 0.18 0 formula 1. (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 (a) + (32) (ive Value e values of (36) = 0.33 × (2) + (32a).: Medium	(32e) = able 1f	39.15 9148.2 250 8.02	(27) (28) (29) (32) (32) (32) (34)
Floor Valls Type1 Valls Type2 Total area of experience of	60.2 18.4 Pelements I roof winder as on both as, W/K: Cm = S(a parame and of a december is S (L al bridging at loss	ows, use e sides of in S (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	offective winternal walk U) P = Cm : tails of the ulation. culated to own (36) =	ndow U-vals and part - TFA) ir constructi using Ap	71.42 45.78 18.42 150.0 19.66 alue calculatitions n kJ/m²K ion are not	x x x y x x y x x y x x y x x y x x y x x x y x x x x y x x x x y x x x x x y x x x x y x x x x y x x x y x x x y x x x y x x x y x x x x y x	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 (a) + (a) 4 3.32 1.(30) + (a) 4 2.(30) + (a) 4 3.32 1.(30) + (a) 4 3.(30) + (a) 4 3.(as given in 2) + (32a). : Medium TMP in Ta	(32e) =	39.15 9148.2 250 8.02	(27 (28 (29 (31 (32 (33 (34 (35)
Valls Type1 Valls Type2 Total area of exparty wall for windows and include the area Tabric heat loss deat capacity Thermal mass for design assess an be used insternated bridge details of thermal fotal fabric head ventilation head	60.2 18.4 Pelements I roof winder as on both as, W/K: Cm = S(a parame and of a decese : S (L al bridging at loss at loss cat Feb 39.57	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn alculated Mar 39.34	offective winternal walk U) P = Cm + tails of the culation. culated (count (36) = 1 monthly)	ndow U-vals and part - TFA) ir constructi using Ap = 0.05 x (3	71.42 45.78 18.42 150.0 19.66 alue calculations kJ/m²K ion are not opendix h 1) Jun	x x x y x y x y x y x y x y x y x y x y	0.13 0.18 0.18 0 formula 1 (26)(30)	0.04] = [8.02 9.28459 8.24 3.32 0 1e)+0.04] a 1ive Value of values of (36) = 0.33 × (0) Oct	2) + (32a). : Medium : TMP in Ta 25)m x (5) Nov 38.43	(32e) = able 1f Dec	39.15 9148.2 250 8.02	(27 (28 (29 (31 (32 (32 (32 (33 (34 (35) (36)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.22	1.21	1.21	1.2	1.19	1.18	1.18	1.18	1.18	1.19	1.2	1.2		
` /				<u> </u>		<u> </u>	<u> </u>	<u> </u>	L Average =	Sum(40) ₁ .	12 /12=	1.2	(40)
Number of day	s in mo	nth (Tabl	e 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
-													
4. Water heat	ing ono	rav roqui	romont:								kWh/ye	or:	
4. Water Heat	ing ene	igy requi	rement.								KVVII/ ye	zai.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		28		(42)
Annual averag	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.35		(43)
not more that 125	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 ir	n litres pe	r day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
-	h = 1= 1 =				400 - 1/-/ -		T / 000/			m(44) ₁₁₂ =		1060.23	(44)
Energy content of		usea - car		ontniy = 4.	190 x va,r		1 m / 3600) KVVII/MOR	ıtrı (see 18		c, 1a)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		– ,
If instantaneous w	ater heati	na at noint	of use (no	n hot water	· storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	- I	1390.13	(45)
									17.00	1 40 00			(46)
(46)m= 21.62 Water storage	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Storage volum) includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '		•			•					100		(**)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	55		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	84		(50)
b) If manufact			-										
Hot water stora	-			le 2 (kW	h/litre/da	ay)					0		(51)
If community h	•		JII 4.3										(52)
Temperature fa			2b							—	0		(53)
Energy lost fro				aar			(47) x (51)) x (52) x (53) -				(54)
Enter (50) or (_	, KVVII/ y	Jai			(47) X (01)) X (02) X (00) =	-	0 84		(55)
Water storage		,	or each	month			((56)m = ((55) × (41)	m	<u> </u>	<u> </u>		()
					05.44		·	1	ī	25.14	25.00		(56)
(56)m= 25.98 If cylinder contains	23.47	d solar sto	25.14	25.98 m = (56) m	25.14 x [(50) – (25.98 H11)] ÷ (5)	25.98 0), else (5	25.14 7)m = (56)	25.98 m where (25.14 H11) is fro	25.98 m Append	ix H	(30)
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
` ′				<u>l</u>							<u> </u>		, ,
Primary circuit	•	•			E0\	(EO) - OC	SE /44\	·m			0		(58)
Primary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
(33)111- 23.20	21.01	20.20	١ ٠٠.٦	25.20	22.01	25.20	25.20	22.01	25.20	22.01	20.20		(55)

Combi loss c	alculated	for oach	month ((61)m –	(60) · 3	65 v (41	/m						
(61)m= 0	0 0	0	0	0	0	05 x (41	0	0	0	0	0	1	(61)
	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				ļ	J · (59)m + (61)m	
(62)m= 193.37	`	179.32	161.06	158.06	141.55	136.25	149.0		166.99	176.19	188.82]	(62)
Solar DHW inpu	t calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter	'0' if no sola	r contribut	tion to wate	er heating)	,	
(add addition	al lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	water hea	ter											
(64)m= 193.37	7 170.53	179.32	161.06	158.06	141.55	136.25	149.0	148.69	166.99	176.19	188.82		_
							0	utput from w	ater heate	r (annual)	112	1969.92	(64)
Heat gains from	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	k [(46)m	+ (57)m	+ (59)m	<u>.</u>]	
(65)m= 87.32	77.49	82.64	75.83	75.57	69.34	68.32	72.59	71.72	78.55	80.86	85.8]	(65)
include (57)m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):									
Metabolic gai	ins (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_	
(67)m= 18.54	16.47	13.39	10.14	7.58	6.4	6.92	8.99	12.06	15.32	17.88	19.06		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5				
(68)m= 200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.9	3 153.23	164.39	178.49	191.74		(68)
Cooking gain	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5				
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and fa	ans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heating	g gains (T	able 5)										_	
(72)m= 117.36	115.32	111.08	105.32	101.58	96.31	91.83	97.57	99.61	105.57	112.31	115.33		(72)
Total interna	al gains =				(66)m + (67)m	n + (68)r	n + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 396.69	394.66	382.1	361.92	341.52	321.83	309.01	314.7	325.1	345.49	368.88	386.33		(73)
6. Solar gair													
Solar gains are		_					itions to	convert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
- .							, –						1
East 0.9x	<u> </u>	X	5.7	74	X	19.64]	0.63		0.7	=	34.45	(76)
East 0.9x		X	5.7			38.42] X _	0.63		0.7	=	67.4	[(76)
East 0.9x		X	5.7			63.27] X _	0.63	×	0.7	=	110.99	[(76)
East 0.9x		X	5.7			92.28]	0.63	x	0.7	=	161.88	(76)
East 0.9x	0.77	X	5.7	74	x 1	13.09	X	0.63	Х	0.7	=	198.39	(76)

	_								_						
East	0.9x	0.77	Х	5.7	' 4	X	1	15.77	X	0.63	X	0.7	=	203.09	(76)
East	0.9x	0.77	X	5.7	' 4	X	1	10.22	X	0.63	X	0.7	=	193.35	(76)
East	0.9x	0.77	X	5.7	' 4	X	9	94.68	X	0.63	X	0.7	=	166.08	(76)
East	0.9x	0.77	X	5.7	' 4	X	7	73.59	x	0.63	X	0.7	=	129.09	(76)
East	0.9x	0.77	X	5.7	' 4	X	4	15.59	X	0.63	X	0.7	=	79.97	(76)
East	0.9x	0.77	X	5.7	' 4	X	2	24.49	х	0.63	X	0.7	=	42.96	(76)
East	0.9x	0.77	X	5.7	' 4	x	1	6.15	x	0.63	X	0.7	=	28.33	(76)
West	0.9x	0.77	x	6.0)5	X	1	9.64	x	0.63	x	0.7	_ =	36.31	(80)
West	0.9x	0.77	X	6.0)5	X	3	88.42	x	0.63	x	0.7	-	71.04	(80)
West	0.9x	0.77	X	6.0)5	X	6	3.27	x	0.63	x	0.7		116.99	(80)
West	0.9x	0.77	x	6.0)5	X	9)2.28	x	0.63	x	0.7	=	170.62	(80)
West	0.9x	0.77	X	6.0)5	X	1	13.09	x	0.63	x	0.7	=	209.1	(80)
West	0.9x	0.77	X	6.0)5	X	1	15.77	x	0.63	x	0.7	-	214.05	(80)
West	0.9x	0.77	X	6.0)5	X	1	10.22	x	0.63	x	0.7	-	203.79	(80)
West	0.9x	0.77	X	6.0)5	X	9	94.68	x	0.63	X	0.7		175.05	(80)
West	0.9x	0.77	x	6.0)5	X	7	' 3.59	x	0.63	×	0.7	-	136.06	(80)
West	0.9x	0.77	X	6.0)5	X	4	15.59	X	0.63	×	0.7	-	84.29	(80)
West	0.9x	0.77	X	6.0)5	X	2	24.49	X	0.63	×	0.7	-	45.28	(80)
West	0.9x	0.77	x	6.0)5	X	1	6.15	x	0.63	×	0.7	-	29.86	(80)
	_								_						
Solar g	ains in	watts, ca	alculated	I for eac	h month	า			(83)m	n = Sum(74)m	(82)m				
(83)m=	70.77	138.44	227.98	332.5	407.49	$\overline{}$	17.14	397.14	341	.13 265.16	164.2	7 88.24	58.2]	(83)
Total g	ains – i	nternal a	nd solar	(84)m =	(73)m	+ (83)m	, watts		•		•	!	-	
(84)m=	467.46	533.1	610.09	694.42	749.02	7	38.97	706.15	655	.88 590.26	509.7	5 457.12	444.52]	(84)
7. Mea	an inter	nal temp	erature	(heating	seasoi	า)									
				`			area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	ctor for g	ains for I	living are	ea, h1,n	- n (s	ee Ta	ıble 9a)							
[Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	А	ug Sep	Oct	Nov	Dec]	
(86)m=	1	0.99	0.98	0.95	0.85		0.68	0.51	0.5	0.83	0.97	0.99	1	1	(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	ollo	w ste	ns 3 to 7	7 in T	able 9c)	•	•	•	_	
(87)m=	19.72	19.87	20.15	20.51	20.8	_	20.95	20.99	20.		20.49	20.04	19.7]	(87)
Temp	oraturo	during h	eating n	ariade ir	rest of	F dv	elling	from Ta	ahla (9, Th2 (°C)	!		<u>!</u>	1	
(88)m=	19.91	19.91	19.91	19.92	19.93	_	19.94	19.94	19.	` 	19.93	19.92	19.92	1	(88)
L								<u> </u>			1	1		_	, ,
Utilisa (89)m=	tion fac	tor for g	0.98	0.93	welling, 0.8	1	, m (se 0.59	0.4	9a) 0.4	15 0.75	0.96	0.99	1	1	(89)
L		<u> </u>						<u> </u>		<u>!</u>		0.99	ļ !]	(00)
г				1	1	Ť	•	i	r i —	to 7 in Tab	'		ı	1	(2.0)
(90)m=	18.21	18.44	18.84	19.36	19.73		9.91	19.93	19.		19.34	_!	18.18		(90)
											TLA = Li	ving area ÷ (4) =	0.38	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	g) = f	LA × T1	+ (1	– fLA) × T2				-	
(92)m=	18.79	18.99	19.34	19.8	20.14	2	20.31	20.34	20.	34 20.23	19.78	19.21	18.76		(92)
Apply	adjustr	nent to th	ne mean	interna	tempe	ratu	ire fro	m Table	4e,	where appr	opriate	:			

(02)	40.70	40.00	40.24	40.0	20.44	20.24	20.24	00.04	20.00	40.70	40.04	40.70	1	(93)
(93)m=	18.79	18.99	19.34	19.8	20.14	20.31	20.34	20.34	20.23	19.78	19.21	18.76		(93)
			uirement				44 -4	Table 0	41	4 T: /	70)	-11-	lata	
			or gains			ed at ste	ер ттог	rable 9	b, so tha	t 11,m=(rojm an	a re-caid	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					1					•	
(94)m=	0.99	0.99	0.97	0.93	0.81	0.62	0.44	0.5	0.77	0.95	0.99	1		(94)
			, W = (94	<u> </u>			ı	1					Ī	(0.7)
(95)m=		527.5	594.32	642.87	608.7	458.75	311.56	325.06	456.32	485.85	452.31	442.62		(95)
			rnal tem					T			<u> </u>		ı	(0.0)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
							-``	- ` 	– (96)m		1	1	I	(0-)
			1110.86		719.18	480.66	314.86	330.75	518.81	782.02	1036.64	1253.11		(97)
•		· · ·	ı				ı)m – (95	 `	r		1	
(98)m=	591.74	466.75	384.31	207.28	82.19	0	0	0	0	220.35	420.72	603.01		٦
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2976.35	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								41.67	(99)
9a. En	ergy rec	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					_
	e heatir								,					
•		•	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar ar
Space	e heatin	g require	ement (c	alculate	d above))	•		•				•	
	591.74	466.75	384.31	207.28	82.19	0	0	0	0	220.35	420.72	603.01		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20	06)		•	•	•		•	•	•	(211)
, ,	632.88	499.2	411.02	221.69	87.91	0	0	0	0	235.67	449.97	644.93		
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	3183.26	(211)
Space	e heatin	a fuel (s	econdar	v). kWh/	month									_
•		•	00 ÷ (20	• , .										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u> </u>	0	(215)
Water	heating	ı												_
	_		ter (calc	ulated al	bove)									
·	193.37	170.53	179.32	161.06	158.06	141.55	136.25	149.09	148.69	166.99	176.19	188.82		
Efficier	ncy of w	ater hea	iter										79.8	(216)
(217)m=	87.61	87.37	86.8	85.49	83.16	79.8	79.8	79.8	79.8	85.55	87.05	87.7		(217)
Fuel fo	r water	heating,	kWh/mo	onth									•	
. ,) ÷ (217)					ī					Ī	
(219)m=	220.72	195.19	206.6	188.4	190.05	177.38	170.74	186.83	186.33	195.19	202.39	215.31		,
								Tota	I = Sum(21				2335.14	(219)
	l totals	ا در د			4					k'	Wh/year	•	kWh/year	7
Space	neating	tuel use	ed, main	system	1								3183.26	_

Water heating fuel used				2335.14	٦
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230	0a)(230g) =		75	(231)
Electricity for lighting				327.49	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	687.58	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	504.39	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1191.97	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	169.97	(268)
Total CO2, kg/year	Sul	m of (265)(271) =		1400.87	(272)

TER =

(273)

28.79

			User D	Notoile:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20			Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address:	Flat 13					
1. Overall dwelling dim		torritoac	i, OVV 10							
	0.10.01.01		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.85	(2a) =	203.55	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 7	71.42	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	203.55	(5)
2. Ventilation rate:										
		econdar heating	у	other	_	total			m³ per hou	ır
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent for	ans					0	X '	10 =	0	(7a)
Number of passive vent	S				Γ	0	x -	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	x	40 =	0	(7c)
					_			Air ch	nanges per ho	
Inditination due to object	over flyer and force	So) ((6b) (/7	'a) ı (7 b) ı ((7 0) –	_					_
Infiltration due to chimne	been carried out or is intend				continue fr	0 om (9) to		÷ (5) =	0	(8)
Number of storeys in		, p, 0000	a to (11),	01110111100	oriando m	0,11 (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	y constr	uction			0	(11)
	present, use the value corre	sponding to	the great	ter wall are	a (after					
deducting areas of open	nings); if equal user 0.35 floor, enter 0.2 (unsea	uled) or 0	1 (seale	ed) else	enter 0				0	(12)
·	nter 0.05, else enter 0	ilou) oi o.	i (ocaic	<i>Ju)</i> , 0100	Cittor o				0	(13)
•	vs and doors draught s	tripped							0	(14)
Window infiltration	· ·	• •		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value	, q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeab	ility value, then (18) = [(17) ÷ 20]+(8	3), otherw	ise (18) = (16)				0.15	(18)
	ies if a pressurisation test ha	as been don	ne or a de	gree air pe	rmeability	is being u	sed			- 1
Number of sides shelter Shelter factor	red			(20) = 1 -	0.075 x (1	9)1 =			2	(19)
Infiltration rate incorpora	ating shelter factor			(21) = (18		-/1			0.85	(20)
Infiltration rate modified	•	d		() (-)	(- /				0.13	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s	1 . 1 .			1 3			1	<u> </u>	J	
(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	
		1	1	1	·	ı	1	ı	ı	
Wind Factor (22a)m = $(2^{2})^{2}$		1005	0.05	T 0.00		4.00		1 4 4 2	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltration rate (allowing for shelter ar	nd wind 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 effective air change rate for the appl	1 ' 1 '	1				1]	
If mechanical ventilation:							0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23	a) × Fmv (equation	(N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing	for in-use factor (fro	m Table 4h) =				76.5	(23c)
a) If balanced mechanical ventilation with he	, , , , , , , , , , , , , , , , , , , 		í `	 		- ` ´	÷ 100]	
(24a)m= 0.28 0.28 0.27 0.26 0.25	0.24 0.24	0.24	0.24	0.25	0.26	0.27		(24a)
b) If balanced mechanical ventilation without	t heat recovery (MV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positif (22b)m < 0.5 \times (23b), then (24c) = (23b)	•			5 × (23b	o)			
(24c)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other				0.5]				
(24d)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (2	4d) in bo	x (25)	-	-	-		
(25)m= 0.28 0.28 0.27 0.26 0.25	0.24 0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losses and heat loss parameter:								
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-val W/m2		A X U (W/		k-value kJ/m²-		X k /K
Doors	2.12 ×	1		2.12	<u></u>			(26)
Windows Type 1	5.74 ×	 1/[1/(1.3)+	0.04] =	7.09	一			(27)
Windows Type 2		1/[1/(1.3)+		16.18	=			(27)
Floor	71.42 x			7.8562	<u>-</u>		\neg	(28)
Walls Type1 60.25 18.83	41.42 X			6.21	=		╡┝	(29)
Walls Type2 10.57 2.12	8.45 X	0.14	╡┇	1.19	륵 ;			(29)
Walls Type3 7.84 0	7.84 X			1.04	북 ¦		-	(29)
Total area of elements, m ²		0.13		1.04	[(31)
Party wall	150.08							_
* for windows and roof windows, use effective window U-v	19.66 X		= /[(1/ ₋ valu	0	[naragrani		(32)
** include the areas on both sides of internal walls and par		g romaia r	7[(17 0 Valu	0,10.04,0	so giveii iii	paragrapi	7 0.2	
Fabric heat loss, W/K = S (A x U)		(26)(30) + (32) =				41.69	(33)
Heat capacity $Cm = S(A \times k)$			((28)	.(30) + (32	2) + (32a).	(32e) =	6557.64	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) i	n kJ/m²K		Indica	tive Value	: Low		100	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	tion are not known p	precisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges: S (L x Y) calculated using A	ppendix K						12.91	(36)
if details of thermal bridging are not known (36) = $0.05 x$ (37)	31)		(22)	(00)				7,
Total fabric heat loss				(36) =	(2E) (E)	\	54.59	(37)
Ventilation heat loss calculated monthly	1 1 1 11	1 0	``		(25)m x (5)		1	
Jan Feb Mar Apr May	Jun Jul 16.03 16.03	Aug	Sep 16.46	Oct	Nov	17.96	1	(38)
	16.03 16.03	15.81	ļ	17.1	17.53	17.90	J	(50)
Heat transfer coefficient, W/K	70.00 70.00	70.44	1	= (37) + (1	70.55	1	
(39)m= 73.41 73.19 72.98 71.91 71.69	70.62 70.62	70.41	71.05	71.69	72.12	72.55	74.05	(30)
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) - http://wv	vw.stroma.com		,	-verage =	Sum(39)₁	12 / 1∠=	71.8 5 age	<u>2 of 87</u>

at ioss para	meter (F	HLP), W/	/m²K					(40)m	= (39)m ÷	(4)			
)m= 1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	0.99	1	1.01	1.02		
ımber of day	ıs in maı	oth (Tob	lo 1a)					,	Average =	Sum(40) ₁ .	12 /12=	1.01	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
,													·
. Water heat	ing ener	gy requi	irement:								kWh/ye	ar:	
sumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		28		(4
nual averag duce the annua more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed			se target o		3.35		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage ii	า litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	!		!			
)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
ergy content of	hot water	used - cal	culated m	onthly – 1	100 v Vd r	m v nm v [Tm / 3600			m(44) ₁₁₂ =		1060.23	(-
m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
144.13	120.03	130.06	113.4	100.01	93.9	07.01	99.00		l	m(45) ₁₁₂ =		1390.13	
stantaneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotal – ou	III(40)112 =	L	1000.10	`
)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(
ater storage		مالد ماد مالد		-1 \^	/\// IDC	_1							
orage volum	,		•			Ū		ame ves	sei		180		(
community herwise if no	•			•			` '	ers) ente	er '0' in (47)			
ater storage			. (o. o, o		,			
If manufact	urer's de	clared l	oss facto	or is kno	wn (kWh	n/day):				1	.2		(
mperature fa	actor fro	m Table	2b							0	.6		(
ergy lost fro		_	-				(48) x (49)) =		0.	72		(
If manufact t water store			-								0		(
community h	•			_ (,,,,,,	-77					<u> </u>		`
lume factor											0		(
mperature fa	actor fro	m Table	2b								0		(
ergy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(
nter (50) or (` ' `	,						,		0.	72		(
ater storage		culated f			T		((56)m = ((55) × (41)	m 	1	 		
	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(
		a solar sto	rage, (57)i	111 = (56)m	x [(50) – (птт)]÷(5	υ), eise (5					СП	
/linder contains			1	ı				1 040	1 22 22	1 040			
)m= 22.32 ylinder contains)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(
vlinder contains m= 22.32 mary circuit	20.16 loss (an	nual) fro	m Table	3	<u> </u>	ļ			22.32		0 22.32		(
/linder contains	20.16 loss (an	nual) fro culated f	m Table for each	3 month (59)m = ((58) ÷ 36	65 × (41)	ım			<u> </u>		

Comb:	laaa aa	ا مدامد ما	fo., o.o.	. حاد		(04)	(00	v . 20	CF (44)	١							
Ī		alculated		Cn	i		(60 T		· ` `	_		0		Τ ο		٦	(61)
(61)m=	0	0	0	ᆜ	0	0	Ļ	0	0	(22)		0	0	0 (40)	0		(01)
1		_		_			_			`	_		` 	``	`	+ (59)m + (61)m ¬	(62)
(62)m=	189.71	167.23	175.6		157.52	154.4		38.01	132.59	145		145.15	163.33		185.16		(62)
			_					-					r contrib	ution to wat	er heating))	
` I		al lines if		(S &			ap T		·	-		•				٦	(63)
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0	J	(63)
· 1		ater hea			457.50	4544	<u> </u>	20.04	1,00.50		40	145.45	100.00	170.05	1,05,40	7	
(64)m=	189.71	167.23	175.6	6	157.52	154.4	13	38.01	132.59	145		145.15	163.33		185.16		7(64)
									1					er (annual)		1926.82	(64)
Ĭ				Ť			_		- ` ´ 	r È	_	_	-``	n + (57)m	- ` ´	n] ¬	(0-1)
(65)m=	84.39	74.85	79.72		73	72.65	<u> </u>	6.51	65.4	69.		68.88	75.62		82.88		(65)
inclu	de (57)	m in calc	culatio	n o	f (65)m	only if o	ylir	nder i	s in the o	llewb	ing	or hot w	ater is	from com	munity	heating	
5. Int	ernal g	ains (see	Table	e 5	and 5a)):											
Metabo	olic gai	ns (Table	5), W	/atts	S				i				1		1	_	
	Jan	Feb	Ma	r	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m=	114	114	114		114	114	·	114	114	11	4	114	114	114	114		(66)
Lighting	g gains	(calcula	ted in	Apı	pendix I	L, equat	ion	L9 o	r L9a), a	lso s	ee T	Table 5				_	
(67)m=	17.88	15.88	12.92	2	9.78	7.31	6	6.17	6.67	8.6	67	11.63	14.77	17.24	18.38		(67)
Appliar	nces ga	ains (calc	ulated	l in	Append	dix L, eq	uat	ion L	13 or L1	3a),	also	see Tal	ble 5				
(68)m=	200.59	202.67	197.4	2	186.26	172.16	15	58.91	150.06	147	.98	153.23	164.39	178.49	191.74	7	(68)
Cookin	g gains	s (calcula	ited in	Ар	pendix	L, equa	tion	L15	or L15a)	, als	o se	e Table	5	-		_	
(69)m=	34.4	34.4	34.4		34.4	34.4	3	34.4	34.4	34	.4	34.4	34.4	34.4	34.4	7	(69)
Pumps	and fa	ıns gains	(Tabl	e 5	a)									•		_	
(70)m=	0	0	0		0	0		0	0	0)	0	0	0	0	7	(70)
Losses	e.g. e	vaporatio	n (ne	gati	ve valu	es) (Tab	le :	5)					•	-		_	
(71)m=	-91.2	-91.2	-91.2	2	-91.2	-91.2	-:	91.2	-91.2	-91	.2	-91.2	-91.2	-91.2	-91.2	7	(71)
Water l	heating	gains (T	able 5	. 5)					•	•				•	•	_	
(72)m=	113.42	111.38	107.1	5	101.38	97.64	9	2.38	87.9	93.	64	95.67	101.64	108.37	111.39	7	(72)
Total i	nterna	l gains =						(66))m + (67)m	1 + (68	3)m +	- (69)m + ((70)m +	(71)m + (72)m	_	
(73)m=	389.1	387.14	374.6	9	354.62	334.32	3′	14.66	301.83	307	.49	317.74	338	361.3	378.71	7	(73)
6. Sol	ar gain	s:															
Solar g	ains are	calculated	using s	olar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e applic	able orienta	tion.		
Orienta		Access F			Area			Flu				g_		FF		Gains	
		Table 6d			m²			Tal	ble 6a		Т	able 6b		Table 6c		(W)	
East	0.9x	0.77		x	5.7	′4	x	1	19.64	x		0.5	x	0.7	=	27.34	(76)
East	0.9x	0.77		x	5.7	4	x	3	88.42	x		0.5	x	0.7		53.49	(76)
East	0.9x	0.77		x	5.7	'4	x	6	3.27	x		0.5	x	0.7	=	88.09	(76)
East	0.9x	0.77		x	5.7	4	x	9	92.28	x		0.5	×	0.7		128.48	(76)
East	0.9x	0.77		x	5.7	'4	x	1	13.09	x		0.5	×	0.7	<u> </u>	157.45	(76)

	-								1							
East	0.9x	0.77	X	5.7	74	X	1	15.77	X		0.5	×	0.7	=	161.18	(76)
East	0.9x	0.77	Х	5.7	74	X	1	10.22	X		0.5	×	0.7	=	153.45	(76)
East	0.9x	0.77	X	5.7	' 4	X	9	94.68	X		0.5	X	0.7	=	131.81	(76)
East	0.9x	0.77	X	5.7	74	X	7	73.59	Х		0.5	X	0.7	=	102.45	(76)
East	0.9x	0.77	X	5.7	74	X	4	5.59	X		0.5	X	0.7	=	63.47	(76)
East	0.9x	0.77	X	5.7	74	X	2	24.49	X		0.5	X	0.7	=	34.09	(76)
East	0.9x	0.77	Х	5.7	74	X	1	6.15	X		0.5	X	0.7	=	22.49	(76)
West	0.9x	0.77	X	13.	09	X	1	9.64	X		0.5	X	0.7	=	62.36	(80)
West	0.9x	0.77	X	13.	09	X	3	88.42	X		0.5	X	0.7	=	121.98	(80)
West	0.9x	0.77	X	13.	09	X	6	3.27	x		0.5	X	0.7	=	200.89	(80)
West	0.9x	0.77	X	13.	09	X	9	2.28	x		0.5	x	0.7	=	292.99	(80)
West	0.9x	0.77	X	13.	09	X	1	13.09	x		0.5	x	0.7	=	359.07	(80)
West	0.9x	0.77	Х	13.	09	X	1	15.77	x		0.5	x	0.7	=	367.57	(80)
West	0.9x	0.77	Х	13.	09	X	1	10.22	x		0.5	x	0.7	=	349.94	(80)
West	0.9x	0.77	х	13.	09	X	9	94.68	X		0.5	x	0.7	=	300.59	(80)
West	0.9x	0.77	X	13.	09	X	7	'3.59	x		0.5	x	0.7	=	233.64	(80)
West	0.9x	0.77	X	13.	09	X	4	15.59	x		0.5	x	0.7	=	144.74	(80)
West	0.9x	0.77	X	13.	09	X	2	24.49	x		0.5	x	0.7	=	77.75	(80)
West	0.9x	0.77	x	13.	09	X	1	6.15	x		0.5	x	0.7	=	51.28	(80)
_		watts, ca				$\overline{}$			Ė		n(74)m .				7	
(83)m=	89.7	175.47	288.98	421.46	516.52		28.75	503.39	432	.41	336.1	208.22	111.85	73.77		(83)
•		nternal a		<u> </u>	<u> </u>	, `							1 .== .=		7	(0.4)
(84)m=	478.8	562.61	663.67	776.09	850.84	1 8	43.41	805.22	739	.89	653.83	546.22	473.15	452.48		(84)
		nal temp		`												
•		during h	٠.			Ŭ			ole 9	, Th1	(°C)				21	(85)
Utilisa		tor for g		T		n (s							_	1	7	
	Jan	Feb	Mar	Apr	May	_	Jun	Jul	 	ug	Sep	Oct	Nov	Dec	4	()
(86)m=	0.95	0.93	0.88	0.78	0.64		0.49	0.37	0.4	11	0.63	0.84	0.93	0.96		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)		_		_	
(87)m=	18.99	19.29	19.76	20.3	20.69]	20.9	20.97	20.	95	20.79	20.25	19.53	18.94		(87)
Temp	erature	during h	eating p	periods i	n rest of	dw	elling	from Ta	able 9	9, Th2	2 (°C)					
(88)m=	20.06	20.06	20.07	20.08	20.08	2	20.09	20.09	20	.1	20.09	20.08	20.08	20.07		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2.	,m (se	ee Table	9a)	-				-	_	
(89)m=	0.95	0.92	0.86	0.75	0.6	_	0.43	0.3	0.3	34	0.57	0.81	0.92	0.96]	(89)
Mean	interna	l temper	ature in	the rest	of dwel	lina	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)	•		_	
(90)m=	17.37	17.8	18.47	19.23	19.74	T	20	20.07	20.	- 1	19.88	19.17	18.15	17.31	7	(90)
		<u>!</u>		!	<u> </u>			<u> </u>			f	LA = Liv	ing area ÷ (4	4) =	0.5	(91)
Maas	intorno	l tompor	aturo (fo	or the wh	مام طبید	منالد	a) – ti	ΙΛ ω Τ 4	 / 4	fl_^	ر To					
(92)m=	18.19	l temper	19.12	19.77	20.22	_	9) = 11 20.45	20.52	20.		20.34	19.72	18.85	18.13	1	(92)
		nent to t		1	<u> </u>	1							1 10.00	1 .0.10	J	(02)
, ipply	aajaoti		moui		c.npc	· att	0 110		0,		c appic	pilato				

4			l	T	l	T	T	l			l			(00)
(93)m=	18.19	18.55	19.12	19.77	20.22	20.45	20.52	20.51	20.34	19.72	18.85	18.13		(93)
			uirement			! 4 4	44 -£	Table O	41	4 T: (70)	-ll-	ulata	
				nperatui using Ta		ned at sto	ер 11 от	i abie 9i	o, so tna	t 11,m=(76)m an	d re-caid	sulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	<u> </u>	,			19						
(94)m=	0.93	0.9	0.84	0.74	0.61	0.46	0.33	0.37	0.59	0.8	0.91	0.94		(94)
Usefu	ıl gains,	hmGm	, W = (9	4)m x (8	4)m		I	I						
(95)m=	446.42	507.36	560.18	576.03	517.51	384.39	268.39	277.35	382.83	438.15	428.24	425.38		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able 8	•	•	•		•			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1019.57	998.96	920.8	781.76	610.58	413.4	277.01	289.51	443.22	653.52	847.09	1010.79		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	426.43	330.36	268.3	148.12	69.25	0	0	0	0	160.24	301.57	435.54		
								Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2139.81	(98)
Space	e heating	g require	ement in	kWh/m²	²/year								29.96	(99)
8c Si	nace cod	olina rec	uiremer	nt	•									
				August.	See Ta	ble 10b								
Oulou	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat			<u> </u>	<u> </u>	<u> </u>	rnal tem			<u> </u>		<u> </u>			
(100)m=		0	0	0	0	663.86	522.61	535.11	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm		<u>I</u>					<u> </u>				
(101)m=	0	0	0	0	0	0.88	0.92	0.9	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	(101)m)	!	!			!			
(102)m=	0	0	0	0	0	586.49	481.71	483.6	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		•			
(103)m=	0	0	0	0	0	1059.57	1013.49	938.14	0	0	0	0		(103)
						dwelling,	continu	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
•				3 × (98	Í				ı					
(104)m=	0	0	0	0	0	340.62	395.64	338.18	0	0	0	0		_
01	l f !									= Sum(=	1074.45	(104)
	d fraction		able 10b	`					1 C =	coolea	area ÷ (4	+) =	0.86	(105)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)=	Ů					0.20	0.20	0.20		 = Sum(=	0	(106)
Space	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)r	n	rotai	– Garri	16087)	_	U	(100)
(107)m=		0	0	0	0	73.52	85.39	72.99	0	0	0	0		
				l			l	l	L Total	= Sum(107)	=	231.9	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear					· · + (4) =	,		3.25	(108)
		•				cchame			(107)	, . (¬) -			5.20	
				· ·	Ĭ	scheme		ling pro-	idod by	0.0000	unitu aal	omo		
						ing or wannentary l					uriity SCf	ieme.	0	(301)
	-			_		_	_		,	-				_
Fractio	iii or spa	ice neat	ILOLU CO	mmunity	system	1 – (30	1)=						1	(302)

The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community heat pump		our other heat sources; th	e latter	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commun	ity heating system	Γ	1	(305)
Distribution loss factor (Table 12c) for community heating system		<u> </u>	1.05	(306)
Space heating		_	kWh/year	
Annual space heating requirement			2139.81	
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	2246.8	(307a)
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		[1926.82	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2023.16	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] =	42.7	(313)
Cooling System Energy Efficiency Ratio		Ī	6.59	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	35.2	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		161.41	(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	o) + (330g) =	161.41	(331)
Energy for lighting (calculated in Appendix L)			315.81	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-482.91	(333)
Electricity generated by wind turbine (Appendix M) (negative quar	ntity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	two fuels repeat (363) to	(366) for the second fuel	289	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.52	766.82	(367)
Electrical energy for heat distribution [(3	313) x	0.52	22.16	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372) =	788.98	(373)
CO2 associated with space heating (secondary) (3	09) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		788.98	(376)
CO2 associated with space cooling (3	15) x	0.52	18.27	(377)

CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 83.77 CO2 associated with electricity for lighting (379) (332))) x 0.52 163.91 Energy saving/generation technologies (333) to (334) as applicable x 0.01 = Item 1 (380) -250.63 0.52 sum of (376)...(382) = Total CO2, kg/year (383)804.3 **Dwelling CO2 Emission Rate** $(383) \div (4) =$ (384) 11.26 El rating (section 14) (385)90.74

			l loor [Details:									
A	1: 1 0		User L					OTDO	205000				
Assessor Name:	Lindsey Ar				a Num				035000				
Software Name:	Stroma FS	AP 2012			are Ve			versio	n: 1.0.5.9				
			Property		: Flat 13								
Address :		Aldrington Ro	oad, SW16	5 1TW									
1. Overall dwelling dime	ensions:												
			Are	a(m²)	1	Av. He	eight(m)		Volume(m ³	<u> </u>			
Ground floor				71.42	(1a) x	2	2.85	(2a) =	203.55	(3a)			
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+	(1n)	71.42	(4)								
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	203.55	(5)			
2. Ventilation rate:				_									
	main heating	second heatin		other		total			m³ per hou	ır			
Number of chimneys	0	+ 0	+	0	│ 	0	X	40 =	0	(6a)			
Number of open flues	0	(6b)											
Number of intermittent fa	30	(7a)											
Number of passive vents	0	(7b)											
Number of flueless gas f	Number of flueless gas fires 0 x 40 =												
								Air ch	anges per ho	our			
Infiltration due to chimne	ys, flues and fa	ans = (6a) + (6b))+(7a)+(7b)+	(7c) =		30		÷ (5) =	0.15	(8)			
If a pressurisation test has t			ceed to (17),	otherwise	continue fr	om (9) to	(16)			_			
Number of storeys in t	he dwelling (ns	s)							0	(9)			
Additional infiltration							[(9))-1]x0.1 =	0	(10)			
Structural infiltration: 0					•	ruction			0	(11)			
if both types of wall are p deducting areas of openi			g to the grea	ter wall are	ea (after								
If suspended wooden	floor, enter 0.2	(unsealed) o	r 0.1 (seal	ed), else	enter 0				0	(12)			
If no draught lobby, en	iter 0.05, else	enter 0							0	(13)			
Percentage of window	s and doors dr	aught strippe	d						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,	q50, expresse	ed in cubic me	tres per h	our per s	quare m	etre of e	envelope	area	5	(17)			
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$]+(8), otherw	vise (18) =	(16)				0.4	(18)			
Air permeability value applie	es if a pressurisation	on test has been	done or a de	gree air pe	rmeability	is being u	ısed			` ′			
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) =				0.34	(21)			
Infiltration rate modified	for monthly win	nd speed							•				
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp	eed from Tabl	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 <i>∸</i> 4												
(00)	-/··· · ·	1.09 0.00	- 1 0 05	T 0.02	Γ.	1 4 00	1 440	1 4 4 0	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

djusted infilt	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m				ī	
0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
<i>alculate effe If mechanic</i>		•	rate for t	he appli	cable ca	se							
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N5)) . othe	wise (23h) = (23a)			0	
If balanced wit		0 11		, ,	,	. ,	,, .	`	,, = (20 0)			0	
		-	-	_					Oh)m ı (22h) v [1 (220)	. 1001	
a) If balance			0	0	0		1 (24a	0	0	23b) x [0	- 100]	
b) If balance	<u> </u>	<u> </u>			<u> </u>								
1b) II balarici			0	0	0	0	0 0	0	0	0	0		
c) If whole h		<u> </u>			<u> </u>								
,					•		c) = (22k		.5 x (23h	o)			
lc)m= 0	0	0	0	0	0	0	0	0	0	0	0		
d) If natural	ventilatio	n or wh	ole hous	L nositiv	/e input	L ventilati	on from I	oft			<u>Į</u>	l	
,				•	•		0.5 + [(2		0.5]				
ld)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	ld) in box	(25)	-	-		•	
5)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		
. Heat losse	e and he	at loss i	naramet	or:									
LEMENT	Gros		Openin		Net Ar	ea	U-valı	ıe	ΑXU		k-value)	АХ
	area	(m ²)	· m		A ,r	n²	W/m2	K	(W/	K)	kJ/m²·l	<	kJ/K
oors					2.12	X	1	=	2.12				
indows Typ	e 1				4.8	x1	/[1/(1.4)+	0.04] =	6.36				
ndows Typ	e 2				10.94	, х1	/[1/(1.4)+	0.04] =	14.5				
oor					71.42	<u>x</u>	0.13	=	9.28459	9			
alls Type1	60.2	25	15.7	4	44.51	x	0.18	=	8.01	Ħ i		7 F	
alls Type2	10.5	57	2.12		8.45	x	0.18		1.52	F i		7 7	
alls Type3	7.8		0		7.84	x	0.18	= :	1.41	=		=	
tal area of					150.0	_							
arty wall	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,			19.66	=	0		0			- г	
or windows and	d roof wind	OWS USE 6	effective wi	ndow I I-va						 as aiven in	naragrant		
include the are						atou uom	g romaia n	I(170 vaic	10) 10.0-1] 0	io givoii iii	paragrapi	0.2	
bric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				43.2	22
eat capacity	Cm = S	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	6600).9
nermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250)
r design asses	sments wh	ere the de	tails of the	construct	ion are no	t known p	recisely the	indicative	e values of	TMP in T	able 1f		
n be used inste						,							
ermal bridg	,	,			•	`						11.7	7
letails of therm Ital fabric he		are not kn	own (36) =	= <i>0.05 x (</i> 3	77)			(33) +	· (36) =			EAC	10
entilation he		alculated	l monthly	/					0.33×0	25)m × (5)	54.9	, U
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
39.81	39.57	39.34	38.22	38.01	37.04	37.04	36.86	37.42	38.01	38.43	38.88		
·	ļ	<u> </u>			L 57.55	L 37.04	1 30.00			<u> </u>	1 30.00		
		at 1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/						1.30/w	- 1371 ± 1	381m			
eat transfer 9)m= 94.8	94.55	94.32	93.2	93	92.03	92.03	91.85	92.4	93	93.42	93.86		

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.33	1.32	1.32	1.31	1.3	1.29	1.29	1.29	1.29	1.3	1.31	1.31		
()										Sum(40) ₁ .		1.3	(40)
Number of day	s in mo	nth (Tabl	le 1a)							(),	L		`
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 best	ing one	rav roqui	romonti								Is\A/b/ye	or.	
4. Water heat	ing ene	rgy requi	rement.								kWh/ye	al.	
Assumed occur if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		28		(42)
Annual averag									se target o		.35		(43)
not more that 125	_		•		-	-	o acmeve	a water us	se larger o	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Διια	Sep	Oct	Nov	Dec		
Hot water usage in			Apr ach month				Aug (43)	Sep	l Oct	INOV	Dec		
	,						, ,	00.50	00.40	00.05	07.40		
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19	1000.00	7(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	1060.23	(44)
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
(40)111= 144.10	120.00	100.00	110.4	100.01	33.3	07.01	33.03			m(45) ₁₁₂ =		1390.13	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	III(45) ₁₁₂ =	- l	1390.13	(43)
(46)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Water storage		10.01	17.01	10.02	14.00	10.00	14.00	10.10	17.00	10.20	20.04		(10)
Storage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	ınd no ta	nk in dw	velling, e	nter 110	litres in	(47)				·		
Otherwise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	55		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	84		(50)
b) If manufact			-										
Hot water stora	-			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h Volume factor	•		on 4.3										(50)
Temperature fa			2h							—	0		(52) (53)
·							(47) (54)) (5 0) (50)		0		
Energy lost fro Enter (50) or (_	, KVVN/ye	ear			(47) X (51)) x (52) x (53) =	-	0		(54)
, ,		,					((50) (FE) (44)		0.	84		(55)
Water storage	ioss cai	culated t	or eacn	montn			((56)M = (55) × (41)ı	m 				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	x H	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (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	loop o	alaulatad	for one	h month	(61)m –	(60) · 3	DGE v. (41	\m							
(61)m=	0	alculated 0	0	0	0 0	00) + 3	000 x (41	0	T	0	0	0	0]	(61)
L			<u> </u>			<u> </u>		<u> </u>	n = 0 a		<u> </u>	<u> </u>	<u> </u>	J (59)m + (61)m	
(62)m=	193.37	. 	179.32		158.06	141.55		149.		48.69	166.99	176.19	188.82]	(62)
Solar DH	IW input	calculated	using Ap	pendix G o	r Appendix	: H (nega	tive quantit	y) (ente	er 'O' if n	no sola	r contribut	ion to wate	er heating)	l	
(add ad	dition	al lines if	FGHRS	and/or \	NWHRS	applie	s, see Ap	pend	ix G)						
(63)m=	0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output	from v	vater hea	ter		-	-	-		-		-	-	-		
(64)m=	193.37	170.53	179.32	161.06	158.06	141.55	136.25	149.	09 14	48.69	166.99	176.19	188.82		_
								(Output f	from wa	ater heate	r (annual) ₁	112	1969.92	(64)
Heat g	ains fro	om water	heating	j, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	1 + (6	1)m] +	0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	87.32	77.49	82.64	75.83	75.57	69.34	68.32	72.5	9 7	1.72	78.55	80.86	85.8		(65)
inclu	de (57)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwelli	ng or	hot w	ater is fi	rom com	munity h	neating	
5. Inte	ernal g	ains (see	Table	5 and 5a):										
Metabo	olic gai	ns (Table	5), Wa	itts											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(66)m=	114	114	114	114	114	114	114	114	1	114	114	114	114		(66)
Lighting	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso se	ee Tal	ole 5			_		
(67)m=	17.89	15.89	12.92	9.78	7.31	6.17	6.67	8.6	7 1	1.64	14.78	17.25	18.38		(67)
Appliar	nces ga	ains (calc	ulated i	n Appen	dix L, eq	uation I	_13 or L1	3a), a	ilso se	ee Tal	ble 5			_	
(68)m=	200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.	98 1	53.23	164.39	178.49	191.74		(68)
Cookin	g gain	s (calcula	ted in A	Appendix	L, equa	ion L15	or L15a), also	see	Table	5			_	
(69)m=	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	4 3	34.4	34.4	34.4	34.4		(69)
Pumps	and fa	ans gains	(Table	5a)										-	
(70)m=	3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses	e.g. e	vaporatio	n (nega	ative valu	es) (Tab	le 5)								_	
(71)m=	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.	2 -	91.2	-91.2	-91.2	-91.2		(71)
Water I	neating	g gains (T	able 5)									-	-		
(72)m=	117.36	115.32	111.08	105.32	101.58	96.31	91.83	97.5	7 9	9.61	105.57	112.31	115.33		(72)
Total i	nterna	l gains =	l			(60	6)m + (67)n	n + (68))m + (6	9)m + ((70)m + (7	(1)m + (72))m		
(73)m=	396.04	394.08	381.63	361.56	341.25	321.6	308.77	314.	42 32	24.68	344.94	368.24	385.65		(73)
6. Sol	Ť														
_		calculated	_					ations to			e applicat		tion.		
Orienta	ition:	Access F Table 6d		Area m²			ux able 6a		g₋ Tab	_ le 6b	т	FF able 6c		Gains (W)	
Foot								1 [. ,	7,
East	0.9x		,			X _	19.64] X [] [.63	_	0.7	=	28.81	(76)
East	0.9x	0.77	,			X	38.42	X [.63		0.7	=	56.36	 (76) (70)
East	0.9x	0.77	,			-	63.27] X [.63		0.7	=	92.82	 (76) (70)
East	0.9x		,			=	92.28] X [] [.63	_	0.7	=	135.37	(76)
East	0.9x	0.77)	4.	8	X	113.09	X	0.	.63	X	0.7	=	165.9	(76)

	_								_		_				
East	0.9x	0.77	X	4.	8	X	1	15.77	X	0.63	X	0.7	=	169.83	(76)
East	0.9x	0.77	Х	4.	8	X	1	10.22	X	0.63	X	0.7	=	161.68	(76)
East	0.9x	0.77	Х	4.	8	X	9	94.68	X	0.63	X	0.7	=	138.88	(76)
East	0.9x	0.77	X	4.	8	X	7	'3.59	X	0.63	X	0.7	=	107.95	(76)
East	0.9x	0.77	Х	4.	8	X	4	5.59	X	0.63	X	0.7	=	66.88	(76)
East	0.9x	0.77	Х	4.	8	X	2	24.49	X	0.63	X	0.7	=	35.92	(76)
East	0.9x	0.77	Х	4.	8	X	1	6.15	X	0.63	X	0.7	=	23.69	(76)
West	0.9x	0.77	X	10	94	X	1	9.64	X	0.63	X	0.7	=	65.67	(80)
West	0.9x	0.77	Х	10	94	X	3	88.42	X	0.63	X	0.7	=	128.46	(80)
West	0.9x	0.77	х	10	94	X	6	3.27	X	0.63	X	0.7	=	211.55	(80)
West	0.9x	0.77	X	10	94	X	9	2.28	X	0.63	X	0.7	=	308.53	(80)
West	0.9x	0.77	X	10	94	X	1	13.09	X	0.63	X	0.7	=	378.11	(80)
West	0.9x	0.77	X	10	94	X	1	15.77	X	0.63	X	0.7	=	387.07	(80)
West	0.9x	0.77	X	10	94	X	1	10.22	X	0.63	X	0.7	=	368.5	(80)
West	0.9x	0.77	X	10.	94	X	9	94.68	X	0.63	X	0.7	=	316.54	(80)
West	0.9x	0.77	X	10	94	X	7	'3.59	X	0.63	x	0.7	=	246.04	(80)
West	0.9x	0.77	X	10.	94	X	4	15.59	X	0.63	x	0.7	_ =	152.42	(80)
West	0.9x	0.77	X	10	94	X	2	24.49	X	0.63	X	0.7	=	81.88	(80)
West	0.9x	0.77	X	10	94	X	1	6.15	X	0.63	x	0.7	_ =	54	(80)
0.5% 0.77															
Solar g	ains in	watts, ca	alculate	d for eac	h mont	h_			(83)m	n = Sum(74)m	(82)m			-	
(83)m=	94.48	184.82	304.37	443.9	544.02		556.9	530.19	455	.42 353.99	219.3	117.8	77.69		(83)
Total g	ains – i	nternal a	nd sola	r (84)m :	= (73)m	+ (83)m	, watts						-	
(84)m=	490.51	578.89	685.99	805.46	885.27	. 8	378.5	838.96	769	.85 678.67	564.2	4 486.04	463.35]	(84)
7. Me	an intei	nal temp	erature	(heating	seaso	n)									
Temp	erature	during h	eating p	periods i	n the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May	<u>' </u>	Jun	Jul	А	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.81		0.63	0.47	0.5	0.79	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	19.61	19.79	20.11	20.51	20.81	2	20.96	20.99	20.	98 20.87	20.46	19.96	19.58]	(87)
Temp	erature	during h	eating	periods i	n rest o	f dw	/elling	from Ta	able 9	9, Th2 (°C)		-		_	
(88)m=	19.82	19.82	19.82	19.84	19.84	_	19.85	19.85	19.		19.84	19.83	19.83]	(88)
ı L İtilisə	tion fac	tor for g	ains for	rest of d	welling	h2	m (se	e Table	. 0a)	· · · · · ·		<u> </u>	l	4	
(89)m=	1	0.99	0.97	0.9	0.75	_	0.53	0.35	0.4	1 0.71	0.94	0.99	1	1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)															
(90)m=	17.99	18.26	18.72	19.29	19.67	Ť	12 (II 19.82	19.85	19.	i	19.23	18.51	17.95	1	(90)
(50)111-	11.33	10.20	10.72	10.29	15.07			1 10.00	1 19.		<u>. </u>	/ing area ÷ (0.5	(91)
												.5 2.00 . (,	0.5	(31)
r				1		$\overline{}$		i e		– fLA) × T2	1	. 1		1	155
(92)m=	18.8	19.03	19.42	19.91	20.24		20.39	20.42	20.		19.85		18.77	J	(92)
Apply	adjustr	nent to th	ne meai	n interna	ı tempe	eratu	ire tro	m rable	40,	where appr	opriate	!			

(00)	40.0	10.02	40.40	40.04	20.04	20.20	20.42	00.40	20.22	40.05	10.04	40.77		(93)
(93)m=	18.8	19.03	19.42	19.91	20.24	20.39	20.42	20.42	20.32	19.85	19.24	18.77		(93)
			uirement				44 -4	Table O	41	4 T: /	70\	-11-	lata	
			or gains	•		ed at ste	ер ттог	rable 9i	b, so tha	t 11,m=(rojin an	d re-caid	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	1:			,	,				1	ı	
(94)m=	0.99	0.99	0.97	0.9	0.77	0.58	0.41	0.47	0.75	0.94	0.99	1		(94)
Usefu			W = (94)				ı	,			ı	ı	ı	
(95)m=		571.19	662.49	727.45	684.34	510.68	348.07	362.57	506.56	532.77	480.06	461.05		(95)
	nly aver	age exte	rnal tem	perature			•	,					ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			i				-``	- ` 	– (96)m				ı	
	1374.83		1218.7	1025.75	794.52	533.21	351.87	369.22	574.49	860	1133.99	1367.55		(97)
Space		<u> </u>	ı	i	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	 	1	ı	
(98)m=	660.24	514.07	413.82	214.78	81.97	0	0	0	0	243.46	470.83	674.44		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3273.61	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								45.84	(99)
9a En	erav rea	wiremer	nts — Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					
	e heatir		no ma	Madain	oainig oʻ	y otorno r	rioraanig	, moro c)					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
	•					,	•	(202) = 1	- (201) =				1	(202)
Fraction of space heat from main system(s) $ (202) = 1 - (201) = $ Fraction of total heating from main system 1 $ (204) = (202) \times [1 - (203)] = $													1	(204)
			ace heat	-				(-) (- / [(/]			93.5	(206)
	•	-	ry/suppl			n evetam	n %						0	(208)
Lillon						-			Can	0-4	Nav	Daa	_	」` ′
Snac	Jan	Feb	Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Opac	660.24	514.07	413.82	214.78	81.97	0	0	0	0	243.46	470.83	674.44		
(044)			<u> </u>			Ů			Ŭ	240.40	470.00	074.44		(0.1.1)
(211)n			(4)] } x 1			0		Ι ο		200 20	502.57	704.00		(211)
	706.14	549.81	442.59	229.71	87.67	0	0	O Tota	0 II (kWh/yea	260.39	503.57	721.32		7(044)
_								Tota	ii (KVVII/yea	ar) =3urri(2	2 1) _{15,1012}		3501.19	(211)
•		`	econdar	• , .	month									
			00 ÷ (20		0	0		Ι ο			0	0		
(215)m=	0	0	0	0	0	0	0	O Tota	0 II (kWh/yea	0	_	0		7(045)
								TOTA	ii (KVVII/yea	ar) =Surri(2	213) _{15,1012}	F	0	(215)
	heating													
Output	193.37	ater hea 170.53	ter (calc 179.32	161.06	158.06	141.55	136.25	149.09	148.69	166.99	176.19	188.82		
Efficio		ater hea		101.00	130.00	141.55	130.23	149.09	148.09	100.99	170.19	100.02	70.0	(216)
				05.50	00.40	70.0	70.0	70.0	70.0	05.00	07.04	07.00	79.8	┙
(217)m=		87.57	86.97	85.58	83.16	79.8	79.8	79.8	79.8	85.82	87.31	87.92		(217)
		•	kWh/mo (217) ÷ (
	220.16	194.73	206.17	188.19	190.07	177.38	170.74	186.83	186.33	194.59	201.79	214.76		
•			I	I				<u> </u>	l = Sum(2		l .		2331.74	(219)
Annus	al totals								•		Wh/year	•	kWh/year	١١٠٠/
		fuel use	ed, main	system	1					IX.	, 		3501.19	7
•	J			-									<u> </u>	_

					_
Water heating fuel used				2331.74	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sur	n of (230a)(230g) =		75	(231)
Electricity for lighting				315.9	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CH	P			
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	756.26	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	503.66	(264)
Space and water heating	(261) + (262) + (263) +	(264) =		1259.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	163.95	(268)
Total CO2, kg/year		sum of (265)(271) =		1462.79	(272)

TER =

30.18

(273)

		User	Details:										
Assessor Name:	Lindsey Arnott		Stroma	Numl	her:		STRO	035000					
Software Name:	Stroma FSAP 201	12	Softwa					n: 1.0.5.9					
			/ Address:		010111								
Address :	The Alders, Aldring	•											
1. Overall dwelling dime		·											
		Ar	ea(m²)		Av. Hei	ght(m)		Volume(m ³	3)				
Ground floor			71.42	1a) x	2.	85	(2a) =	203.55	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	71.42	4)									
Dwelling volume				(3a)+(3b)	+(3c)+(3d))+(3e)+	(3n) =	203.55	(5)				
2. Ventilation rate:							L						
2. Voltalation fato.		econdary	other		total			m³ per hou	ır				
Number of chimneys	heating h	neating +	0	= [0	X	40 =	0	(6a)				
Number of open flues	0 +	0 +	0	=	0	x:	20 =	0	(6b)				
Number of intermittent fa	ans			F	0	x	10 =	0	(7a)				
Number of passive vents	8			F	0	x	10 = [0	(7b)				
·	lumber of flueless gas fires												
Trainibor of hadrood gad i	L	0	(7c)										
							Air ch	anges per ho	our				
Infiltration due to chimne	evs. flues and fans = (6	6a)+(6b)+(7a)+(7b)	+(7c) =		0	_	÷ (5) =	0	(8)				
If a pressurisation test has I				ntinue fro			. (6)		(0)				
Number of storeys in t	he dwelling (ns)							0	(9)				
Additional infiltration						[(9)	-1]x0.1 =	0	(10)				
Structural infiltration: 0	0.25 for steel or timber	frame or 0.35 f	or masonry	constru	uction			0	(11)				
	present, use the value corres	sponding to the gre	ater wall area	(after									
deducting areas of open	floor, enter 0.2 (unsea	led) or 0.1 (sea	ıled) else e	nter 0			[0	(12)				
If no draught lobby, er	•	, 0. 0 (000	,,					0	(13)				
Percentage of window		tripped					[0	(14)				
Window infiltration			0.25 - [0.2 x	(14) ÷ 10	00] =		[0	(15)				
Infiltration rate			(8) + (10) +	(11) + (1)	2) + (13) +	- (15) =	[0	(16)				
Air permeability value,	q50, expressed in cub	oic metres per l	nour per sq	uare me	etre of e	nvelope	area	3	(17)				
If based on air permeabi		•				•		0.15	(18)				
Air permeability value appli	es if a pressurisation test ha	s been done or a c	legree air pern	neability i	s being us	ed	L		` ′				
Number of sides sheltered	ed							1	(19)				
Shelter factor			(20) = 1 - [0	.075 x (1	9)] =			0.92	(20)				
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.14	(21)				
Infiltration rate modified	for monthly wind speed	t e					, ,						
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	(∠)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 infiltration rate (allowing for sh	elter and wind s	need) = (21a) x	(22a)m					
0.18 0.17 0.17 0.15	0.15 0.13	0.13 0.13	0.14	0.15	0.16	0.16		
Calculate effective air change rate for the		l I	1 -					
If mechanical ventilation:							0.5	(23a)
If exhaust air heat pump using Appendix N, (23				= (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in %	allowing for in-use fa	actor (from Table 4	n) =				76.5	(23c)
a) If balanced mechanical ventilation		, , ,	 	, ,		``	÷ 100]	
(24a)m= 0.29 0.29 0.29 0.27	0.27 0.25	0.25 0.25	0.26	0.27	0.27	0.28		(24a)
b) If balanced mechanical ventilation		, , , , , , , , , , , , , , , , , , ,	 	, ,		1	1	
(24b)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation of 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 hous if (22b)m = 1, then (24d)m = (22b)				0.5]		-		
(24d)m= 0 0 0 0	0 0	0 0	0	0	0	0		(24d)
Effective air change rate - enter (24a)	or (24b) or (24c	c) or (24d) in bo	x (25)				•	
(25)m= 0.29 0.29 0.29 0.27	0.27 0.25	0.25 0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losses and heat loss parameter	ar.							
ELEMENT Gross Opening area (m²)	gs Net Are			A X U (W/I		k-value kJ/m²-l		X k /K
Doors Type 1	2.68	x 1		2.68	$\stackrel{\prime}{\Box}$			(26)
Doors Type 2	2.74	X 1	≓ ₌ i	2.74	=			(26)
Windows Type 1	4.16	x1/[1/(1.3)·		5.14	=			(27)
Windows Type 2	6.05		ــا = [0.04+	7.48	=			(27)
Windows Type 3	2.85	x1/[1/(1.3)-	ــا آ ₌ [0.04+	3.52	=			(27)
Floor	71.42	x 0.11		7.8562	=			(28)
Walls Type1 79.91 18.48		= ==	=	9.21	-			(29)
Walls Type 2 18.41 0	18.41	= ==		2.43	룩 ;			(29)
Total area of elements, m ²	169.74	= -		2.40				(31)
* for windows and roof windows, use effective wir ** include the areas on both sides of internal walls	ndow U-value calcula		1/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	(01)
Fabric heat loss, W/K = S (A x U)	o arra paranorio	(26)(30	0) + (32) =				41.06	(33)
Heat capacity Cm = S(A x k)			((28)	.(30) + (32	2) + (32a).	(32e) =	8973.96	(34)
Thermal mass parameter (TMP = Cm ÷	TFA) in kJ/m²K		Indicat	ive Value	: Low		100	(35)
For design assessments where the details of the can be used instead of a detailed calculation.	construction are not	known precisely th	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges : S (L x Y) calculated u	ısing Appendix K	(12.3	(36)
if details of thermal bridging are not known (36) =	0.05 x (31)							_
Total fabric heat loss			(33) +				53.36	(37)
Ventilation heat loss calculated monthly	1	.,	1 ` ´ 1		25)m x (5)		1	
Jan Feb Mar Apr	May Jun	Jul Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 19.78 19.54 19.31 18.14	17.91 16.75	16.75 16.51	17.21	17.91	18.38	18.84		(38)
Heat transfer coefficient, W/K		1	1 1	= (37) + (3		1	1	
(39)m= 73.14 72.91 72.67 71.51	71.27 70.11	70.11 69.88	70.58	71.27	71.74	72.21		7(00)
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) -	http://www.stroma.c	com	A	verage =	Sum(39) ₁	12 /12=	71.4 5 age	2 of 8 ⁽¹⁾

Heat loss para	ımeter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.02	1.02	1.02	1	1	0.98	0.98	0.98	0.99	1	1	1.01		
							ı	,	Average =	Sum(40) ₁ .	12 /12=	1	(40)
Number of day	1	nth (Tab	le 1a)	1	ı	1		ı		i			
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	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 226	1 20.	1	**		
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
	<u>!</u>	!		!	ļ.	!	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1060.23	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
If instantaneous u	votor booti	na at naint	of upo /pr	a hat water	r otorogol	ontor O in	haves (46		Total = Su	m(45) ₁₁₂ =	-	1390.13	(45)
If instantaneous w			,		, , , , , , , , , , , , , , , , , , ,		, ,	, , , I		1	i I		(40)
(46)m= 21.62 Water storage	18.91 loss:	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Storage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	neating a	and no ta	nk in dw	velling, e	nter 110) litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1	.2		(48)
Temperature f										0	.6		(49)
Energy lost fro		_	-		or io not		(48) x (49)) =		0.	72		(50)
b) If manufactHot water store			-								0		(51)
If community h	-			((((((((((((((((((((,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-,,					<u> </u>		(= -)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	72		(55)
Water storage	loss cal	culated f	or each	month	_	_	((56)m = ((55) × (41)	m	_			
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61)m = (60) - 365 x (41)m = (60) - 80	Oznaki Izaz zal		f l		(04)	(00) - 0	DE (44)							
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 88.71		r			,	,	· ` `		Ι ,	Ι ,	Ι ,		1	(61)
(62) (62) (62) (62) (62) (62) (62) (62) (63)		!	ļ						<u> </u>		<u> </u>	<u> </u>	(50)	(01)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter for if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)								<u> </u>		` 	` 	`	(59)m + (61)m I	(00)
Company Comp	` ′						<u> </u>							(62)
Compute Comp										r contribut	ion to wate	er heating)		
Output from water heater (64)me	`						· ·		ŕ –		Ι ο		I	(62)
189.71 167.23 175.66 157.52 154.4 138.01 132.59 145.43 145.15 163.33 172.65 185.16				U	0	U	0	U	0		0	0		(03)
Heat gains from water heating, kWh/month 0.25				457.50	454.4	420.04	422.50	4.45.40	14545	400.00	470.05	405.40	1	
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m 84.39 74.85 79.72 73 72.65 66.51 65.4 69.66 68.88 75.62 78.03 82.88 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating S. Internal gains (see Table 5 and 5a):	(64)m= 189.71	167.23	1/5.00	157.52	154.4	138.01	132.59		L		ļ		1026.82	1(64)
Common Section Secti	Hartaria (con		b C	1.14/1. /	(1 - 0 - 0)	- / [0 05	(45)							(04)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			r				r		i e	1	i -	ı —]	(CE)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 114 11	` '								ļ		ļ			(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 114 114 114 114 114 114 114 114 114 11	include (57)n	n in calc	ulation o	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	5. Internal ga	ins (see	Table 5	and 5a):									
Color 114	Metabolic gains	s (Table	5), Watt	ts									•	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)= 18.22	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(67)m=	(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 200.59 202.67 197.42 186.26 172.16 158.91 150.06 147.98 153.23 164.39 178.49 191.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 3	Lighting gains ((calculat	ed in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(68)m= 200.59 202.67 197.42 186.26 172.16 158.91 150.06 147.98 153.23 164.39 178.49 191.74 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.	(67)m= 18.22	16.18	13.16	9.96	7.45	6.29	6.79	8.83	11.85	15.05	17.57	18.73		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.4 34.4 34.4 34.4 34.4 34.4 34.4 34.	Appliances gair	ns (calcı	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
Company Comp	(68)m= 200.59	202.67	197.42	186.26	172.16	158.91	150.06	147.98	153.23	164.39	178.49	191.74		(68)
Pumps and fans gains (Table 5a) (70)m=	Cooking gains	(calculat	ted in Ap	pendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•		•	
Comparison of the control of the con	(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m=	Pumps and fan	s gains	(Table 5	ia)			•		•	•	•	•	•	
(71)m=	(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Water heating gains (Table 5) (72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 63.84 (76)	Losses e.g. eva	aporatio	n (negat	ive valu	es) (Tab	le 5)					•		•	
(72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c (W) East 0.9x 0.77	(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
(72)m= 113.42 111.38 107.15 101.38 97.64 92.38 87.9 93.64 95.67 101.64 108.37 111.39 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Water heating	gains (T	able 5)				!		•	•		!		
(73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c FF Gains Table 6c Table 6d M2 Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)				101.38	97.64	92.38	87.9	93.64	95.67	101.64	108.37	111.39		(72)
(73)m= 389.43 387.44 374.93 354.81 334.45 314.78 301.96 307.65 317.96 338.28 361.63 379.06 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area Table 6a Flux Table 6b Table 6c FF Gains Table 6c Table 6d M2 Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Total internal	gains =	Į			(66)	ım + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	1 (1)m + (72)	m	l	
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 6d m^2 Table 6a Table 6b Table 6c (W) East 0.9×0.77 $\times 4.16$ $\times 19.64$ $\times 0.5$ $\times 0.7$ = 19.82 (76) East 0.9×0.77 $\times 4.16$ $\times 38.42$ $\times 0.5$ $\times 0.7$ = 38.77 (76) East 0.9×0.77 $\times 4.16$ $\times 63.27$ $\times 0.5$ $\times 0.7$ = 63.84 (76)		- ,	374.93	354.81	334.45					· · · · · · · · · · · · · · · · · · ·	· · · · · ·			(73)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_{-} FF Gains Table 6d m^2 Table 6a Table 6b Table 6c (W) East $0.9x$ 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East $0.9x$ 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East $0.9x$ 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 63.84 (76)	` ′													
Table 6d m ² Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)			using solar	flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Table 6d m ² Table 6a Table 6b Table 6c (W) East 0.9x 0.77 x 4.16 x 19.64 x 0.5 x 0.7 = 19.82 (76) East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Orientation: A	ccess F	actor	Area		Flu	X		g_		FF		Gains	
East 0.9x 0.77 x 4.16 x 38.42 x 0.5 x 0.7 = 38.77 (76) East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	Ta	able 6d		m²		Tal	ble 6a	7		Т	able 6c		(W)	
East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	East 0.9x	0.77	х	4.1	6	x 1	9.64	x	0.5	x	0.7		19.82	(76)
East 0.9x 0.77 x 4.16 x 63.27 x 0.5 x 0.7 = 63.84 (76)	East 0.9x	0.77	×	4.1	6	x 3	88.42	x	0.5	= x	0.7		38.77	(76)
	East 0.9x		x					x		= x		= =		_
	_							×		╡⋄╞		= =		_
East 0.9x 0.77 x 4.16 x 113.09 x 0.5 x 0.7 = 114.11 (76)						_		╎┝		⊣		╡ -		-

East	0.9x	0.77		X	4.16	一,	, [115.77] x		0.5	7 x	0.7		116.81	(76)
East	0.9x	0.77	_	X	4.16	╡	, 	110.22] x		0.5		0.7	= =	111.21	(76)
East	0.9x	0.77	_	X	4.16	=	, <mark>├</mark>	94.68]]		0.5	_	0.7	= =	95.53	(76)
East	0.9x	0.77	一	X	4.16	=	, <mark>├</mark>	73.59]]		0.5	_	0.7	= =	74.25	(76)
East	0.9x	0.77	_	X	4.16	╡	, <mark>├</mark>	45.59]]		0.5	_ 	0.7	= =	46	(76)
East	0.9x	0.77		X	4.16	=	, <mark>├</mark>	24.49]]		0.5	_	0.7	= =	24.71	(76)
East	0.9x	0.77		X	4.16	╡,	, H	16.15] X		0.5		0.7	= =	16.3	(76)
South	0.9x	0.77		X	2.85	۵,	, H	46.75] x		0.5	×	0.7		32.32	(78)
South	0.9x	0.77		X	2.85	= ,	ι <mark>⊢</mark>	76.57] x		0.5	×	0.7	=	52.93	(78)
South	0.9x	0.77	一	X	2.85	╡,	Ϋ́	97.53	X		0.5	×	0.7		67.42	(78)
South	0.9x	0.77		X	2.85	╡,	,	110.23	X		0.5	×	0.7		76.2	(78)
South	0.9x	0.77		X	2.85	= ,	, <u> </u>	114.87	X		0.5	×	0.7		79.41	(78)
South	0.9x	0.77		X	2.85	= ,	、一	110.55	j×		0.5	×	0.7		76.42	(78)
South	0.9x	0.77		X	2.85	= ,	, <u> </u>	108.01	X		0.5	x	0.7	=	74.67	(78)
South	0.9x	0.77		X	2.85	= ,	◟┌	104.89	x		0.5	x	0.7	=	72.51	(78)
South	0.9x	0.77		X	2.85	╡,	, <u> </u>	101.89	X		0.5	x	0.7	=	70.43	(78)
South	0.9x	0.77		X	2.85	= ,	、戸	82.59	x		0.5	x	0.7	=	57.09	(78)
South	0.9x	0.77		X	2.85	,	⟨□	55.42	X		0.5	x	0.7	=	38.31	(78)
South	0.9x	0.77		X	2.85	<u> </u>	⟨□	40.4	x		0.5	x	0.7	=	27.93	(78)
West	0.9x	0.77		X	6.05	<u> </u>	ΚĒ	19.64	X		0.5	x	0.7	=	28.82	(80)
West	0.9x	0.77		X	6.05	<u> </u>	ΚĒ	38.42	X		0.5	x	0.7	=	56.38	(80)
West	0.9x	0.77		X	6.05		< [63.27	X		0.5	x	0.7	=	92.85	(80)
West	0.9x	0.77		X	6.05	,	· [92.28	X		0.5	x	0.7	=	135.41	(80)
West	0.9x	0.77		X	6.05	,	· [113.09	X		0.5	x	0.7	=	165.96	(80)
West	0.9x	0.77		X	6.05	,	· [115.77	X		0.5	x	0.7	=	169.88	(80)
West	0.9x	0.77		X	6.05	,	· [110.22	X		0.5	X	0.7	=	161.74	(80)
West	0.9x	0.77		X	6.05	,	· [94.68	X		0.5	x	0.7	=	138.93	(80)
West	0.9x	0.77		X	6.05		· [73.59	X		0.5	x	0.7	=	107.99	(80)
West	0.9x	0.77		X	6.05		٠ <u> </u>	45.59	X		0.5	x	0.7	=	66.9	(80)
West	0.9x	0.77		X	6.05		٠ <u> </u>	24.49	X		0.5	x	0.7	=	35.94	(80)
West	0.9x	0.77		X	6.05	,	· [16.15	X		0.5	X	0.7	=	23.7	(80)
7-				$\overline{}$	for each mo		000	10 047.04		$\overline{}$	um(74)m		1 00 05	07.00	٦	(92)
(83)m=	80.96	148.07	224.1		$\begin{array}{c c} 304.73 & 359 \\ \hline (84)m = (73) \end{array}$		363.		306	5.97	252.67	169.99	98.95	67.92		(83)
	470.39	535.51	599.0	_	659.53 693		677		614	62	570.62	508.27	460.58	446.98	7	(84)
` ' L				_	ļ .		011	0 1040.07	1 014	.02	070.02	000.27	1 400.00	1 440.00		(5.7)
					heating sea		a or	oa from Tal	blo O	Th	1 (°C)				24	(95)
•		•		•	eriods in the ving area, h		•		nie 9	, 111	i (C)				21	(85)
	Jan	Feb	Ma	-		lay	Ju		ΙΑ	ug	Sep	Oct	Nov	Dec	7	
(86)m=	0.96	0.94	0.9	\rightarrow	0.83 0.7	- 	0.5	_	0.4		0.68	0.86	0.94	0.96	┥	(86)
_		ļļ			Į			!	<u> </u>		l		1		J	• •
(87)m=	18.98	19.24	19.6	-	ving area T	`	20.8	i	/ IN I		20.74	20.2	19.51	18.94	7	(87)
(- · /···			. 3.3					1	1		211 1	-	1		_	` '

Tomr	oroturo	during h	neating p	oriode ir	roct of	dwalling	from To	blo 0 T	h2 (°C)					
(88)m=	20.06	20.07	20.07	20.08	20.09	20.1	20.1	20.1	20.09	20.09	20.08	20.07		(88)
		<u>!</u>	<u>!</u>						20.00	20.00	20.00	20.07		(00)
(89)m=	0.95	0.93	ains for i	0.81	0.68	0.51	0.36	9a) 0.4	0.62	0.84	0.93	0.96		(89)
		<u> </u>	<u> </u>					<u> </u>	<u> </u>	<u> </u>	0.00	0.00		(==)
	17.36	1 temper	ature in	the rest	of dwelli	ng 12 (fo	ollow ste	20.05	/ In Tabl	e 9c)	18.13	17.21		(90)
(90)m=	17.30	17.73	10.32	19.05	19.61	19.90	20.06	20.05	<u> </u>	fLA = Livin	<u> </u>	17.31	0.20	 ` ′
									'	ILA – LIVIII	y area + (-	+) -	0.38	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	ling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	17.98	18.31	18.83	19.48	19.98	20.3	20.4	20.39	20.18	19.53	18.66	17.93		(92)
			he mean		· ·					r e		1		
(93)m=	17.98	18.31	18.83	19.48	19.98	20.3	20.4	20.39	20.18	19.53	18.66	17.93		(93)
			uirement											
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
uie u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilis			ains, hm		iviay	Juli	Jul	Aug	ССР	000	1107	Dec		
(94)m=	0.93	0.91	0.86	0.79	0.68	0.53	0.39	0.43	0.63	0.82	0.91	0.94		(94)
	∟ ⊔ aains.	hmGm	, W = (9 ²	1)m x (84	4)m			l			l			
(95)m=		486.02	517.83	520.07	470.46	358.57	254.12	262.55	358.91	415.37	417.66	420		(95)
Mont	hly aver	age exte	rnal tem	perature	e from Ta	able 8	<u> </u>		<u> </u>	<u>l</u>	<u>l</u>	<u> </u>		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	-[(39)m :	x [(93)m	– (96)m	1	ļ	<u> </u>		
	1000.68	1	896.22	756.27	590.03	399.45	266.52	278.77	429.06	636.37	829.44	991.71		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Vh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=		330.41	281.52	170.07	88.96	0	0	0	0	164.43	296.48	425.35		
		!						Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2175.35	(98)
Snac	a haatin	a requir	ement in	k\Mh/m²	!/vear							ŕ	30.46	(99)
·		•			/yeai								30.40	(55)
	•	- J	quiremen											
Calcu		ĭ	July and	- U										
Heet	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(100)m=		e Lm (ca	lculated 0	using 2		659.03	518.81	531.06	emarten 0	nperatur 0	0	able 10)		(100)
, ,				U	U	009.00	310.01	551.06	U	U		U		(100)
(101)m=		tor for lo	0	0	0	0.83	0.89	0.87	0	0	0	0		(101)
, ,		<u> </u>					0.89	0.07	0	0		U		(101)
USeit	JI 1055, I	IIII⊏III (V	Vatts) = (, ווונטטו	. (101)111		_	_						(4.00)
(102)m-	0	0	_ ^	Λ	0	540.61	450.22	161 27	0	l 0	0	1 ∩		(102)
(102)m=		0	0	0	0	549.61	459.33	461.27	0	0	0	0		(102)
Gains	s (solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)		<u> </u>			
Gains (103)m=	s (solar o	gains ca	lculated 0	for appli	cable we	eather re	egion, se 831.72	e Table 791.94	10)	0	0	0	v (41)m	(102)
Gains (103)m=	s (solar o	gains ca 0 g require	lculated 0 ement fo	for appli 0 r month,	cable we	eather re	egion, se 831.72	e Table 791.94	10)	0	0		x (41)m	
Gains (103)m=	s (solar g	gains ca 0 g require	lculated 0	for appli 0 r month,	cable we	eather re	egion, se 831.72	e Table 791.94	10)	0	0	0	x (41)m	
Gains (103)m= Spac set (1	s (solar g	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	eather re 866.26 Iwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) \\ 0 \\ /h) = 0.0 \end{array} $	0 24 x [(10	0 03) <i>m</i> – (0 102)m] x	x (41)m 751.07	
Gains (103)m= Spac set (1 (104)m=	s (solar g	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	eather re 866.26 Iwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ Total	0 24 x [(10	0 03)m – (0 1,0,4)	0 102)m]		(103)
Gains (103)m= Spac set (1 (104)m=	s (solar of the cooling of the cooli	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	eather re 866.26 Iwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ Total	0 24 x [(10 0 1 = Sum(0 03)m – (0 1,0,4)	0 102)m]	751.07	(103)
Gains (103)m= Spac set (1 (104)m=	s (solar (e cooling 104)m to 0 d fraction	gains ca 0 g require zero if (lculated 0 ement for (104)m <	for appli 0 r month, 3 × (98	cable we 0 whole o	eather re 866.26 Iwelling,	egion, se 831.72 continuo	e Table 791.94 ous (kW	$ \begin{array}{c c} 10) & 0 \\ & 0 \\ & 0 \end{array} $ Total	0 24 x [(10 0 1 = Sum(0 03)m – (0 1,0,4)	0 102)m]	751.07	(103)
Gains (103)m= Spac set (1 (104)m= Cooled Interm	s (solar (e cooling 104)m to 0 d fraction	gains ca 0 g require zero if (0 actor (Ta	lculated 0 ement fo (104)m < 0	for appli 0 r month, 3 × (98 0	cable we 0 whole common 0	eather re 866.26 Iwelling, 227.99	egion, se 831.72 continuo 277.06	ee Table 791.94 ous (kW 246.02	10) 0 /h) = 0.0 Total f C =	0 24 x [(10 0 1 = Sum(cooled a	0 03)m - (0 104) area ÷ (4	0 102)m] 3 0 = 4) =	751.07	(103)

(107)m= 0	0	0	0	0	41.95	× (106)	45.27	0	0	0	0		
(107)111-					41.55	30.30	40.21		I = Sum		=	138.21	(107)
Space cooling	require	ment in I	دWh/m²/y	/ear) ÷ (4) =	` ,		1.94	(108)
9b. Energy red	quiremer	nts – Co	mmunity	heating	scheme	;							
This part is use Fraction of spa										nunity so	heme.	0	(301)
Fraction of spa			•		•	· ·	(Table T	1) 0 11 11	OHE			1	(302)
The community so			•	•	,	•	allows for	CHP and	up to foul	r other hea	t sources: ti		(302)
includes boilers, h	eat pump	s, geother	mal and wa	aste heat i									_
Fraction of hea										,	_ ,	1	(303
Fraction of tota	·			•						302) x (30	3a) =	1	(304a
Factor for cont				,	. ,,		•	iting sys	tem			1	(305)
Distribution los		(Table 1	12c) for (commun	ity heati	ng syste	em					1.05	(306)
Space heating Annual space		requiren	nent									kWh/yea 2175.35	ir
Space heat fro	_			מ				(98) x (30	04a) x (3	05) x (306)	=	2284.12	(307
Efficiency of se		•	•	•	svstem	in % (fro	om Table					0	(308
Space heating			•	•	•	,				÷ (308) =		0	` (309
				,	•	, ,							``
Water heating Annual water h		requirem	ent									1926.82	\neg
If DHW from c		•						(0.4) (0.	00) (0)	os) (000)			
Water heat fro		•		0				. , ,	, ,	05) x (306)		2023.16	(310
Electricity used							0.01	× [(307a)	(307e)	+ (310a)	.(310e)] =	43.07	(313)
Cooling Syster	_	•	•			. 0)		(407)	(0.1.1)			6.59	(314)
Space cooling	,					,		= (107) ÷	÷ (314) =			20.98	(315)
Electricity for p mechanical ve							outside					161.41	(330
warm air heati	ng syste	em fans										0	(330
oump for solar	water h	eating										0	(330
Total electricity	for the	above,	kWh/yea	r				=(330a) ·	+ (330b)	+ (330g) =		161.41	(331
Energy for ligh	ting (cal	lculated	in Apper	ndix L)								321.76	(332
Electricity gene	erated b	y PVs (A	Appendix	M) (ne	gative qu	ıantity)						-482.91	(333)
Electricity gene	erated b	y wind to	urbine (A	ppendix	(M) (ne	gative qu	uantity)					0	(334)
12b. CO2 Emi	ssions –	- Commı	unity hea	ting sch	eme								
								ergy h/year				Emissions	
										kg CO2/I	/\//h	kg CO2/year	

CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	773.52	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	22.35	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)(372))	=	795.88	(373)
CO2 associated with space heating (see	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) =			795.88	(376)
CO2 associated with space cooling		(315) x	0.52	=	10.89	(377)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	83.77	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	166.99	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli		0.52 x 0.0	1 =	-250.63	(380)
Total CO2, kg/year	sum of (376)(382) =				806.9	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.3	(384)
El rating (section 14)					90.71	(385)

			l loor D) otoilo:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20		User D	Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address	Flat 24					
Address: 1. Overall dwelling dim		ion Road	1, 300 10) IIVV						
1. Overall awelling aim	C11310113.		Δτο	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.85	(2a) =	203.55	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 7	71.42	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	203.55	(5)
2. Ventilation rate:										
		econdar heating	у 	other	_	total			m³ per hou	ır —
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	│ +	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				, E	3	x -	10 =	30	(7a)
Number of passive vent	S				F	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	x	40 =	0	(7c)
Training or macrosc gas	00				L					(, o)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	a)+(7b)+((7c) =	Γ	30		÷ (5) =	0.15	(8)
If a pressurisation test has	been carried out or is intend	ded, proceed	d to (17), (otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	ruction			0	(11)
deducting areas of open	present, use the value corre nings); if equal user 0.35	sportaing to	ine great	ler wall are	a (ailei					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
J	vs and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2			(45)		0	(15)
Infiltration rate	250	h:		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeab	$_{1}$, q50, expressed in cultivity value, then $(18) = 10$		•	•	•	etre or e	envelope	area	5	(17)
·	ies if a pressurisation test ha					is beina u	sed		0.4	(18)
Number of sides shelter			`	,	,	Ü			1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.37	(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	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	1	
		1 5.55			<u> </u>			<u> </u>	j	

Adjusted infilt	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43]		
Calculate effe		•	rate for t	he appli	cable ca	se	•			•				٦,,,,,,
If mechanic If exhaust air h			ndix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)				0	(23a
If balanced wit) = (23a)				0	(23b
a) If balance		-	-	_					2h\m . /	22h) v [1 (220)		0	(230
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	$\frac{1-(230)}{0}$]]		(24a
b) If balance	ed mech:	anical ve	ntilation	without	heat rec	covery (N	/\\) (24h	l = (2)	2b)m + (23b)		J		•
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(24b
c) If whole h	nouse ex	tract ven	tilation o	or positiv	e input v	ventilatio	n from o	utside	<u> </u>			1		
,	m < 0.5 ×			•	•				5 × (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(240
d) If natural if (22b)	ventilation m = 1, the				•				0.5]					
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59]		(240
Effective air	r change	rate - er	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			-	-		
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59			(25)
3. Heat losse	es and he	eat loss r	paramete	er:										
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²·		A X kJ/	
Doors Type 1					2.68	x	1		2.68	,				(26)
Doors Type 2					2.74	x	1	₹ - i	2.74	=				(26)
Windows Typ	e 1				3.96	x1,	/[1/(1.4)+	0.04] =	5.25					(27)
Windows Typ	e 2				5.76	x1,	/[1/(1.4)+	0.04] =	7.64					(27)
Windows Typ	e 3				2.71	x1,	/[1/(1.4)+	0.04] =	3.59					(27)
Floor					71.42	2 x	0.13	=	9.28459	9 [(28)
Walls Type1	79.9)1	17.8	5	62.06	3 x	0.18		11.17			=		– (29)
Walls Type2	18.4	1	0		18.41	X	0.18	-	3.31			=		一 (29)
Total area of	elements	, m²			169.7	4								(31)
* for windows and ** include the are						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	n 3.2		
Fabric heat lo	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				45	5.67	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	898	82.78	(34)
Thermal mass	s parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		2	250	(35)
For design asses can be used inste				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f			_
Thermal bridg	jes : S (L	x Y) cal	culated i	using Ap	pendix ł	<						1	0.1	(36)
if details of therm Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			55	5.77	(37)
Ventilation he	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 40.96	40.68	40.39	39.08	38.83	37.68	37.68	37.47	38.12	38.83	39.33	39.85]		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (38)m		_		
(39)m= 96.73	96.44	96.16	94.84	94.6	93.45	93.45	93.23	93.89	94.6	95.09	95.62			_
Stroma FSAP 20	12 Version:	1.0.5.9 (S	AP 9.92)	http://ww	w.stroma.d	com			Average =	Sum(39) ₁	12 /12=	94	4.8 ≱ age 2	<u>₂ ∮{3</u> 49)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.35	1.35	1.35	1.33	1.32	1.31	1.31	1.31	1.31	1.32	1.33	1.34		
				l .		l .	l.		Average =	Sum(40) ₁ .	12 /12=	1.33	(40)
Number of day	·	nth (Tab	le 1a)					ı	1	i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		28		(42)
Annual average Reduce the annu- not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage										1			
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
				<u> </u>		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1060.23	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
					, ,	. 0:			Total = Su	m(45) ₁₁₂ =	= [1390.13	(45)
If instantaneous v	vater heati	ng at point	of use (no	not water	storage),	enter 0 in	boxes (46)	to (61)		1	1		
(46)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Water storage Storage volum) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		150		(47)
If community h						_		a	00.		150		(41)
Otherwise if n	-			_			, ,	ers) ente	er '0' in (47)			
Water storage	loss:		`					,		,			
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	55		(48)
Temperature f	factor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	84		(50)
b) If manufac			-										(= 4)
Hot water stor If community h	•			ie Z (KVV	n/litre/da	ly)					0		(51)
Volume factor	_		011 4.0								0		(52)
Temperature f			2b							—	0		(53)
Energy lost fro	om wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,							-	84		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(56)
If cylinder contain												хН	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(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				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61) m = $(60) \div 365 \times (41)$ m													
$\begin{array}{c c} \text{Combinoss c} \\ \text{(61)m=} & 0 \end{array}$	0 0	0	0	0	0 - 3	05 x (41	0	0	0	0	0	1	(61)
			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>. </u>	<u> </u>	<u> </u>		ļ	J · (59)m + (61)m	
(62)m= 193.37		179.32	161.06	158.06	141.55	136.25	149.0		166.99	176.19	188.82]	(62)
Solar DHW inpu	t calculated	using App	endix G o	r Appendix	H (negat	ive quantity	y) (enter	'0' if no sola	ır contribut	tion to wate	er heating)	ı	
(add addition	al lines if	FGHRS	and/or \	NWHRS	applies	s, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 193.37	7 170.53	179.32	161.06	158.06	141.55	136.25	149.0	9 148.69	166.99	176.19	188.82		_
							0	utput from w	ater heate	r (annual)	112	1969.92	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61	m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 87.32	77.49	82.64	75.83	75.57	69.34	68.32	72.59	71.72	78.55	80.86	85.8		(65)
include (57	m in calc	culation o	of (65)m	only if c	ylinder	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec		
(66)m= 114	114	114	114	114	114	114	114	114	114	114	114		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_	
(67)m= 18.37	16.31	13.27	10.04	7.51	6.34	6.85	8.9	11.95	15.17	17.71	18.88		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ble 5				
(68)m= 200.59	9 202.67	197.42	186.26	172.16	158.91	150.06	147.9	3 153.23	164.39	178.49	191.74		(68)
Cooking gair	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5				
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and f	ans gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heatin	g gains (T	able 5)										_	
(72)m= 117.36	115.32	111.08	105.32	101.58	96.31	91.83	97.57	99.61	105.57	112.31	115.33		(72)
Total interna	al gains =				(66)m + (67)m	n + (68)r	n + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 396.52	394.5	381.97	361.82	341.45	321.77	308.95	314.6	324.99	345.34	368.71	386.14		(73)
6. Solar gai													
Solar gains are		•				•	ations to	convert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
- <i>.</i>							, –						1
East 0.9x		X	3.9	96	X	19.64]	0.63	x	0.7	=	23.77	(76)
East 0.9x		X	3.9		-	38.42] x	0.63	x	0.7	=	46.5	[(76)
East 0.9x		X	3.9		-	63.27]	0.63	x	0.7	=	76.57	(76)
East 0.9x		X	3.9		=	92.28] x	0.63	x	0.7	=	111.68	(76)
East 0.9x	0.77	X	3.9	96	X 1	13.09	X	0.63	х	0.7	=	136.87	(76)

East	о о Г			1		٦			1 1			г		_		(70)
East	0.9x	0.77	႕	X	3.96] X		15.77	X	0.63		ΧL	0.7	╡ -	140.11	(76)
	0.9x	0.77		X	3.96	J X	—	10.22	X	0.63	_	ΧL	0.7	╡ "	133.39	(76)
East	0.9x	0.77		X	3.96	J X		4.68	X	0.63		X	0.7	= =	114.58	(76)
East	0.9x	0.77		X	3.96	X	7	3.59	X	0.63		X	0.7	=	89.06	(76)
East -	0.9x	0.77		X	3.96	X	4	5.59	X	0.63		x [0.7	=	55.17	(76)
East	0.9x	0.77		X	3.96	X	2	4.49	X	0.63		X	0.7	=	29.64	(76)
East	0.9x	0.77		X	3.96	X	1	6.15	X	0.63		X	0.7	=	19.55	(76)
South	0.9x	0.77		X	2.71	X	4	6.75	X	0.63		x	0.7	=	38.72	(78)
South	0.9x	0.77		X	2.71	X	7	6.57	X	0.63		X	0.7	=	63.41	(78)
South	0.9x	0.77		X	2.71	X	9	7.53	X	0.63		X	0.7	=	80.78	(78)
South	0.9x	0.77		X	2.71	X	1	10.23	X	0.63		x	0.7	=	91.3	(78)
South	0.9x	0.77		x	2.71	X	1	14.87	X	0.63		x	0.7	=	95.14	(78)
South	0.9x	0.77		x	2.71	X	1	10.55	X	0.63		x	0.7	=	91.56	(78)
South	0.9x	0.77		x	2.71	x	1	08.01	X	0.63		x [0.7	=	89.46	(78)
South	0.9x	0.77		x	2.71	X	1	04.89	X	0.63		x	0.7	=	86.87	(78)
South	0.9x	0.77		x	2.71	x	1	01.89	x	0.63		x	0.7	=	84.38	(78)
South	0.9x	0.77		x	2.71	x	8	2.59	x	0.63		x [0.7	_ =	68.4	(78)
South	0.9x	0.77		x	2.71	x	5	5.42	x	0.63		x	0.7		45.9	(78)
South	0.9x	0.77		x	2.71	x		40.4	x	0.63		х	0.7	=	33.46	(78)
West	0.9x	0.77		x	5.76	x	1	9.64	x	0.63		х	0.7	=	34.57	(80)
West	0.9x	0.77	一	x	5.76	x	3	8.42	x	0.63		х	0.7	=	67.63	(80)
West	0.9x	0.77	一	x	5.76	X	6	3.27	x	0.63		x [0.7		111.38	(80)
West	0.9x	0.77		x	5.76	j x	9	2.28	x	0.63		х	0.7	_ =	162.44	(80)
West	0.9x	0.77		x	5.76	j x	1	13.09	x	0.63		х	0.7		199.08	(80)
West	0.9x	0.77		x	5.76	j x	1	15.77	X	0.63		х	0.7	-	203.79	(80)
West	0.9x	0.77		x	5.76	X	1	10.22	X	0.63		x	0.7	=	194.02	(80)
West	0.9x	0.77		x	5.76	X	9	4.68	X	0.63		х	0.7	-	166.66	(80)
West	0.9x	0.77		x	5.76	X	7	3.59	X	0.63		x	0.7	= =	129.54	(80)
West	0.9x	0.77	=	x	5.76	X		5.59	X	0.63		x [0.7		80.25	(80)
West	0.9x	0.77		x	5.76] x		4.49	X	0.63		x [0.7		43.11	(80)
West	0.9x	0.77		x	5.76] x		6.15	X	0.63	=	χΓ	0.7		28.43	(80)
	L					_						L				`
Solar ga	ains in	watts, ca	alcula	ted	for each mon	ıth			(83)m	ı = Sum(74)m(8	32)m				
(83)m=	97.06	177.54	268.		365.42 431.0	-	35.46	416.87	368	.11 302.	98 20	03.82	118.64	81.44]	(83)
Total ga	ins – i	nternal a	nd so	olar	(84)m = (73) r	n + (83)m	, watts					-		<u></u>	
(84)m=	493.58	572.05	650.	71	727.24 772.5	64 7	57.23	725.82	682	.77 627.	97 54	49.16	487.35	467.58		(84)
7. Mea	ın inter	nal temp	eratu	ıre (heating seas	on)										
Tempe	rature	during h	eatin	g pe	eriods in the I	iving	area	from Tal	ole 9,	Th1 (°C	;)				21	(85)
Utilisat	ion fac	tor for ga	ains f	or li	ving area, h1	,m (s	ee Ta	ble 9a)								
Γ	Jan	Feb	Ma	ar	Apr Ma	y	Jun	Jul	A	ug Se	эр	Oct	Nov	Dec]	
(86)m=	1	0.99	0.98	3	0.95 0.87		0.71	0.55	0.0	6 0.8	3 (0.97	0.99	1	7	(86)
Mean i	nterna	l temper	ature	in li	ving area T1	(follo	w ste	ns 3 to 7	 7 in T	able 9c)					_	
(87)m=	19.58	19.75	20.0	$\overline{}$	20.42 20.73		20.92	20.98	20.		34 2	20.42	19.93	19.55	7	(87)
· · · L						_			<u> </u>				<u> </u>		_	

Tomp	oratura	durina h	oating n	oriode ir	roct of	dwolling	ı from To	blo 0 T	h2 (°C)					
(88)m=	19.8	19.8	19.8	19.82	19.82	19.83	from Ta 19.83	19.84	19.83	19.82	19.82	19.81	1	(88)
` '	Ll					<u>!</u>	ee Table		19.03	19.02	19.02	19.01	l	(00)
(89)m=	1	0.99	0.97	0.93	0.82	0.61	0.41	0.46	0.75	0.95	0.99	1		(89)
Mean	internal	temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)	<u>I</u>			
(90)m=	17.93	18.18	18.61	19.15	19.56	19.79	19.83	19.83	19.7	19.17	18.46	17.9		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.38	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) x T2					_
(92)m=	18.56	18.78	19.16	19.63	20.01	20.22	20.27	20.27	20.14	19.65	19.03	18.53		(92)
		ent to the	ne mear	ı ı internal	temper	ature fro	m Table	L	ere appro	L opriate			I	
(93)m=	18.56	18.78	19.16	19.63	20.01	20.22	20.27	20.27	20.14	19.65	19.03	18.53		(93)
	ace heat	ina reau	uirement											
Set Ti		nean int	ernal ter	mperatui		ned at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	:ulate	
110 41	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fact			<u> </u>	iviay	L	L	ı 'wg	L		1400	1 200	I	
(94)m=	0.99	0.99	0.97	0.92	0.83	0.65	0.46	0.51	0.77	0.95	0.99	0.99		(94)
	ıl gains,	hmGm	W = (94)	1 4)m x (84	4)m	1	1						I	
(95)m=		564.39	631.26	672.7	637.47	490.1	336.88	350.85	486.56	519.84	480.95	465.02		(95)
	nly avera				from Ta	ı able 8							I	
(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	for mea	an intern	al tempe	erature.	L Lm . W :	=[(39)m :	r [(93)w	L – (96)m	l]			I	
1	1379.25			1018.04	786.28	525.37	343	360.46	567.08	855.95	1134.06	1370.39		(97)
Space	e heating	require	ement fo	r each m	nonth. k	Mh/mon	th = 0.02	24 x [(97	ı)m – (95)ml x (4	L 1)m		I	
(98)m=		520.55	435.79	248.65	110.71	0	0	0	0	250.07	470.24	673.59		
				ļ.		!	ļ.	Tota	l per year	ı (kWh/year) = Sum(9	8) _{15,912} =	3371.06	(98)
Space	e heating	g require	ement in	kWh/m²	/year								47.2	(99)
9a. En	ergy req	uiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatin	g:												
Fracti	on of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	t from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of tot	al heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of n	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	econda	ry/suppl	ementar	y heatin	g systen	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space	e heating	g require	ement (c	alculate	d above))	•					•		
	661.47	520.55	435.79	248.65	110.71	0	0	0	0	250.07	470.24	673.59		
(211)m	n = {[(98)	m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	707.45	556.74	466.08	265.94	118.41	0	0	0	0	267.45	502.93	720.42		
'								Tota	l (kWh/yea	ar) =Sum(2	211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	=	3605.41	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month									
•)m x (20	`		• , .										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
						-	_	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
														_

Output from water heater (calculated above)													
193.37 170.53 179.32 161.06 158.06 141.55 136.25 149.09 148.69 166.99 176.19 188.82	(040)												
Efficiency of water heater 79	, ,												
(217)m= 87.84 87.6 87.1 85.97 83.89 79.8 79.8 79.8 79.8 85.89 87.31 87.92	(217)												
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m= 220.15 194.67 205.89 187.34 188.42 177.38 170.74 186.83 186.33 194.43 201.8 214.77													
Total = $Sum(219a)_{112}$ = 2328	.74 (219)												
· · · · · · · · · · · · · · · · · · ·	/year												
Space heating fuel used, main system 1	.41												
Water heating fuel used 2328	.74												
Electricity for pumps, fans and electric keep-hot													
central heating pump:	(230c)												
boiler with a fan-assisted flue													
Total electricity for the above, kWh/year sum of (230a)(230g) =	(231)												
Electricity for lighting 324	37 (232)												
12a. CO2 emissions – Individual heating systems including micro-CHP													
Energy Emission factor Emis	sions												
3,	2/year												
Space heating (main system 1) (211) x 0.216 = 778	77 (261)												
Space heating (secondary) (215) x 0.519 = 0	(263)												
Water heating (219) x 0.216 = 503	01 (264)												
Space and water heating (261) + (262) + (263) + (264) = 128	.78 (265)												
Electricity for pumps, fans and electric keep-hot (231) × 0.519 = 38.	(267)												
Electricity for lighting (232) × 0.519 = 168	35 (268)												
Total CO2, kg/year sum of (265)(271) = 1489	.05 (272)												

TER =

(273)

30.72

			User_I	Details:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20)12		Strom Softwa					0035000 on: 1.0.5.9	
			i i	Address	: Flat 33					
Address :	The Alders, Aldrin	gton Road	d, SW16	3 1TW						
1. Overall dwelling dime	ensions:		Λ	a/m²\		Av. Ha	! or lo 4 / roo \		Value a/m	1
Ground floor				a(m²) 49.68	(1a) x		ight(m) 2.75	(2a) =	Volume(m 3 136.62	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	1e)+(1r	n)	49.68	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	136.62	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	′y □ +	other 0	7 = [total 0	x	40 =	m³ per hou	(6a)
Number of open flues	0 +	0	┪╻┝	0	」	0	x	20 =	0	(6b)
Number of intermittent fa	0	U			J			10 =		= `
					Ļ	0			0	(7a)
Number of passive vents						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	7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has					continue fr	_		÷ (3) =	0	(0)
Number of storeys in t		,	, ,,			, ,	, ,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	ruction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre ings): if equal user 0.35	esponding to	the grea	ter wall are	a (after					
If suspended wooden	• / /	aled) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0)							0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value			•	•	•	etre of e	envelope	area	3	(17)
If based on air permeab	· •								0.15	(18)
Air permeability value appli Number of sides shelter		ias been dor	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	Cu			(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	iting shelter factor			(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spec	ed								 `
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind s						•	•	•	_	
(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 $(22a)m = (2a)m =$	'	1 25-			· .				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 infiltr	ation rat	e (allowi	ng for sl	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 effe If mechanic		_	rate for t	he appli	cable ca	se	-		-	-			
If exhaust air h			andiv N (2	13h) - (23a	a) v Emy (e	aguation (N5N othe	nvice (23h) = (232)			0.5	(2:
		0 11		, ,	,	. ,	,, .	`) = (23a)			0.5	(2:
If balanced with		-	-	_					21.) (001) [4 (00.)	76.5	(2:
a) If balance	1			.		- `	- 	``	– `		' ' '	÷ 100] I	(2
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
b) If balance				ı —			r ´`	í ·	 	– ´ – 	Ι .	1	(2)
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h					-		on from c c) = (22 b		5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r							on from I 0.5 + [(2		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 (24b	o) or (24	c) or (24	ld) in box	(25)				•	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
3. Heat losse	s and he	at loss i	naramet	or.									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		A X k kJ/K
oors		()		-	2.12		1		2.12				(2
Vindows Type	e 1				3.16	_	/[1/(1.3)+		3.9	=			(2
Vindows Type					8.72	=	/[1/(1.3)+		10.78	=			(2
Valls Type1		<u> </u>		_		=		—, ¦		╡ ,		–	`
	40.8		14	_	26.81	=	0.15	=	4.02	믁 ¦			(2
Valls Type2	10.	_	0	_	10.2	X	0.14	=	1.44	닠 ¦		╡	(2
Valls Type3	7.5	6	0		7.56	X	0.13	_ =	1	ᆜ !		-	(2
loof	49.6		0		49.68	3 X	0.11	=	5.46				(3
otal area of e	elements	, m²			108.2	5							(3
arty wall					18.97	X	0	=	0				(3
for windows and include the are						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
abric heat lo				is anu pan	uuoris		(26)(30)	+ (32) =				20.72	(3
leat capacity		,	0)				(20)(00)		(30) + (32	2) ± (32a)	(32e) -	28.72	==
hermal mass		,	2 – Cm	· TEA\ ir	n k I/m2k				tive Value	, , ,	(326) =	1450.5	(3
or design asses	•	•		,			recisely the				able 1f	100	(3
an be used inste				00770174101			00.00.9	a.oaare	74.4000				
hermal bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						10.06	(3
details of therm		are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he								(33) +	(36) =			38.78	(3
entilation hea		i	·	<u> </u>		T	1		= 0.33 × (ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 12.63	12.48	12.34	11.62	11.48	10.76	10.76	10.61	11.05	11.48	11.76	12.05		(3
leat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
		T											

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.03	1.03	1.03	1.01	1.01	1	1	0.99	1	1.01	1.02	1.02		
						ı	ı	,	Average =	Sum(40) ₁ .	12 /12=	1.01	(40)
Number of day	1	nth (Tab	le 1a)					ı					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		68		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.12		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 81.53	78.56	75.6	72.63	69.67	66.7	66.7	69.67	72.63	75.6	78.56	81.53		
						_	- /			m(44) ₁₁₂ =	L	889.39	(44)
Energy content of													
(45)m= 120.9	105.74	109.12	95.13	91.28	78.77	72.99	83.76	84.76	98.78	107.82	117.09		
If instantaneous w	vater heati	ng at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	- [1166.14	(45)
(46)m= 18.14	15.86	16.37	14.27	13.69	11.82	10.95	12.56	12.71	14.82	16.17	17.56		(46)
Water storage	l	10.07		10.00	11.02	10.00	12.00	12.7	1 1.02	10.17	11.00		(- /
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		oclarod I	occ fact	or ie kna	wn (k\//k	2/d2v/).					•		(40)
•				JI IS KIIO	WII (KVVI	i/uay).					.2		(48)
Temperature f Energy lost fro				oor			(48) x (49)	\ _			.6		(49)
b) If manufact		_	-		or is not		(40) X (49)	, –		0.	72		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor Temperature f			2h								0		(52)
·							(47) v (54)) v (EQ) v (E0)		0		(53)
Energy lost fro Enter (50) or		_	, KVVII/y	al			(47) X (31)) x (52) x (55) =	-	0 72		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = ((55) × (41)	m	0.	12		(00)
	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
(56)m= 22.32 If cylinder contains												ix H	(50)
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
` '	!				21.0	22.02	22.02	21.0	22.02				, ,
Primary circuit	•	,			50\m = 4	(EQ) + 26	S5 ~ (44)	ım			0		(58)
Primary circuit (modified by				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
			<u> </u>	<u> </u>	L	L	L	L	<u> </u>	L			

Combi loss	ralculated	for each	month ((61)m =	(60) ± 3	865 v (41)m							
(61)m= 0	0	0	0	0 0	0	0))	0	0	T 0	0]	(61)
	auired for	water h	eating ca	Lalculated	L I for eac	 ch month	(62)	—— m =	0.85 × (′45)m +		(57)m +	ı · (59)m + (61)m	
(62)m= 166.4		154.7	139.24	136.86	122.88		129	_	128.87	144.36	151.93	162.67]	(62)
Solar DHW inp	ut calculated	using App	endix G o	r Appendix	H (nega	 tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	.	
(add additio												•		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(63)
Output from	water hea	ter				•	•				•	•	•	
(64)m= 166.4	19 146.91	154.7	139.24	136.86	122.88	118.57	129	.34	128.87	144.36	151.93	162.67]	
	•	•				•		Outp	out from wa	ater heate	er (annual)	112	1702.83	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n]	
(65)m= 76.6	7 68.1	72.75	66.92	66.82	61.48	60.74	64.	32	63.47	69.31	71.14	75.4]	(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	n Feb	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec]	
(66)m= 84.0	3 84.03	84.03	84.03	84.03	84.03	84.03	84.	03	84.03	84.03	84.03	84.03		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				_	
(67)m= 13.0	5 11.59	9.43	7.14	5.34	4.5	4.87	6.3	33	8.49	10.78	12.58	13.41]	(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a),	also	see Tal	ble 5		_	_	
(68)m= 146.	4 147.92	144.09	135.94	125.66	115.99	109.53	108	.01	111.84	119.99	130.27	139.94]	(68)
Cooking gai	ns (calcula	ted in A	opendix	L, equat	ion L15	or L15a), als	o se	e Table	5		-	-	
(69)m= 31.4	31.4	31.4	31.4	31.4	31.4	31.4	31	.4	31.4	31.4	31.4	31.4]	(69)
Pumps and	fans gains	(Table 5	āa)											
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	ive valu	es) (Tab	le 5)									
(71)m= -67.2	3 -67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67	.23	-67.23	-67.23	-67.23	-67.23]	(71)
Water heating	ng gains (T	able 5)		-	_	-					-		_	
(72)m= 103.0)5 101.33	97.78	92.95	89.81	85.39	81.63	86.	45	88.15	93.16	98.81	101.34]	(72)
Total intern	al gains =	•		-	(60	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m		
(73)m= 310.7	71 309.06	299.51	284.24	269.01	254.09	244.24	248	.99	256.69	272.14	289.87	302.91]	(73)
6. Solar ga	ins:												_	
Solar gains a		•					ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		_	g_ able 6b	7	FF able 6c		Gains (W)	
							,		able ob	_ '	able oc		(۷۷)	-
East 0.9		X	3.1	16	X	19.64	X		0.5	x	0.7	=	15.05	(76)
East 0.9			3.1		x	38.42	X		0.5	x	0.7	=	29.45	 (76) −
East 0.9		X	3.1		x	63.27	X		0.5	x	0.7	=	48.5	<u> </u> (76)
East 0.9		X	3.1	16	x	92.28	X	<u></u>	0.5	x	0.7	=	70.73	(76)
East 0.9	x 0.77	X	3.1	16	X	113.09	X		0.5	X	0.7	=	86.68	(76)

	-								,			_			_		_
East	0.9x	0.77	X	3.	6	X	1	15.77	X		0.5	×	0.7	•		88.73	(76)
East	0.9x	0.77	X	3.	6	X	1	10.22	X		0.5	X	0.7	-		84.48	(76)
East	0.9x	0.77	X	3.	6	X	9	94.68	X		0.5	X	0.7	=		72.57	(76)
East	0.9x	0.77	X	3.	6	X	7	73.59	X		0.5	X	0.7	-	-	56.4	(76)
East	0.9x	0.77	X	3.′	6	X	4	5.59	X		0.5	X	0.7	=	=	34.94	(76)
East	0.9x	0.77	X	3.	6	X	2	24.49	x		0.5	X	0.7	=	-	18.77	(76)
East	0.9x	0.77	X	3.	6	x	1	6.15	X		0.5	X	0.7	-	-	12.38	(76)
West	0.9x	0.77	X	8.7	′2	X	1	9.64	X		0.5	X	0.7	-	=	41.54	(80)
West	0.9x	0.77	X	8.7	'2	X	3	88.42	x		0.5	x	0.7	-	-	81.26	(80)
West	0.9x	0.77	X	8.7	'2	X	6	3.27	x		0.5	X	0.7	-	=	133.82	(80)
West	0.9x	0.77	X	8.7	′2	X	9	2.28	x		0.5	x	0.7		-	195.18	(80)
West	0.9x	0.77	X	8.7	' 2	X	1	13.09	x		0.5	x	0.7		- 🔚	239.2	(80)
West	0.9x	0.77	x	8.7	' 2	X	1	15.77	x		0.5	x	0.7		- 🗀	244.86	(80)
West	0.9x	0.77	x	8.7	<u>'</u> 2	X	1	10.22	х		0.5	x	0.7		-	233.12	(80)
West	0.9x	0.77	X	8.7	<u>'2</u>	X	9	94.68	x		0.5	x	0.7		-	200.24	(80)
West	0.9x	0.77	X	8.7	<u>'2</u>	X	7	' 3.59	x		0.5	×	0.7		-	155.64	(80)
West	0.9x	0.77	X	8.7	' 2	X	4	15.59	x		0.5	×	0.7		-	96.42	(80)
West	0.9x	0.77	X	8.7	' 2	X	2	24.49	x		0.5	×	0.7		-	51.8	(80)
West	0.9x	0.77	x	8.7	' 2	X	1	6.15	x		0.5	= x	0.7	╡.	-	34.16	(80)
	L																
Solar o	ains in	watts, ca	lculated	for eac	h month	1			(83)m	n = Su	ım(74)m .	(82)m					
(83)m=	56.59	110.71	182.32	265.9	325.88	33	33.59	317.59	272	.81	212.05	131.3	6 70.57	46.54	ı		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts									
(84)m=	367.3	419.77	481.83	550.14	594.88	58	87.68	561.83	521	1.8	468.74	403.5	360.44	349.4	5		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)											
Temp	erature	during h	eating p	eriods ii	the liv	ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for ga	ains for l	iving are	ea, h1,n	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	С		
(86)m=	0.94	0.92	0.87	0.78	0.64	(0.49	0.37	0.4	41	0.62	0.83	0.92	0.95			(86)
Mean	interna	l tempera	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)			-			
(87)m=	19.08	19.35	19.79	20.31	20.68	т —	20.9	20.97	20.		20.79	20.28	19.6	19.04	ı		(87)
Tamn	erature	during h	eating n	arinde i	rest of	: dw	مااام	from Ta	عاما	a Th	2 (°C)						
(88)m=	20.05	20.06	20.06	20.07	20.07	т —	20.09	20.09	20.		20.08	20.07	20.07	20.06	5		(88)
								<u> </u>					1				, ,
Ultilisa	ation fac	tor for ga	0.85			_	•	T	T	, T	0.56	0.0	0.01	1 0 04	\neg		(89)
	0.04	1 004 1	บ.ชอ	0.75	0.6	Т,	0.43	0.3	0.3	34	0.56	8.0	0.91	0.94			(69)
(89)m=	0.94	0.91					T-0 //			to 7	in Tabl	a 0c)					
(89)m= Mean	interna	l tempera	ature in		1	Ť		i	i 				1	1	_		(25)
(89)m=				the rest 19.23	of dwel 19.73	Ť	12 (fo 9.99	20.06	20.		19.88	19.22		17.44			(90)
(89)m= Mean	interna	l tempera	ature in		1	Ť		i	i 		19.88	19.22	18.26 ving area ÷ (1	0.58	(90) (91)
(89)m= Mean (90)m=	interna 17.5	l tempera	ature in	19.23	19.73	1	9.99	20.06	20.	06	19.88 f	19.22			1	0.58	 ` ′
(89)m= Mean (90)m=	interna 17.5	l tempera	ature in	19.23	19.73	1 1	9.99	20.06	20.	06 – fL/	19.88 f	19.22	ving area ÷ (0.58	 ` ′

(93)m=	18.42	18.74	19.25	19.86	20.28	20.52	20.59	20.58	20.41	19.84	19.04	18.37		(93)
,			uirement	L	20.20	20.52	20.55	20.56	20.41	19.04	19.04	10.57		(00)
•		·			ro obtoir	and at st	on 11 of	Table 9	o co tha	t Ti m_(76)m an	d ro colo	ulato	
			or gains	•		ieu ai sii	ър птог	Table 91	J, 50 IIIa	t 11,111=(rojili ali	u re-caic	uiale	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g	ains, hm	<u> </u>	· · · · ·				•		l			
(94)m=	0.92	0.89	0.84	0.74	0.61	0.46	0.34	0.38	0.58	0.79	0.89	0.93		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m	I								
(95)m=	337.94	373.96	402.87	407.09	363.89	271.47	190.91	197.28	272.08	318.08	320.98	324.26		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	725.79	709.33	651.92	552.22	431.28	293.07	197.48	206.28	314.41	464.22	603.33	720.1		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	288.56	225.37	185.29	104.49	50.14	0	0	0	0	108.73	203.29	294.51		
			I	I		I		Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1460.38	(98)
Snace	a haatin	a requir	ement in	k\/\/h/m2	2/vear								20.4	(99)
·		• •			7y c ai								29.4	
		- J	quiremer											
Calcu			July and	Ĭ	l .	Ĭ					·			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
					1	 		and exte		<u> </u>				(400)
(100)m=		0	0	0	0	465.69	366.61	375.42	0	0	0	0		(100)
	ation fac				I -					_	I -			(404)
(101)m=		0	0	0	0	0.88	0.92	0.9	0	0	0	0		(101)
			Vatts) = (ì ´	<u> </u>	ĭ		1			1			(400)
(102)m=		0	0	0	0	410.48	337.41	339.42	0	0	0	0		(102)
			T					e Table		_	ı .	_		(400)
(103)m=		0	0	0	0	740.05	708.86	662.71	0	0	0	0		(103)
•			<i>ement to</i> (104)m <			dwelling,	continue	ous (kW	h') = 0.02	24 x [(10)3)m – (102)m [:	x (41)m	
(104)m=		0	0	0	0	237.3	276.37	240.53	0	0	0	0		
(104)111=						207.0	210.01	240.00		= Sum(<u> </u>	=	754.19	(104)
Cooled	d fraction	1								,	area ÷ (4		0.83	(104)
			able 10b)					10-	ooolea .	arca . (-	-, –	0.03	(100)
(106)m=		0	0	O	0	0.25	0.25	0.25	0	0	0	0		
			l	l		l		l	Total	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n		(-00			` ′
(107)m=		0	0	0	0	49.21	57.31	49.88	0	0	0	0		
			ļ.	Į.		Į.		ļ.	Total	= Sum(107)	=	156.4	(107)
Space	cooling	requirer	ment in k	«Mh/m²/ν	/ear					· · + (4) =	,		3.15	(108)
		-				coborne			(101)	, . (.) –			5.15	
			nts – Cor											
								ting prov (Table 1			uriity SCf	ieme.	0	(301)
	-			•		-	_	(1 abio 1	., 5 11 11	0110				믁
Fractio	n of spa	ce heat	from co	mmunity	system	1 – (301	1) =						1	(302)

The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community heat pump		our other heat sources; the	e latter 1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1](304a)
Factor for control and charging method (Table 4c(3)) for commun	ity heating system	[1](305)
Distribution loss factor (Table 12c) for community heating system		L	1.05](306)
Space heating		L	kWh/year	
Annual space heating requirement		Γ	1460.38	7
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1533.4	(307a)
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1702.83	-]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	1787.97	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] =	33.21	(313)
Cooling System Energy Efficiency Ratio		Ī	6.59	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	23.74	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		108.34	(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	o) + (330g) =	108.34	(331)
Energy for lighting (calculated in Appendix L)		Ī	230.5	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		Ī	-482.91	(333)
Electricity generated by wind turbine (Appendix M) (negative qua	ntity)	Ī	0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using to	two fuels repeat (363) to	(366) for the second fuel	289	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.52	596.47	(367)
Electrical energy for heat distribution [(3	313) x	0.52	17.24	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372	=	613.71	(373)
CO2 associated with space heating (secondary) (3	09) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		613.71	(376)
CO2 associated with space cooling (3	15) x	0.52	12.32	(377)

CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 56.23 CO2 associated with electricity for lighting (379) (332))) x 0.52 119.63 Energy saving/generation technologies (333) to (334) as applicable x 0.01 = Item 1 (380) -250.63 0.52 Total CO2, kg/year sum of (376)...(382) = (383)551.25 **Dwelling CO2 Emission Rate** $(383) \div (4) =$ (384)11.1 El rating (section 14) (385)92.2

			lloor D) otoilo:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20		User D	Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address	Flat 33					
1. Overall dwelling dime	-	Jion Roac	ı, 300 10	, 11 VV						
1. Overall awelling aims	лююто.		Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.75	(2a) =	136.62	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) 4	19.68	(4)			_		
Dwelling volume			•		(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	136.62	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	T + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				Ī	2	x -	10 =	20	(7a)
Number of passive vents	;				Ē	0	x	10 =	0	(7b)
Number of flueless gas fi	ires				F	0	x 4	40 =	0	(7c)
, and the second					L					` ′
								Air ch	nanges per ho	our
Infiltration due to chimne	·					20		÷ (5) =	0.15	(8)
If a pressurisation test has b		ded, procee	d to (17), (otherwise (continue fr	om (9) to ((16)			٦
Number of storeys in the Additional infiltration	ne aweiling (ns)						[(0)	-1]x0.1 =	0	(9)
Structural infiltration: 0	25 for steel or timber	frame or	0 35 fo	r masoni	v constr	uction	[(9)]	- i jx0. i =	0	(10)
	resent, use the value corre				•	dottori			0	(''')
deducting areas of openii	• / .									_
If suspended wooden t	•	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en		لم مرمنسه							0	(13)
Percentage of windows Window infiltration	s and doors draught s	stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
Air permeability value,	a50. expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	5	(17)
If based on air permeabil			•	•	•				0.4	(18)
Air permeability value applie	es if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -		9)] =			0.85	(20)
Infiltration rate incorporat	-			(21) = (18) x (20) =				0.34	(21)
Infiltration rate modified f		1		Ι.			1		1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp	1 1			T			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	J	
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]	

Adjusted infiltration rate (allowing for shelte	and wind speed) =	= (21a) x (22a)m				
0.43		0.31 0.34	0.36 0.	.38 0.4		
Calculate effective air change rate for the a		1 0.0 1 0.0 1	0.00		l	
If mechanical ventilation:					0	(23a)
If exhaust air heat pump using Appendix N, (23b) =	(23a) × Fmv (equation ((N5)), otherwise (23)	b) = (23a)		0	(23b)
If balanced with heat recovery: efficiency in % allow	ing for in-use factor (from	m Table 4h) =			0	(23c)
a) If balanced mechanical ventilation with	heat recovery (MV	'HR) (24a)m = (2)	2b)m + (23b)) × [1 – (23c)	÷ 100]	
(24a)m= 0 0 0 0 0	0 0	0 0	0	0 0		(24a)
b) If balanced mechanical ventilation with	out heat recovery (MV) (24b)m = (2	2b)m + (23b))	1	
(24b)m= 0 0 0 0 0	0 0	0 0	0	0 0		(24b)
c) If whole house extract ventilation or po if $(22b)m < 0.5 \times (23b)$, then $(24c) = (24c)$	•		0.5 × (23b)			
(24c)m= 0 0 0 0 0	0 0	0 0	0	0 0		(24c)
d) If natural ventilation or whole house poif (22b)m = 1, then (24d)m = (22b)m	•		: 0.5]		'	
(24d)m= 0.59 0.59 0.59 0.57 0.5	7 0.55 0.55	0.55 0.56	0.57 0.	.57 0.58		(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24	4d) in box (25)	•		ı	
(25)m= 0.59 0.59 0.59 0.57 0.5	7 0.55 0.55	0.55 0.56	0.57 0.	.57 0.58		(25)
3. Heat losses and heat loss parameter:	·				·	
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²-l		
Doors	2.12 ×		2.12	NO/III I	(10)	(26)
Windows Type 1		1/[1/(1.4)+ 0.04] =	3.63			(27)
Windows Type 2		1/[1/(1.4)+ 0.04] =				, ,
			10.02			(27)
	28.39 X		5.11			(29)
Walls Type2 10.2 0	10.2 ×	0.18 =	1.84		┥	(29)
Walls Type3 7.56 0	7.56 ×	0.18 =	1.36		_	(29)
Roof 49.68 0	49.68 ×	0.13 =	6.46			(30)
Total area of elements, m ²	108.25					(31)
Party wall	18.97 ×	0 =	0			(32)
* for windows and roof windows, use effective window ** include the areas on both sides of internal walls and		g formula 1/[(1/U-vai	ue)+0.04] as giv	ren in paragraph	1 3.2	
Fabric heat loss, W/K = S (A x U)	,	(26)(30) + (32) =			30.54	(33)
Heat capacity Cm = S(A x k)		((28)	(30) + (32) + (32a)(32e) =	1472.62	(34)
Thermal mass parameter (TMP = Cm ÷ TFA	A) in kJ/m²K	Indic	ative Value: Med	dium	250	(35)
For design assessments where the details of the cons can be used instead of a detailed calculation.	•	precisely the indicativ	e values of TMF	P in Table 1f		` /
Thermal bridges : S (L x Y) calculated using	Appendix K				12.65	(36)
if details of thermal bridging are not known (36) = 0.05	x (31)					
Total fabric heat loss		(33)	+ (36) =		43.19	(37)
Ventilation heat loss calculated monthly		(38)n	$n = 0.33 \times (25) \text{m}$	n x (5)	1	
Jan Feb Mar Apr M	ay Jun Jul	Aug Sep	Oct N	lov Dec		
(38)m= 26.7 26.54 26.38 25.64 25	5 24.85 24.85	24.73 25.1	25.5 25	5.78 26.08		(38)
Heat transfer coefficient, W/K		(39)n	n = (37) + (38)m		_	
(39)m= 69.89 69.73 69.57 68.83 68.	69 68.04 68.04	67.92 68.29	68.69 68	69.27		_
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) - http:/	//www.stroma.com		Average = Sum	1(39) ₁₁₂ /12=	68.8 β age 2	2 of (3 4 9)

Heat loss para	meter (l	HP) W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.41	1.4	1.4	1.39	1.38	1.37	1.37	1.37	1.37	1.38	1.39	1.39	ı	
()										Sum(40) ₁ .		1.39	(40)
Number of day	s in mo	nth (Tab	le 1a)							(),			` ^
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ı	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31	ı	(41)
L!										•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
A												ı	
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.		68		(42)
Annual average											.12	ı	(43)
Reduce the annua not more that 125	-				-	-	to achieve	a water us	se target o	of Total			
							T .		I -		<u> </u>	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	ı litres pei	r day for ea	ach month	Va,m = ta	ctor from	able 1c x	(43)					ı	
(44)m= 81.53	78.56	75.6	72.63	69.67	66.7	66.7	69.67	72.63	75.6	78.56	81.53		_
Energy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd.r	n x nm x D	OTm / 3600			ım(44) ₁₁₂ = ables 1b. 1		889.39	(44)
(45)m= 120.9	105.74	109.12	95.13	91.28	78.77	72.99	83.76	84.76	98.78	107.82	117.09	ı	
` '		<u> </u>		l	l	l	l	-	<u>I</u> Total = Su	I ım(45) ₁₁₂ =	<u> </u>	1166.14	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rota. Ou	(10)112	ı		` ′
(46)m= 18.14	15.86	16.37	14.27	13.69	11.82	10.95	12.56	12.71	14.82	16.17	17.56	ı	(46)
Water storage	loss:			<u> </u>	<u> </u>	<u> </u>	<u> </u>	l	<u> </u>	<u> </u>			
Storage volume	e (litres)) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150	ı	(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot water	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage												i	
a) If manufacti	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	55	:	(48)
Temperature fa	actor fro	m Table	2b							0.	54	ı	(49)
Energy lost from		•					(48) x (49)) =		0.	84	ı	(50)
b) If manufacti			-									ı	
Hot water stora	•			e 2 (kW	h/litre/da	ıy)					0		(51)
If community he Volume factor	_		on 4.3									ı	(50)
Temperature fa			2h							_	0	ı	(52) (53)
•							(47) v (E1)) x (52) x (E2) _			ı	, ,
Energy lost from Enter (50) or (_	, KVVII/ye	zai			(47) X (31)) X (32) X (33) =	-	0 84	ı	(54) (55)
Water storage	, ,	,	or each	month			((56)m - (55) × (41)ı	m	0.	04		(00)
					i	1	., , ,		ī	1	- 1	ı	(==)
(56)m= 25.98 If cylinder contains	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	iv ⊔	(56)
-				· · ·		1	1			1			(57)
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	ı	. ,
Primary circuit	•	•			50 \	(EO) 0.5	· · · · · · · · · · · · · · · · · · ·				0		(58)
Primary circuit				,	•	. ,	, ,		r tharma	otot)			
(modified by					ı —	ı —				- 	20.00	ı	(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Camb:	laaa aa	المعامدة	fo.,	مائدہ محمد ما	(C4)	(00) . (OCE (44	١							
(61)m=	0	alculated 0	or eac	n month	$\frac{(61)m = 0}{10}$	(60) ÷ 3	0 × (41)m o		0	0	Ιο	0	1	(61)
L		ļ				<u> </u>		ļ			<u> </u>	ļ	ļ	(F0)m + (61)m	(01)
(62)m=	170.15		158.36		140.52	126.42		13:		132.41	148.02	155.48	166.33	(59)m + (61)m]	(62)
L		calculated			ļ							ļ		J	(02)
		al lines if									i contribu	ion to wate	er nealing)		
(63)m=	0	0	0	0	0	0	0	0		0	0	0	0	1	(63)
L	from w	/ater hea	ter		ļ.						ļ			J	
(64)m=	170.15		158.36	142.79	140.52	126.42	122.23	13	3	132.41	148.02	155.48	166.33	1	
` ' L		1		ı	1		.1		Outp	out from w	ter heate	r (annual)₁	12	1745.93	(64)
Heat ga	ains fro	m water	heating	ı, kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	า + (6	1)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	 .]	-
(65)m=	79.59	70.74	75.68	69.75	69.74	64.31	63.66	67.2	_	66.31	72.24	73.97	78.33	ĺ	(65)
inclu	de (57)	m in calc	culation	of (65)m	only if c	vlinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	ı neating	
		ains (see		. ,		,			<u> </u>				• •		
		ns (Table			,										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec]	
(66)m=	84.03	84.03	84.03	84.03	84.03	84.03	84.03	84.0	03	84.03	84.03	84.03	84.03	1	(66)
Lighting	g gains	(calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				•	
(67)m=	13.1	11.64	9.46	7.16	5.36	4.52	4.89	6.3	5	8.52	10.82	12.63	13.46		(67)
Applian	ices ga	ains (calc	ulated i	n Appen	dix L, eq	uation I	_13 or L1	3a), a	also	see Ta	ble 5		•	-	
(68)m=	146.4	147.92	144.09	135.94	125.66	115.99	109.53	108.	.01	111.84	119.99	130.27	139.94]	(68)
Cookin	g gains	s (calcula	ted in A	Appendix	L, equat	ion L15	or L15a), als	0 SE	e Table	5	-		•	
(69)m=	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.	4	31.4	31.4	31.4	31.4]	(69)
Pumps	and fa	ıns gains	(Table	5a)											
(70)m=	3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses	e.g. e	vaporatio	n (nega	ative valu	ies) (Tab	le 5)								_	
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.	23	-67.23	-67.23	-67.23	-67.23		(71)
Water h	neating	gains (T	able 5)											_	
(72)m=	106.98	105.27	101.71	96.88	93.74	89.32	85.57	90.3	38	92.09	97.09	102.74	105.28		(72)
Total in	nterna	l gains =				(60	6)m + (67)n	n + (68	8)m +	+ (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m=	317.7	316.04	306.48	291.2	275.96	261.04	251.19	255.	.95	263.66	279.11	296.86	309.89		(73)
	ar gain														
•		calculated	•				•	ations t	to co		e applical		tion.	_	
Orienta		Access F Table 6d	actor	Area m²	l		ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
Coat						_		1 1						. ,	7,
East	0.9x	0.77			74	X	19.64	_ X]		0.63	_ ×	0.7	=	16.45	(76)
East	0.9x	0.77	===		74	x	38.42] X]		0.63	×	0.7	=	32.17	[(76)
East	0.9x	0.77			74	x	63.27	X		0.63	x	0.7	=	52.98	[(76)
East	0.9x	0.77			74	-	92.28	X		0.63	_ ×	0.7	=	77.27	(76)
East	0.9x	0.77)	2.	74	X	113.09	X		0.63	Х	0.7	=	94.7	(76)

	_								_						
East	0.9x	0.77	X	2.7	' 4	X	1	15.77	X	0.63	X	0.7	=	96.94	(76)
East	0.9x	0.77	X	2.7	' 4	X	1	10.22	X	0.63	X	0.7	=	92.29	(76)
East	0.9x	0.77	X	2.7	' 4	X	9	94.68	x	0.63	X	0.7	=	79.28	(76)
East	0.9x	0.77	X	2.7	' 4	X	7	'3.59	x	0.63	X	0.7	=	61.62	(76)
East	0.9x	0.77	Х	2.7	' 4	X	4	15.59	X	0.63	X	0.7	=	38.18	(76)
East	0.9x	0.77	Х	2.7	'4	X	2	24.49	X	0.63	X	0.7	=	20.51	(76)
East	0.9x	0.77	х	2.7	'4	X	1	6.15	x	0.63	x	0.7	=	13.52	(76)
West	0.9x	0.77	X	7.5	56	X	1	9.64	X	0.63	X	0.7	=	45.38	(80)
West	0.9x	0.77	x	7.5	56	x	3	88.42	x	0.63	X	0.7	=	88.77	(80)
West	0.9x	0.77	х	7.5	56	X	6	3.27	x	0.63	x	0.7	=	146.19	(80)
West	0.9x	0.77	x	7.5	56	X	9	2.28	x	0.63	x	0.7	_ =	213.21	(80)
West	0.9x	0.77	x	7.5	56	X	1	13.09	x	0.63	x	0.7		261.29	(80)
West	0.9x	0.77	X	7.5	56	X	1	15.77	x	0.63	x	0.7	=	267.48	(80)
West	0.9x	0.77	x	7.5	56	X	1	10.22	x	0.63	x	0.7	<u> </u>	254.65	(80)
West	0.9x	0.77	X	7.5	56	X	9	94.68	x	0.63	x	0.7	=	218.74	(80)
West	0.9x	0.77	X	7.5	56	X	7	73.59	x	0.63	x	0.7	=	170.02	(80)
West	0.9x	0.77	х	7.5	56	X	4	l5.59	x	0.63	x	0.7	=	105.33	(80)
West	0.9x	0.77	X	7.5	56	X	2	24.49	x	0.63	x	0.7	=	56.58	(80)
West	0.9x	0.77	Х	7.5	56	X	1	6.15	x	0.63	x	0.7	<u> </u>	37.32	(80)
Solar g	ains in 61.82	watts, ca	alculated	for eac 290.48	n month 355.99	$\overline{}$	64.42	346.95	(83)m 298	n = Sum(74)m .02 231.65	(82)m		50.84]	(83)
Total ga	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts					•	4	
(84)m=	379.52	436.98	505.65	581.68	631.96	6	25.47	598.14	553	.97 495.3	422.6	2 373.94	360.74]	(84)
7. Mea	an inter	nal temp	erature	(heating	seasor	า)									
				`			area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for ga	ains for I	iving are	ea, h1,n	n (s	ee Ta	ıble 9a)							_
[Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.99	0.97	0.93	0.82		0.65	0.49	0.5	0.79	0.96	0.99	1	1	(86)
Mean	interna	l tempera	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)		-		_	
(87)m=	19.57	19.75	20.07	20.47	20.78	_	20.94	20.99	20.		20.44	19.93	19.54]	(87)
Temp	erature	during h	eating n	eriods ir	rest of	: 4w	Ælling	from Ta	ahle (9, Th2 (°C)				_	
(88)m=	19.76	19.76	19.76	19.77	19.78	_	19.79	19.79	19.	` 	19.78	19.77	19.77	1	(88)
L								<u> </u>			!	 		J	
(89)m=	0.99	tor for ga	0.96	0.9	0.76	_	0.54	0.36	(9a) 0.4	11 0.7	0.93	0.99	0.99	1	(89)
L		<u> </u>						<u> </u>		!		0.00	0.00	J	()
Г					1	Ť	•	i	r i —	to 7 in Tab	'	10.40	17.00	1	(90)
(90)m=	17.9	18.16	18.61	19.18	19.57	1	19.75	19.78	19.		19.15	18.43 ving area ÷ (17.86	0.50	_ ``
												viriy alea - (- , –	0.58	(91)
Г						$\overline{}$			_	– fLA) × T2	_			7	
(92)m=	18.87	19.08	19.46	19.92	20.27	1	20.44	20.48	20.		19.9		18.84]	(92)
Apply	adjustr	nent to th	ne mean	interna	tempe	ratu	ire fro	m Table	4e,	where appr	opriate	:			

												l	
` ′	3.87 19.			20.27	20.44	20.48	20.48	20.36	19.9	19.3	18.84		(93)
8. Space		·											
			l temperatu ins using T		ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	$\overline{}$		ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation				Iviay	1 0011	<u> </u>	/wg	Гоор		1101	200		
	.99 0.9			0.78	0.6	0.43	0.49	0.75	0.94	0.98	0.99		(94)
Useful ga	ains, hm(3m , W =	: (94)m x (8	34)m	ı		!		<u>I</u>	!		l	
(95)m= 37	6.05 429	.6 486	.33 525.22	494.96	375.74	259.92	270.08	371.26	395.94	367.69	358.05		(95)
Monthly a	average (external	temperatur	e from T	able 8	•	•	•			•	'	
(96)m= 4	.3 4.	6.5	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 in	ternal temp	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-	<u> </u>		
` '	8.33 989			588.84	397.55	264.07	276.85	427.65	638.63	841.65	1013.85		(97)
			nt for each	1	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1	· · · · · · · · · · · · · · · · · · ·		
(98)m= 47	7.86 375	.94 308.	.78 168.2	69.84	0	0	0	0	180.56	341.25	487.92		_
							Tota	ıl per year	(kWh/yea	r) = Sum(9	08)15,912 =	2410.35	(98)
Space he	eating red	Juiremer	nt in kWh/m	²/year								48.52	(99)
9a. Energy	y require	nents –	Individual I	neating s	ystems i	ncluding	micro-C	CHP)					
Space he						J							
Fraction	of space	heat fror	m seconda	ry/supple	ementary	system						0	(201)
Fraction	of space	heat fror	m main sys	tem(s)			(202) = 1	- (201) =				1	(202)
Fraction	of total h	eating fro	om main sy	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency	of main	space h	eating syst	em 1								93.5	(206)
•		-	pplementa		a system	ղ. %						0	(208)
		<u> </u>	ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ′
			nt (calculate		I	Jui	L	Гоер	OCI	INOV	Dec	KVVII/yea	ai
· —	7.86 375		<u> </u>	69.84	0	0	0	0	180.56	341.25	487.92		
(211)m – J	[(08)m v	 (204\1_\	x 100 ÷ (2	06) 1	Į	ļ	ļ	ļ			<u> </u>		(211)
` ′ ┌──	1.08 402	` 	 	74.7	0	0	0	0	193.11	364.97	521.84		(211)
				1				l I (kWh/yea		211) _{1,510,-1}		2577.91	(211)
Space he	eating fue	l (secon	dary), kWh	/month						10,10			」 ` ′
$= \{[(98)m]\}$	_	•	• ,	/111 0 11ti1									
	0 0	1	<u> </u>	0	0	0	0	0	0	0	0		
		•	I				Tota	ıl (kWh/yea	ar) =Sum(2 <mark>15)</mark> _{15,101}		0	(215)
Water hea	ating										ļ		_
	•	neater (d	calculated a	above)									
17	0.15 150	22 158.	.36 142.79	140.52	126.42	122.23	133	132.41	148.02	155.48	166.33		_
Efficiency	of water	heater										79.8	(216)
(217)m= 87	'.42 87.	16 86.	57 85.25	83.06	79.8	79.8	79.8	79.8	85.34	86.85	87.52		(217)
Fuel for w		•											
(219)m =				160.40	150.40	150.47	166.07	165.00	170 44	170.04	100.00		
(219)m= 19	4.63 172	34 182	.94 167.49	169.18	158.42	153.17	166.67	165.93 al = Sum(2	173.44 19a) =	179.01	190.06	2072 07	7(240)
Annual +-	tala						1016	– Juiii(Z		Mbbas		2073.27	(219)
Annual to Space hea		used. m	ain system	1					K	Wh/yea		kWh/year 2577.91	1
,	J 1 31	,	,								ļ		_

Water heating fuel used				2073.27	٦
Electricity for pumps, fans and electric keep-hot					_
central heating pump:		[30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (2	30a)(230g) =		75	(231)
Electricity for lighting				231.36	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fact kg CO2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	556.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	447.83	(264)
Space and water heating	(261) + (262) + (263) + (264)	=		1004.66	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	120.07	(268)
Total CO2, kg/year	S	um of (265)(271) =		1163.65	(272)

TER =

(273)

34.55

			User D	Notaile:						
			USELL					0.70.0	22522	
Assessor Name:	Lindsey Arı			Strom					035000	
Software Name:	Stroma FS		_	Softwa				versic	n: 1.0.5.9	
			Property		Flat 34					
Address :		Aldrington Roa	ad, SW16	1TW						
1. Overall dwelling dime	ensions:									
			Are	a(m²)		Av. He	eight(m)	_	Volume(m	<u>-</u>
Ground floor				71.42	(1a) x	2	2.75	(2a) =	196.4	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	In) 7	71.42	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	196.4	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0	+ 0	_ + _	0	Ī - Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive vents	3				Ė	0	x	10 =	0	(7b)
Number of flueless gas f	ires				F	0	x	40 =	0	(7c)
					L					
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = $(6a)+(6b)+$	(7a)+(7b)+((7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has t			ed to (17),	otherwise o	ontinue fr	rom (9) to	(16)			_
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0					•	ruction			0	(11)
if both types of wall are p deducting areas of openi			to the grea	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dra	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic metr	es per ho	our per s	quare m	etre of e	envelope	e area	3	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20] +$	-(8), otherw	rise (18) = (16)				0.15	(18)
Air permeability value applie	es if a pressurisation	on test has been de	one or a de	gree air pe	rmeability	is being u	ised			
Number of sides sheltered	ed								1	(19)
Shelter factor				(20) = 1 -	[0.0 75 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	x (20) =				0.14	(21)
Infiltration rate modified	for monthly win	d speed							_	
Jan Feb	Mar Apr	May Jun	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 (22a)m = (2	2)m ÷ 1									
(000)	<u>- / </u>	1.00 0.05	0.05	1 0 00		1.00	1 446	T 440	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 infiltrat	ion rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16]	
Calculate effecti		_	rate for t	he appli	cable ca	se	!			!			— ,
If mechanical			andis N. (O	2h) (22a) Fm. (a	auatian (N	VIEVV otho	muiaa (22h) (220)			0.5	(23a
If exhaust air hea) = (23a)			0.5	(23b
If balanced with h		-	-	_					21.) (001) [4 (00.)	76.5	(23c)
a) If balanced (24a)m= 0.29	mecna _{0.29}	0.29	ntilation 0.27	0.27	0.25	0.25	1R) (248 0.25	0.26	 	23b) x [1 – (23c) 0.28) ÷ 100]]	(24a
` '	!					<u> </u>	ļ	<u>!</u>	0.27	ļ	0.20	J	(2+α
b) If balanced (24b)m= 0	mecha 0	o linical ve	ntilation	without 0	neat rec		0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (24)$	20)m + (. 0	230)	0	1	(24b
· · ·			_								0	J	(240)
c) If whole hou				-	•				5 × (23b	p)	•	1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c
d) If natural ve if (22b)m :					•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air cl	hange ı	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.29	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losses	and he	at loss p	paramete	er:									
ELEMENT	Gros area	S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k :J/K
Doors		` ,			2.12	x	1	=	2.12	$\stackrel{\prime}{\Box}$			(26)
Windows Type 1	1				5.74	x1,	/[1/(1.3)+	0.04] =	7.09				(27)
Windows Type 2	2				14.71	x1,	/[1/(1.3)+	0.04] =	18.18	Ħ			(27)
Windows Type 3	3				2.85	x1,	/[1/(1.3)+	0.04] =	3.52	Ħ			(27)
Walls Type1	77.1	1	23.3	\neg	53.81	x	0.15	─	8.07	Ħ ſ			(29)
Walls Type2	10.2		2.12	=	8.08	x	0.14	=	1.14	≓ i		=	(29)
Walls Type3	7.56		0	=	7.56	x	0.13	=	1	≓ i		-	(29)
Roof	71.42		0	=	71.42	<u> </u>	0.11	-	7.86	=		-	(30)
Total area of ele					166.2	=	<u> </u>						(31)
* for windows and ro	oof windo	ws, use e			alue calcul		formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	n 3.2	(0.)
Fabric heat loss							(26)(30)) + (32) =				48.98	(33)
Heat capacity C		`	,					((28).	(30) + (32	2) + (32a).	(32e) =	1615.08	(34)
Thermal mass p	aramet	er (TMF	P = Cm ÷	- TFA) in	kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assessment can be used instead				constructi	on are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridges	s : S (L :	x Y) cal	culated u	using Ap	pendix ł	<						16.45	(36)
if details of thermal l		are not kn	own (36) =	= 0.05 x (3	1)								<u> </u>
Total fabric heat								(33) +	(36) =			65.43	(37)
Ventilation heat					_		l .		= 0.33 × (<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(22)
(38)m= 19.08	18.86	18.63	17.51	17.28	16.16	16.16	15.93	16.61	17.28	17.73	18.18	J	(38)
Heat transfer co						T	1	(39)m	= (37) + (38)m		1	
(39)m= 84.51	84.29	84.06	82.94	82.72	81.59	81.59	81.37	82.04	82.72	83.17	83.62		 .
Stroma FSAP 2012	Version:	1.0.5.9 (S	AP 9.92) -	http://ww	w.stroma.d	com			Average =	Sum(39) ₁	12 /12=	82.8 β ag	e 2 of 39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.18	1.18	1.18	1.16	1.16	1.14	1.14	1.14	1.15	1.16	1.16	1.17		
							ı	,	Average =	Sum(40) ₁ .	12 /12=	1.16	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	1	1	1		ı	1	i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed i			se target o		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 226	1 30.	1	_ = ••		
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
	!	!	<u> </u>	!	<u> </u>	!	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1060.23	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
If instantaneous v	votor boot	ina at naint	of upo /pa	a hat water	r otorogol	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- [1390.13	(45)
If instantaneous v	i	· ·	·				, ,	, , , I	1	1			(40)
(46)m= 21.62 Water storage	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110) litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kVVI	n/day):				1	.2		(48)
Temperature f										0	.6		(49)
Energy lost from b) If manufact		_	-		or ic not		(48) x (49)) =		0.	72		(50)
Hot water stor			-								0		(51)
If community h	-			•		,							` '
Volume factor											0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	72		(55)
Water storage	loss cal	culated t	for each	month	_	_	((56)m = ((55) × (41)	m 	_			
(56)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	ix H	
(57)m= 22.32	20.16	22.32	21.6	22.32	21.6	22.32	22.32	21.6	22.32	21.6	22.32		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	•	,			59)m =	(58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wa	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Comb:	laaa aa	ا مدامد ما	fo., o.o.	. حاد		(04)	(00	v . 20	CF (44)	١							
Ī		alculated		Cn	i		(60 T		· ` `	_		0		Τ ο		٦	(61)
(61)m=	0	0	0	ᆜ	0	0	Ļ	0	0	(22)		0	0	0 (40)	0		(01)
1		_		_			_			`	_		` 	``	`	+ (59)m + (61)m ¬	(62)
(62)m=	189.71	167.23	175.6		157.52	154.4		38.01	132.59	145		145.15	163.33		185.16		(62)
			_					-					r contrib	ution to wat	er heating))	
` I		al lines if		(S &			ap T		·	-		•				٦	(63)
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0	J	(63)
· 1		ater hea			457.50	4544	<u> </u>	20.04	1,00.50		40	145.45	100.00	170.05	1,05,40	7	
(64)m=	189.71	167.23	175.6	6	157.52	154.4	13	38.01	132.59	145		145.15	163.33		185.16		7(64)
									1					er (annual)		1926.82	(64)
Ĭ				Ť			_		- ` ´ 	r È	_	_	-``	n + (57)m	- ` ´	n] ¬	(0-)
(65)m=	84.39	74.85	79.72		73	72.65	<u> </u>	6.51	65.4	69.		68.88	75.62		82.88		(65)
inclu	de (57)	m in calc	culatio	n o	f (65)m	only if o	ylir	nder i	s in the o	llewb	ing	or hot w	ater is	from com	munity	heating	
5. Int	ernal g	ains (see	Table	e 5	and 5a)):											
Metabo	olic gai	ns (Table	5), W	/atts	S				i				1		1	_	
	Jan	Feb	Ma	r	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m=	114	114	114		114	114	·	114	114	11	4	114	114	114	114		(66)
Lighting	g gains	(calcula	ted in	Apı	pendix I	L, equat	ion	L9 o	r L9a), a	lso s	ee T	Table 5				_	
(67)m=	17.88	15.88	12.92	2	9.78	7.31	6	6.17	6.67	8.6	67	11.63	14.77	17.24	18.38		(67)
Appliar	nces ga	ains (calc	ulated	l in	Append	dix L, eq	uat	ion L	13 or L1	3a),	also	see Tal	ble 5				
(68)m=	200.59	202.67	197.4	2	186.26	172.16	15	58.91	150.06	147	.98	153.23	164.39	178.49	191.74	7	(68)
Cookin	g gains	s (calcula	ited in	Ар	pendix	L, equa	tion	L15	or L15a)	, als	o se	e Table	5	-		_	
(69)m=	34.4	34.4	34.4		34.4	34.4	3	34.4	34.4	34	.4	34.4	34.4	34.4	34.4	7	(69)
Pumps	and fa	ıns gains	(Tabl	e 5	a)									•		_	
(70)m=	0	0	0		0	0		0	0	0)	0	0	0	0	7	(70)
Losses	e.g. e	vaporatio	n (ne	gati	ve valu	es) (Tab	le :	5)					•	-		_	
(71)m=	-91.2	-91.2	-91.2	2	-91.2	-91.2	-:	91.2	-91.2	-91	.2	-91.2	-91.2	-91.2	-91.2	7	(71)
Water l	heating	gains (T	able 5	 5)					•	•				•	•	_	
(72)m=	113.42	111.38	107.1	5	101.38	97.64	9	2.38	87.9	93.	64	95.67	101.64	108.37	111.39	7	(72)
Total i	nterna	l gains =						(66))m + (67)m	1 + (68	3)m +	- (69)m + ((70)m +	(71)m + (72)m	_	
(73)m=	389.1	387.14	374.6	9	354.62	334.32	3′	14.66	301.83	307	.49	317.74	338	361.3	378.71	7	(73)
6. Sol	ar gain	s:															
Solar g	ains are	calculated	using s	olar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e applic	able orienta	tion.		
Orienta		Access F			Area			Flu				g_		FF		Gains	
		Table 6d			m²			Tal	ble 6a		Т	able 6b		Table 6c		(W)	
East	0.9x	0.77		x	5.7	′4	x	1	19.64	x		0.5	x	0.7	=	27.34	(76)
East	0.9x	0.77		x	5.7	4	x	3	88.42	x		0.5	x	0.7		53.49	(76)
East	0.9x	0.77		x	5.7	'4	x	6	3.27	x		0.5	x	0.7	=	88.09	(76)
East	0.9x	0.77		x	5.7	4	x	9	92.28	x		0.5	×	0.7		128.48	(76)
East	0.9x	0.77		x	5.7	'4	x	1	13.09	x		0.5	×	0.7	<u> </u>	157.45	(76)

East	0.9x	0.77		x	5.74	7 x		15.77] x		0.5	7 x l	0.7		161.18	(76)
East	0.9x	0.77		X	5.74] ×		10.22] x		0.5		0.7	= =	153.45	(76)
East	0.9x	0.77		x	5.74	⊒ ק ×		94.68]]	H	0.5	_	0.7	= =	131.81	(76)
East	0.9x	0.77		x	5.74	」 」×		3.59]]		0.5	_	0.7		102.45	(76)
East	0.9x	0.77	\equiv	x	5.74	┙ ╴ ×		15.59]]		0.5	_	0.7	= =	63.47	(76)
East	0.9x	0.77		x	5.74	╣		24.49]]		0.5	_	0.7	= =	34.09	(76)
East	0.9x	0.77		x	5.74	۱ ×		6.15]] x		0.5	_	0.7		22.49	(76)
South	0.9x	0.77		x	2.85	۲ ×		6.75)] x		0.5	×	0.7		32.32	(78)
South	0.9x	0.77		x	2.85	i x	7	'6.57	X		0.5	×	0.7	=	52.93	(78)
South	0.9x	0.77		x	2.85	i x	9	7.53	X		0.5	×	0.7		67.42	(78)
South	0.9x	0.77		x	2.85	i x	1	10.23	X		0.5	×	0.7	=	76.2	(78)
South	0.9x	0.77		x	2.85	i x	1	14.87	x		0.5	×	0.7		79.41	(78)
South	0.9x	0.77		x	2.85	i x	1	10.55	X		0.5	T x	0.7	=	76.42	(78)
South	0.9x	0.77		x	2.85	i x	1	08.01	x		0.5	×	0.7		74.67	(78)
South	0.9x	0.77		x	2.85	i x	1	04.89	x		0.5	×	0.7	=	72.51	(78)
South	0.9x	0.77		x	2.85	i x	1	01.89	X		0.5	×	0.7		70.43	(78)
South	0.9x	0.77		x	2.85	i x	8	32.59	X		0.5	×	0.7	=	57.09	(78)
South	0.9x	0.77		x	2.85	i x	5	55.42	x		0.5	×	0.7	=	38.31	(78)
South	0.9x	0.77		x	2.85	i ×		40.4	x		0.5	×	0.7	=	27.93	(78)
West	0.9x	0.77		x	14.71	T x	1	9.64	x		0.5	x	0.7	=	70.07	(80)
West	0.9x	0.77		x	14.71	×	3	88.42	x		0.5	x	0.7	=	137.08	(80)
West	0.9x	0.77		x	14.71	Īx	6	3.27	x		0.5	×	0.7		225.75	(80)
West	0.9x	0.77		x	14.71	×	9	2.28	x		0.5	x	0.7	=	329.25	(80)
West	0.9x	0.77		x	14.71	×	1	13.09	X		0.5	x	0.7	=	403.5	(80)
West	0.9x	0.77		x	14.71	×	1	15.77	x		0.5	x	0.7	=	413.06	(80)
West	0.9x	0.77		x	14.71	×	1	10.22	x		0.5	x	0.7	=	393.25	(80)
West	0.9x	0.77		x	14.71	×	9	94.68	X		0.5	x	0.7	=	337.79	(80)
West	0.9x	0.77		x	14.71	×	7	'3.59	X		0.5	x	0.7	=	262.56	(80)
West	0.9x	0.77		X	14.71	X		5.59	X		0.5	x	0.7	=	162.66	(80)
West	0.9x	0.77		X	14.71	×	2	24.49	X		0.5	x	0.7	=	87.37	(80)
West	0.9x	0.77		X	14.71	×	1	6.15	X		0.5	x	0.7	=	57.63	(80)
_					for each mor				ř		m(74)m		_	1	7	(2.2)
(83)m=	129.74	243.5	381.		533.92 640.3		650.66	621.36	542	.12	435.44	283.22	159.78	108.04		(83)
_				_	$\frac{(84)m = (73)}{200.55}$	_	` '		046	<u> </u>	750 40	604.00	504.00	100.75	7	(84)
(84)m=	518.83	630.64	755.		888.55 974.6		965.32	923.2	849	9.6	753.18	621.22	521.08	486.75		(04)
					heating seas					 4	(0.0)					
•		•		•	eriods in the l	-			ole 9	, Ih1	(°C)				21	(85)
Utilisa		Ť		$\overline{}$	ving area, h1	T			Ι ,		Can	O a t	Nev	Daa	7	
(86)m=	Jan 0.95	Feb 0.92	0.80	\rightarrow	Apr Ma	- +	Jun 0.49	Jul 0.37	0.4	ug 11	Sep 0.61	Oct 0.83	0.93	Dec 0.96	_	(86)
					I			<u>!</u>				0.03	0.83	0.90	_	(00)
		· ·			ving area T1	÷т		i	_			20.44	40.00	40.07	7	/07\
(87)m=	18.73	19.08	19.0	О	20.19 20.6		20.87	20.95	20.	94	20.74	20.14	19.32	18.67	_	(87)

T		ما بمصاحب ام		مان مام اس		م منالم بيام	from To	hia O T	LO (0C)					
	19.93	19.94	neating p	19.95	19.95	19.97	19.97	19.97	19.96	19.95	19.95	10.04		(88)
(88)m=		ļ	<u> </u>						19.96	19.95	19.95	19.94		(00)
			ains for i			<u> </u>								
(89)m=	0.94	0.91	0.85	0.73	0.59	0.42	0.29	0.33	0.55	0.8	0.91	0.95		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	16.92	17.42	18.16	18.98	19.54	19.85	19.94	19.93	19.72	18.93	17.79	16.84		(90)
		=					-		f	LA = Livin	g area ÷ (4	4) =	0.5	(91)
Mear	interna	l temner	ature (fo	r the wh	ole dwel	lling) – fl	Δ ν Τ1	+ (1 – fl	A) × T2			•		
(92)m=	17.83	18.26	18.88	19.59	20.09	20.36	20.45	20.44	20.23	19.54	18.56	17.76		(92)
			he mean								10.00			, ,
(93)m=	17.83	18.26	18.88	19.59	20.09	20.36	20.45	20.44	20.23	19.54	18.56	17.76		(93)
		l	uirement											
			ternal ter		re obtain	ed at ste	en 11 of	Table 9	h so tha	t Ti m=(76)m an	d re-calc	ulate	
			or gains	•		iou at ott	SP 11 01	Table 5	o, 50 tria	(11,111—(<i>i</i> 0)111 a11	a ro oaio	diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	-									
(94)m=	0.92	0.89	0.82	0.72	0.59	0.45	0.33	0.37	0.57	0.78	0.89	0.93		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	479.13	558.99	622.6	640.74	576.62	430.6	301.51	311.2	427.22	485.65	465.29	453.86		(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	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1143.66	1125.71	1041.12	886.83	693.65	470.11	314.03	328.34	503.12	739.5	953.34	1133.89		(97)
_							000	0_0.0.	000.12		000.0.			
Spac	e heatin	g require	ement fo	r each n	nonth, k\									, ,
Spac (98)m=	e heatin 494.41	g require	ement fo	r each n 177.19	nonth, k\ 87.07							505.94		, ,
-						Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻ 188.86	1)m 351.4	505.94	2497.08	(98)
(98)m=	494.41	380.84	311.38	177.19	87.07	Wh/mon	th = 0.02	24 x [(97)m — (95 0)m] x (4 ⁻ 188.86	1)m 351.4	505.94		(98)
(98)m=	494.41 e heatin	380.84 g require	311.38 ement in	177.19 kWh/m²	87.07	Wh/mon	th = 0.02	24 x [(97)m — (95 0)m] x (4 ⁻ 188.86	1)m 351.4	505.94	2497.08 34.96	_
(98)m= Spac 8c. S	e heatin	380.84 g require	311.38 ement in quiremen	177.19 kWh/m²	87.07 ² /year	Wh/mon	th = 0.02	24 x [(97)m — (95 0)m] x (4 ⁻ 188.86	1)m 351.4	505.94		(98)
(98)m= Spac 8c. S	e heatin	380.84 g require	311.38 ement in quirement July and	t August.	87.07 ² /year See Tab	Wh/mont 0	th = 0.02	24 x [(97 0)m – (95 0)m] x (4 188.86 (kWh/year	1)m 351.4 r) = Sum(9	505.94		(98)
(98)m= Spac 8c. S Calcu	e heatin pace coulated fo Jan	g require	and and and and and and and and and and	kWh/m² t August. Apr	87.07 E/year See Tab May	Wh/mont 0 ole 10b Jun	th = 0.02 0	24 x [(97 0 Tota)m – (95 0 Il per year)m] x (4** 188.86 (kWh/year	1)m 351.4) = Sum(9	505.94 8) _{15,912} =		(98)
(98)m= Spac 8c. S Calcu	e heatin pace co	g require oling rec r June, Feb e Lm (ca	and and and and and and and and and and	kWh/m² t August. Apr using 28	87.07 E/year See Tak May 5°C inter	Wh/mont 0 ole 10b Jun	th = 0.02 0 Jul	24 x [(97 0 Tota Aug and exte)m – (95 0 Il per year Sep)m] x (4* 188.86 (kWh/year	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec		(98)
(98)m= Spac 8c. S Calcu Heat (100)m=	e heatin pace coulated fo Jan loss rate	g require coling rec r June, c Feb e Lm (ca	and and and and and and and and and and	kWh/m² t August. Apr	87.07 E/year See Tab May	Wh/mont 0 ole 10b Jun	th = 0.02 0	24 x [(97 0 Tota)m – (95 0 Il per year)m] x (4** 188.86 (kWh/year	1)m 351.4) = Sum(9	505.94 8) _{15,912} =		(98)
Spac Sc. S Calcu Heat (100)m= Utilisa	e heatin pace co plated fo Jan loss rate o ation face	g require oling rec r June, Feb e Lm (ca	and and and and and and and and and and	kWh/m² t August. Apr using 25	87.07 See Tat May 5°C inter 0	ole 10b Jun rnal temp	th = 0.02 0 Jul perature 603.78	Aug and exte)m – (95 0 Il per year Sep ernal ten	oct operatur	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec Table 10)		(98) (99) (100)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m=	e heatin pace coulated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca	and and and and and and and and and and	kWh/m² t August. Apr using 25	87.07 See Tat May 5°C inter 0	ole 10b Jun rnal temp 766.96	th = 0.02 0 Jul	24 x [(97 0 Tota Aug and exte)m – (95 0 Il per year Sep)m] x (4* 188.86 (kWh/year	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec		(98)
Spac Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin pace co plated fo Jan loss rate o ation face	g require coling rec r June, c Feb e Lm (ca 0 ctor for lo	and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x	87.07 See Tat May 5°C inter 0	ole 10b Jun rnal temp 766.96	Jul perature 603.78	Aug and exte	Sep ernal ten	Oct nperatur 0	1)m 351.4 2) = Sum(9 Nov e from T 0	505.94 8) _{15,912} = Dec Table 10) 0		(98) (99) (100) (101)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace coulated fo Jan loss rate 0 ation face ul loss, h	g require r June, v Feb e Lm (ca 0 etor for lo	and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x	87.07 See Tate May 5°C inter 0 0 (101)m	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78	Aug and exte 618.39	Sep ernal ten 0	oct operatur	1)m 351.4 r) = Sum(9 Nov e from T	505.94 8) _{15,912} = Dec Table 10)		(98) (99) (100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin pace couldated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar o	g require coling rec r June, c Feb e Lm (ca 0 ctor for lo mLm (V 0 gains ca	and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	See Tab May 5°C inter 0 (101)m 0 cable we	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re	Jul perature 603.78 0.9 545.24 egion, se	Aug and extended a	Sep ernal ten 0	Oct nperatur 0	1)m 351.4 2) = Sum(9 Nov e from T 0	505.94 8) _{15,912} = Dec Table 10) 0		(98) (99) (100) (101) (102)
Spac Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace coulated fo Jan loss rate 0 ation face ul loss, heating of the coulated for the coulated	g require r June, v Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca	and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	87.07 See Tate May 5°C inter 0 (101)m 0 cable we	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78 0.9 545.24 egion, se 1151.38	Aug and exte 618.39 0.88 546.25 e Table	New Year Sep O	Oct o o o	1)m 351.4) = Sum(9 Nov e from T 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0	34.96	(98) (99) (100) (101)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ation face (solar of the cooling of the coolin	g require r June, . Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0 g require	and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tate May 5°C inter 0 (101)m 0 cable we 0 whole of	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78 0.9 545.24 egion, se 1151.38	Aug and exte 618.39 0.88 546.25 e Table	New Year Sep O	Oct o o o	1)m 351.4) = Sum(9 Nov e from T 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0	34.96	(98) (99) (100) (101) (102)
Space Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar (0 0)) e coolin(04)m to	g require r June, . Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0 g require	and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tate May 5°C inter 0 (101)m 0 cable we 0 whole of	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul perature 603.78 0.9 545.24 egion, se 1151.38	Aug and exte 618.39 0.88 546.25 e Table	New Year Sep O	Oct o o o	1)m 351.4) = Sum(9 Nov e from T 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0	34.96	(98) (99) (100) (101) (102)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar (0 0)) e coolin(04)m to	g require coling recovery r June, very Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require zero if (and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 × (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and ext 618.39 0.88 546.25 e Table 1066.38	Sep O O O O O O O O O	Oct Oct 0 0 24 x [(10) 0	1)m 351.4) = Sum(9 Nov e from T 0 0 0 0 0 0 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m]	34.96 « (41)m	(100) (101) (102) (103)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar (0 0)) e coolin(04)m to	g require r June, Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0 g require zero if (and and and and and and and and and and	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 × (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and ext 618.39 0.88 546.25 e Table 1066.38	Sep Sep O O O O O O O O Total	Oct Oct Oct 0 0 24 x [(10) 0 = Sum(1)m 351.4) = Sum(9 Nov e from T 0 0 0 0 0 0 0 0	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] >	34.96	(98) (99) (100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 1 0 ation face 0 s (solar (0 0 e cooling 0 0 d fraction	g require r June, v Feb e Lm (ca 0 etor for lo 0 mLm (W 0 gains ca 0 g require zero if (and and and and and and and and and and	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98) 0	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and ext 618.39 0.88 546.25 e Table 1066.38	Sep Sep O O O O O O O O Total	Oct Oct Oct 0 0 24 x [(10) 0 = Sum(1)m 351.4 1) = Sum(9 Nov e from T 0 0 0 0 10.4)	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] >	34.96 	(100) (101) (102) (103)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face 0 color (o) color (o) de cooling 04)m to de fraction ittency face	g require r June, v Feb e Lm (ca 0 etor for lo 0 mLm (W 0 gains ca 0 g require zero if (and and and and and and and and and and	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98) 0	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	ole 10b Jun rnal temp 766.96 0.86 660.56 eather re 1202.06	Jul perature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and ext 618.39 0.88 546.25 e Table 1066.38	Sep Sep O O O O O O O O Total	Oct Oct Oct 0 0 24 x [(10) 0 = Sum(1)m 351.4 1) = Sum(9 Nov e from T 0 0 0 0 10.4)	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] >	34.96 	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Interm	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face 0 color (o) color (o) de cooling 04)m to de fraction ittency face	g require coling rec r June, c Feb e Lm (ca 0 entor for lo mum (V 0 gains ca 0 g require zero if (0 n actor (Ta	and and and and and and and and and and	kWh/m² kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	87.07 See Tak May 5°C inter 0 (101)m 0 cable we 0 whole o m 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jul Derature 603.78 0.9 545.24 egion, se 1151.38 continue	Aug and extended a	New Year Sep	Oct Oct Oct 0 0 24 x [(10) cooled a	1)m 351.4) = Sum(9 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	505.94 8) _{15,912} = Dec Table 10) 0 0 102)m] x	34.96 	(100) (101) (102) (103)

(107)m= 0	0	0	0	0	84.15	97.34	83.52	0	0	0	0	ı	
(107)111-					04.10	37.54	00.02		l = Sum		=	265.01	(107)
Space cooling	require	ment in l	دWh/m²/y	/ear) ÷ (4) =	` ,		3.71	(108)
9b. Energy red	quiremer	nts – Co	mmunity	heating	scheme	;							
This part is use Fraction of spa										nunity sc	heme.	0	(301)
Fraction of spa			•		•	_	(Table T	1) 0 11 11	One		[1	(302)
The community so			•	•	,	,	e allows for	CHP and	up to foul	r other hea	t sources: tl		(002)
includes boilers, h	eat pump	s, geotheri	mal and wa	aste heat f					а р 10 10а.	01110111100			_
Fraction of hea				•							_ ,	1	(303a
Fraction of tota	·			•	•					(302) x (303	3a) =	1	(304a
Factor for cont				,	. ,,		-	ting sys	tem		ļ	1	(305)
Distribution los		(Table 1	12c) for (commun	ity heati	ng syste	em					1.05	(306)
Space heating Annual space		requiren	nent								ĺ	kWh/yea	ar
Space heat fro	_			n				(98) x (3)	04a) x (3)	05) x (306)	 	2621.93	(307
Efficiency of se		•	•	•	system	in % (fr	om Table				<u> </u>	0	(308
Space heating			•	_	•	,) ÷ (308) =	[0	(309
			00001	aai yi oa	Sp.0	ialy by	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(00) 11 (01	.,	. (555)			(,
Water heating Annual water h		requirem	ent								ĺ	1926.82	
If DHW from c	ommuni	ty schen	ne:								i		_
Water heat fro		•)				(64) x (30	03a) x (30	05) x (306)	=	2023.16	(310
Electricity used							0.01	× [(307a)	(307e)	+ (310a)	.(310e)] =	46.45	(313)
Cooling Syster	_		•									6.59	(314)
Space cooling	,			•		,		= (107) ÷	- (314) =			40.23	(315)
Electricity for p mechanical ve							n outside				ĺ	155.75	(330a
warm air heati	ng syste	em fans										0	(330
pump for solar	water h	eating										0	(330)
Total electricity	for the	above, l	kWh/yea	r				=(330a) ·	+ (330b)	+ (330g) =		155.75	(331)
Energy for ligh	ting (cal	lculated	in Apper	ndix L)								315.81	(332)
Electricity gene	erated b	y PVs (A	Appendix	(M) (ne	gative qu	ıantity)						-482.91	(333)
Electricity gene	erated b	y wind to	urbine (A	ppendix	(M) (ne	gative q	uantity)					0	(334)
12b. CO2 Emi	ssions –	- Commu	unity hea	ting sch	eme						l		
								ergy				Emissions	
							kW	h/year		kg CO2/I	κWh	kg CO2/year	•

CO2 associated with heat source 1	[(307b	o)+(310b)] x 100 ÷ (367b) x	0.52	=	834.19	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	24.11	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372))	=	858.3	(373)
CO2 associated with space heating (see	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) =			858.3	(376)
CO2 associated with space cooling		(315) x	0.52	=	20.88	(377)
CO2 associated with electricity for pump	ps and fans within dwe	elling (331)) x	0.52	=	80.83	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	163.91	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl		0.52 x 0.0	1 = _	-250.63	(380)
Total CO2, kg/year	sum of (376)(382) =				873.28	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.23	(384)
El rating (section 14)					89.95	(385)

			lloor D) otoilo:						
Assessor Name: Software Name:	Lindsey Arnott Stroma FSAP 20		User D	Strom Softwa	are Vei				0035000 on: 1.0.5.9	
Address :	The Alders, Aldring			Address:	Flat 34					
1. Overall dwelling dim		torritoac	2, OVV 10							
			Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.75	(2a) =	196.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) 7	71.42	(4)			•		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	196.4	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent f	ans		_			3	x -	10 =	30	(7a)
Number of passive vent	ts				Ī	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	X 4	40 =	0	(7c)
					_			Air cr	nanges per ho	our —
Infiltration due to chimn	· ·					30		÷ (5) =	0.15	(8)
Number of storeys in	been carried out or is intend the dwelling (ns)	iea, procee	a to (17), (otnerwise (continue in	om (9) to	(16)		0	(9)
Additional infiltration	the aweiling (110)						[(9)]	-1]x0.1 =	0	(10)
	0.25 for steel or timber	frame or	0.35 fo	r masoni	v constr	uction	[(0)	· jaco	0	(11)
	present, use the value corre				•	0.01.01.			<u> </u>	(/
• .	nings); if equal user 0.35	L - 1\ 0	4 / 1	1\	0					_
•	floor, enter 0.2 (unsea	ilea) or 0.	.1 (seale	ea), eise	enter U				0	(12)
•	nter 0.05, else enter 0 ws and doors draught s	tripped							0	(13)
Window infiltration	ws and doors draught s	uipped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
	e, q50, expressed in cu	hic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	5	(17)
If based on air permeab	• • • •		•	•	•	01.0 0. 0	лиоюро	u.ou	0.4	(18)
·	lies if a pressurisation test ha					is being u	sed		0.1	()
Number of sides shelter	red								1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18) x (20) =				0.37	(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 ÷ 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]	
		1		1		<u> </u>		<u> </u>	J	

If exhaust air heat pump using Appendix N. (22b) = (23a) x Fmv (equation (Ns)), otherwise (23b) = (23a) (23a) (3a)	Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
If nechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (NS)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (NS)), otherwise (23b) = (23a) If balanced whether recovery efficiency in % allowing for in-use factor (from Table 4h) =							` 	r `	`	0.4	0.42	0.44]		
## exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) = 5			_	rate for t	he appli	cable ca	se	<u> </u>	<u> </u>	<u> </u>	ļ		J		_
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =								.=						0	(23a
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23d) + 100] [24a]mm) = (23a)				0	(23b
(24a)m			-	-	_									0	(230
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						·	- ` ` 	- ^ ` ` - 	ŕ	- 	` 	1 ` '	i ÷ 100] i		(0.4
(24b)m-0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0												0			(24a
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b). (24d)m= 0	· ·	1				i			í `	 	- 		1		(= 1)
(24c)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) (24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				_		<u> </u>				0	0	0]		(24b
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 = 0.61	•				•					.5 × (23k	o)				
If (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(240
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.61 0.61 0.6 0.58 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 3. Heat losses and heat loss parameter. ELEMENT Gross area (m²) Openings area (p²) Openings area (p²) Openings area (p²) Openings (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p²) Openings area (p	,									0.5]					
25 me 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.56 0.57 0.58 0.59 0.6 (25)	(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(240
3. Heat losses and heat loss parameter: ELEMENT Gross Openings A,m² V/m2K (W/K) kJ/m²-K kJ/K Doors 2.12 x 1 = 2.12 (26) Windows Type 1 3.88 x1/1/(1.4) +0.04 = 5.14 (27) Windows Type 2 9.93 x1/1/(1.4) +0.04 = 5.14 (27) Windows Type 3 1.92 x1/1/(1.4) +0.04 = 2.55 (27) Walls Type 1 77.11 15.73 61.38 x 0.18 = 11.05 (29) Walls Type 2 10.2 2.12 8.08 x 0.18 = 11.05 (29) Walls Type 2 10.2 2.12 8.08 x 0.18 = 1.45 (29) Walls Type 3 7.56 0 7.56 x 0.18 = 1.36 (29) Walls Type 3 7.56 0 7.56 x 0.18 = 1.36 (29) Walls Type 3 7.56 (30) 7.56 x 0.18 = 1.36 (30) Total area of elements, m² (30) Total area of of 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) = (25) (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K (35)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (36)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Walls Type 1 77.11	Effective air	change	rate - en	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	-		
Doors	(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(25)
Doors	3 Heat losse	s and he	eat loss r	naramete	ōt.										
Doors	ELEMENT	Gros	SS	Openin	gs										
Windows Type 1 3.88	Daara	area	(m²)	m	l ²		_		_	•	K)	KJ/m²-	K	KJ/	
Windows Type 2 9.93 x1/[1/(1.4) + 0.04] = 13.16 (27) Windows Type 3 1.92 x1/[1/(1.4) + 0.04] = 2.55 (27) Walls Type1 77.11 15.73 61.38 x 0.18 11.05 (29) Walls Type2 10.2 2.12 8.08 x 0.18 1.45 (29) Walls Type3 7.56 0 7.56 x 0.18 1.36 (29) Roof 71.42 0 71.42 x 0.13 166.29 (31) Total area of elements, m² 166.29 (31) **for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) = 46.12 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) **For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Wentilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Wentilation heat loss calculated monthly (39)m = (37) + (38)m (39)m = (37) + (38)m (30)m = (38)m = (38							_				_				
Windows Type 3 1.92 x1/[1/(1.4) + 0.04] = 2.55 (27)						3.88	_			5.14	_				(27)
Walls Type1						9.93	_			13.16	_				(27)
Walls Type2 10.2 2.12 8.08 x 0.18 = 1.45 (29) Walls Type3 7.56 0 7.56 x 0.18 = 1.36 (29) Roof 71.42 0 71.42 x 0.13 = 9.28 (30) Total area of elements, m² 166.29 (31) *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 46.12 (33) Heat capacity Cm = S(A x K) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (21.1 (36)) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (35) = (67.22 (37)) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.37 (38)m (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) +		3 				1.92	x1.	/[1/(1.4)+	0.04] =	2.55	ᆗ .				(27)
Walls Type3	• •	77.1	1	15.73	3	61.38	3 X	0.18	=	11.05			<u> </u>		(29)
Roof T1.42 0	Walls Type2	10.	2	2.12		8.08	Х	0.18	=	1.45			[(29)
Total area of elements, m²	Walls Type3	7.5	6	0		7.56	Х	0.18	=	1.36					(29)
* 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) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (21.1 (36)) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Unique (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 (39.43 (39.16) (37.85 (37.6) (36.47 (36.47 (36.47 (36.47 (36.26) (36.9) (37.6) (38.1) (38.1) (38.1) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39.16)	Roof	71.4	2	0		71.42	<u>x</u>	0.13		9.28			\Box [(30)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 46.12 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (21.1 (36)) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.85 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	Total area of e	lements	, m²			166.2	9								(31)
Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) ((28)(30) + (32) = (28)(32) + (32a)(32e) = (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84							ated using	formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragraph	3.2		
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1721.06 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84					s and pan	itions		(26)(30)) + (32) =				16	: 12	7(33)
Thermal mass parameter (TMP = Cm ÷ 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. Thermal bridges: S (L x Y) calculated using Appendix K 21.1 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84			,	• ,				, , , ,		(30) + (3	2) + (32a).	(32e) =			=
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 21.1 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 67.22 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	. ,		,) = Cm ÷	- TFA) ir	n kJ/m²K				, , ,	, , ,	(= = 7			=
Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	For design assess	sments wh	ere the de	tails of the				ecisely the				able 1f		<u> </u>	_(00)
if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84					usina Ac	pendix l	<						2	1 1	7(36)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84 (39)m = (37) + (38)m	if details of therma	al bridging				-			(33) +	· (36) =					<u> </u>
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84			alculated	monthly	,						(25)m x (5))	07	.22	(01)
(38)m= 39.72 39.43 39.16 37.85 37.6 36.47 36.47 36.26 36.9 37.6 38.1 38.62 (38) Heat transfer coefficient, W/K (39)m= (37) + (38)m (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84		r				,lun	.lul	Aua		<u> </u>	1	<u> </u>	1		
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84							-	<u></u>	<u> </u>	†	<u> </u>	†			(38)
(39)m= 106.94 106.65 106.38 105.07 104.82 103.69 103.69 103.47 104.12 104.82 105.32 105.84	` ′	<u> </u>				L	<u> </u>	L	<u> </u>		ļ		J		. ,
1 0 (0) 40 40 77 (0)				105.07	104.82	103 69	103 69	103 47				105.84	1		
	` '	<u> </u>				<u> </u>		1 .50.47		L	<u> </u>	<u> </u>	10	5. 0 5	2 [3,9)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.5	1.49	1.49	1.47	1.47	1.45	1.45	1.45	1.46	1.47	1.47	1.48		
	•	!							Average =	Sum(40) ₁ .	12 /12=	1.47	(40)
Number of da	·	<u> </u>	· ·						<u> </u>				
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. Water hea	iting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ if TFA > 13. if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		28		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target c		.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								1		L			
(44)m= 97.19	93.65	90.12	86.59	83.05	79.52	79.52	83.05	86.59	90.12	93.65	97.19		
` '	<u> </u>			l		l	l		Total = Su	m(44) ₁₁₂ =	-	1060.23	(44)
Energy content o	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 144.13	126.05	130.08	113.4	108.81	93.9	87.01	99.85	101.04	117.75	128.53	139.58		
									Total = Su	m(45) ₁₁₂ =	= [1390.13	(45)
If instantaneous	water heati	ng at point	of use (no	not water	storage),	enter 0 in	boxes (46)	to (61)	1	1	1		
(46)m= 21.62	18.91	19.51	17.01	16.32	14.08	13.05	14.98	15.16	17.66	19.28	20.94		(46)
Water storage Storage volun) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		150		(47)
If community	` '					_		a	00.		150		(41)
Otherwise if n	_			_			, ,	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	55		(48)
Temperature	factor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	84		(50)
b) If manufac			-										(54)
Hot water stor	_			ie z (KVV	n/iitie/ua	iy)					0		(51)
Volume factor	_		011 1.0								0		(52)
Temperature	factor fro	m Table	2b							—	0		(53)
Energy lost fro	om watei	rstorage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	84		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)		x [(50) – (H11)] ÷ (5		7)m = (56)	m where (m Appendi	хН	
(57)m= 25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circui	t loss (ar	nnual) fro	m Table	- 							0		(58)
Primary circui	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

0 111		,	41	(0.4)	(00)	05 (44	`						
Combi loss		r	month (` 	<u> </u>	<u> </u>		Ι ο	Ι ,	Ι ,	Ι ,	1	(61)
` ′	0	0	<u> </u>	0	0	0	(00)	0 05	(45)	(40)	(57)	(50) (64)	(01)
(62)m= 193.3		179.32	161.06	158.06	141.55	136.25	(62)m		(45)m + 166.99	(46)m +	(57)m + 188.82	(59)m + (61)m	(62)
` '		l	L	<u> </u>		ļ				<u> </u>		i	(02)
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												ł	. ,
(64)m= 193.3		179.32	161.06	158.06	141.55	136.25	149.0	9 148.69	166.99	176.19	188.82		
	<u> </u>	<u> </u>	<u> </u>				0	I utput from w	ater heate	ır (annual)₁	I12	1969.92	(64)
Heat gains f	rom water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 87.3		82.64	75.83	75.57	69.34	68.32	72.59	-	78.55	80.86	85.8	ĺ	(65)
	7)m in cal	culation (of (65)m	only if c	vlinder i	s in the	dwellir	a or hot w	/ater is f	rom com	munity h	ı ıeating	
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 ga				, ·									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114	+	114	114	114	114	114	114	114	114	114	114		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 17.8	9 15.89	12.92	9.78	7.31	6.17	6.67	8.67	11.64	14.78	17.25	18.39		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5										ı			
(68)m= 200.5	9 202.67	197.42	186.26	172.16	158.91	150.06	147.9	8 153.23	164.39	178.49	191.74		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	÷ 5			ı	
(69)m= 34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4		(69)
Pumps and	fans gains	(Table 5	5а)					•			•	1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	-		-		-	-		
(71)m= -91.2	2 -91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2	-91.2		(71)
Water heating	ng gains (1	able 5)	-	-		-		-	-	-	-	•	
(72)m= 117.3	6 115.32	111.08	105.32	101.58	96.31	91.83	97.57	99.61	105.57	112.31	115.33		(72)
Total intern	al gains =				(66)m + (67)m	า + (68)เ	n + (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 396.0	394.08	381.63	361.56	341.25	321.6	308.77	314.4	3 324.68	344.94	368.24	385.65		(73)
6. Solar ga													
Solar gains a		_					itions to	convert to the	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
5 4							, –					` '	1
East 0.9	-		3.8		-	19.64]	0.63	×	0.7	=	23.29	(76)
East 0.9		X	3.8		-	38.42	X	0.63	×	0.7	=	45.56	[(76)
East 0.9		X	3.8		-	63.27]	0.63	×	0.7	=	75.03	[(76)
East 0.9		X	3.8		-	92.28]	0.63	×	0.7	=	109.42	(76)
East 0.9	X 0.77	X	3.8	38	x 1	13.09	X	0.63	X	0.7	=	134.1	(76)

East	0.9x	0.77		X	3.88	7 x	1	15.77] x		0.63	X	0.7		137.28	(76)
East	0.9x	0.77		X	3.88	」 】 x		10.22]]		0.63	→ x	0.7	= =	130.69	(76)
East	0.9x	0.77		X	3.88	」 기 x		94.68]]		0.63	ا ×	0.7	= =	112.26	(76)
East	0.9x	0.77	一	X	3.88] ×		3.59]]		0.63	ا ×	0.7	= =	87.26	(76)
East	0.9x	0.77		X	3.88	」 】 x		15.59]]		0.63	ا ×	0.7	= =	54.06	(76)
East	0.9x	0.77	\equiv	X	3.88	」 】x		24.49]]		0.63	ا ×	0.7	= =	29.04	(76)
East	0.9x	0.77		X	3.88	۱ ×		6.15]] x		0.63	ا x	0.7	= =	19.15	(76)
South	0.9x	0.77		X	1.92	٦ ×		6.75)] x		0.63	×	0.7		27.43	(78)
South	0.9x	0.77		X	1.92	i x	7	'6.57	X		0.63	×	0.7	=	44.93	(78)
South	0.9x	0.77		X	1.92	i x	9	7.53	x		0.63	×	0.7	-	57.23	(78)
South	0.9x	0.77		X	1.92	i x	1	10.23	X		0.63	×	0.7		64.68	(78)
South	0.9x	0.77		X	1.92	i x	1	14.87	x		0.63	×	0.7	= =	67.4	(78)
South	0.9x	0.77		X	1.92	i x	1	10.55	X		0.63	×	0.7	_ =	64.87	(78)
South	0.9x	0.77		X	1.92	i x	1	08.01	X		0.63	×	0.7		63.38	(78)
South	0.9x	0.77		X	1.92	i x	1	04.89	x		0.63	×	0.7	=	61.55	(78)
South	0.9x	0.77		X	1.92	i ×	1	01.89	x		0.63	×	0.7	=	59.78	(78)
South	0.9x	0.77		X	1.92	Ī×	8	32.59	x		0.63	×	0.7	=	48.46	(78)
South	0.9x	0.77		X	1.92	Ī×	5	55.42	x		0.63	x	0.7	=	32.52	(78)
South	0.9x	0.77		X	1.92	T x		40.4	x		0.63	×	0.7	=	23.7	(78)
West	0.9x	0.77		X	9.93	×	1	9.64	x		0.63	x	0.7	=	59.6	(80)
West	0.9x	0.77		X	9.93	×	3	88.42	x		0.63	x	0.7	=	116.6	(80)
West	0.9x	0.77		X	9.93	X	6	3.27	x		0.63	x	0.7	=	192.02	(80)
West	0.9x	0.77		X	9.93	X	9	2.28	x		0.63	x	0.7	=	280.05	(80)
West	0.9x	0.77		X	9.93	×	1	13.09	X		0.63	x	0.7	=	343.21	(80)
West	0.9x	0.77		X	9.93	×	1	15.77	x		0.63	x	0.7	=	351.33	(80)
West	0.9x	0.77		X	9.93	×	1	10.22	x		0.63	x	0.7	=	334.48	(80)
West	0.9x	0.77		X	9.93	×	9	94.68	X		0.63	X	0.7	=	287.32	(80)
West	0.9x	0.77		X	9.93	×	7	'3.59	X		0.63	x	0.7	=	223.32	(80)
West	0.9x	0.77		X	9.93	×	4	5.59	X		0.63	X	0.7	=	138.35	(80)
West	0.9x	0.77		X	9.93	×	2	24.49	X		0.63	X	0.7	=	74.32	(80)
West	0.9x	0.77		X	9.93	×	1	6.15	X		0.63	X	0.7	=	49.01	(80)
_				$\overline{}$	for each mor	_					m(74)m		i	1	7	(00)
(83)m=	110.33	207.08	324.2		454.15 544.7		553.48	528.56	461	.13	370.37	240.8	7 135.87	91.87		(83)
_				_	(84)m = (73)	_	• •		775		005.04	505.0	1 504.40	177.50	٦	(84)
(84)m=	506.36	601.16	705.		815.71 885.9		875.08	837.33	775	0.56	695.04	585.8	504.12	477.52		(04)
		· ·			heating seas			, -,		T L 4	(0.0)					7(0=)
•		_		•	eriods in the I				ole 9	, Ih1	(°C)				21	(85)
Utilisa		Ť		-	ving area, h1	T			Ι ,		Can	0	Nev	Daa	٦	
(86)m=	Jan 1	Feb 0.99	0.98	_	Apr Ma 0.94 0.84	- +	Jun 0.68	Jul 0.52	0.5	ug 58	Sep 0.82	Oct 0.96	0.99	Dec 1	4	(86)
					<u> </u>			<u>!</u>			!	0.90	0.99		_	(00)
				-	ving area T1	÷г		i	_			00.05	1400	40.00	٦	(97)
(87)m=	19.41	19.61	19.9	4	20.37 20.7	2	20.92	20.98	20.	9/	20.81	20.35	19.8	19.39	J	(87)

T	a dinaka a l				ali i i a III a ai		.b.l. 0 T	LO (0 0)					
Temperatur (88)m= 19.69		19.7	19.71	19.71	19.72	19.72	19.73	19.72	19.71	19.71	19.7		(88)
` ′	_ <u> </u>	!	ļ		<u> </u>	ļ		19.72	19.71	19.71	19.7		(00)
Utilisation fa		1			```	i	- 	0.70	0.04	0.00		1	(00)
(89)m= 0.99	0.99	0.97	0.91	0.78	0.58	0.38	0.44	0.73	0.94	0.99	1		(89)
Mean intern		ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)			1	
(90)m= 17.62	17.91	18.39	19	19.45	19.67	19.72	19.71	19.58	18.98	18.2	17.58		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.5	(91)
Mean intern	al tempe	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 18.53	18.77	19.17	19.69	20.09	20.3	20.35	20.35	20.2	19.67	19.01	18.49		(92)
Apply adjus	tment to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.53	18.77	19.17	19.69	20.09	20.3	20.35	20.35	20.2	19.67	19.01	18.49		(93)
8. Space he	eating req	uirement											
Set Ti to the the utilisation			•		ned at sto	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		<u> </u>	<u> </u>	Way	Our	J Gai	7149	СОР	001	1101		l	
(94)m= 0.99	0.99	0.97	0.91	0.8	0.63	0.45	0.51	0.77	0.94	0.99	0.99		(94)
Useful gains	s, hmGm	, W = (94	4)m x (84	4)m	I	<u> </u>		I				ı	
(95)m= 502.6	592.17	681.45	744.13	711.33	548.45	380.62	394.79	534.51	553.03	497.12	474.7		(95)
Monthly ave	erage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	ate for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1521.2	28 1479.13	1348.28	1133.66	879.19	591.1	389.19	408.39	635.46	950.72	1254.15	1512.74		(97)
Space heat		ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95		1)m	•	•	
(98)m= 757.9	596.04	496.12	280.46	124.89	0	0	0	0	295.88	545.06	772.3		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3868.65	(98)
Space heat	ing requir	ement in	kWh/m²	/year								54.17	(99)
9a. Energy re	equireme	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heat	•			, .									٦
Fraction of	•				mentary	•						0	(201)
Fraction of	space hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of	total heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency o	f main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency o	f seconda	ry/suppl	ementar	y heatin	g systen	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	_ ar
Space heat	ing requir	ement (c	alculate	d above)								
757.9	596.04	496.12	280.46	124.89	0	0	0	0	295.88	545.06	772.3		
	00)4)] } x 1	00 ÷ (20	06)									(211)
(211)m = {[(9	98)m x (20	/1 /			1	_	0	0	316.45	582.95	825.99		
$(211)m = \{[(9)]$ 810.59	- í - ` -	530.61	299.96	133.57	0	0	0	0	310.45	302.93	025.99	1	
` ' - 131	- í - ` -	1	299.96	133.57	0	U		l (kWh/yea				4137.59	(211)
` '	9 637.47	530.61			0	0						4137.59	(211)
810.59	9 637.47 ing fuel (s	530.61 econdar	y), kWh/		0	0						4137.59	(211)
810.59 Space heat	9 637.47 ing fuel (s	530.61 econdar	y), kWh/		0	0	Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	= 0	4137.59	_
Space heat = {[(98)m x (2)	9 637.47 ing fuel (s 201)] } x 1	530.61 econdar 00 ÷ (20	y), kWh/ 8)	month			Tota	I Il (kWh/yea	ar) =Sum(2	211) _{15,1012}	= 0	4137.59	(211)

Water heating									
Output from water heater (calculated above) 193.37 170.53 179.32 161.06 158.06 1	41.55 136.25	149.09	148.69	166.99	176.19	188.82			
Efficiency of water heater	l			ļ.		!	79.8	(216)	
(217)m= 88.1 87.88 87.39 86.28 84.19	79.8 79.8	79.8	79.8	86.32	87.63	88.18		(217)	
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•	•				•	•		
· · · · · · · · · · · · · · · · · · ·	77.38 170.74	186.83	186.33	193.45	201.06	214.14		_	
		Tota	I = Sum(2	19a) ₁₁₂ =			2323.07	(219)	
Annual totals	kWh/year	7							
Space heating fuel used, main system 1		4137.59							
Water heating fuel used	2323.07	_							
Electricity for pumps, fans and electric keep-hot									
central heating pump:						30		(230c)	
boiler with a fan-assisted flue		(230e)							
Total electricity for the above, kWh/year	75	(231)							
Electricity for lighting	315.91	(232)							
12a. CO2 emissions – Individual heating system	s including m	icro-CHP							
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/year		
Space heating (main system 1)	(211) x			0.2	16	=	893.72	(261)	
Space heating (secondary)	(215) x			0.5	19	=	0	(263)	
Water heating	(219) x			0.2	16	=	501.78	(264)	
Space and water heating	(261) + (262)	1) + (262) + (263) + (264) =							
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =					38.93	(267)	
Electricity for lighting	(232) x			0.5	19	=	163.96	(268)	
Total CO2, kg/year			sum o	of (265)(2	271) =		1598.38	(272)	

TER =

(273)

33.13



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